Educational Note

IFRS 17 Discount Rates and Cash Flow Considerations for Property and Casualty Insurance Contracts

Committee on Property and Casualty Insurance Financial Reporting

June 2022

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The actuary should be familiar with relevant educational notes. Educational notes are not binding; rather they are intended to illustrate the application of the standards of practice. A practice that an educational note describes for a situation is not necessarily the only accepted practice for that situation nor is it necessarily accepted practice for a different situation. Responsibility for ensuring that work is in accordance with accepted actuarial practice lies with the actuary. As accepted actuarial practice evolves, an educational note may no longer appropriately illustrate the application of standards. To assist the actuary, the CIA website contains a reference of pending changes to educational notes.

MEMORANDUM

To: Members in the Property and Casualty Insurance Practice Area

From: Steven W. Easson, Chair
Actuarial Guidance Council

Sarah Ashley Chevalier, Chair
Committee on Property and Casualty Insurance Financial Reporting

Date: June 30, 2022

Subject: **Educational Note: IFRS 17 Discount Rates and Cash Flow Considerations for Property and Casualty Insurance Contracts**

The Committee on Property and Casualty Insurance Financial Reporting (PCFRC) has prepared this educational note to provide guidance related to setting and applying discount rates (including cash flow considerations) for the purposes of calculating the present value of estimates of future cash flows under IFRS 17.

This educational note is structured in sections as follows:

- Sections 1 and 2, respectively, provide an introduction and a list of the terminology used in this educational note.
- Sections 3 through 7 illustrate various considerations in determining an entity's fulfilment cash flows, including selecting an IFRS 17 discount curve.
- Sections 8 through 13 provide additional guidance around the application of discount rates, measuring changes in discounting assumptions, and other aspects of financial statement presentation.
- Section 14 describes the illustrative examples set out in Appendices 1 through 9, detailed in the Excel file that forms part of this educational note.

This educational note is focused on the Canadian market, economic environment, and products. Similar considerations and approaches could be used for setting the discount rates for other currencies. It is written from the perspective of Canadian actuaries and is not intended to duplicate any other guidance. Further information ("guidance") can be found in the International Actuarial Association (IAA) guidance and other Canadian Institute of Actuaries (CIA) documents

A preliminary version of the draft of this educational note was shared with the following committees prior to publication:

- Committee on Life Insurance Financial Reporting (CLIFR)
- Committee on Risk Management and Capital Requirements

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- Committee on the Appointed/Valuation Actuary
- International Insurance Accounting Committee
- Committee on Worker's Compensation
- Group Insurance Practice Committee
- ASB's Designated Group on IFRS 17.

A preliminary version of the draft of this educational note was also shared with the staff of the Accounting Standards Board (AcSB) to broaden consultations with the accounting community. Given that this educational note provides actuarial guidance rather than accounting guidance, the AcSB staff review was limited to citations of and any inconsistencies with IFRS 17. CIA educational notes do not go through the AcSB's due process and therefore, are not endorsed by the AcSB.

The draft of this educational note was also presented several times at the Actuarial Guidance Council (AGC) in the months preceding the request for approval. CLIFR satisfied itself that it had sufficiently addressed the comments received on the draft of this educational note and it was published in August 2020 and revised in December 2020.

The subcommittee feels that it has addressed the material comments received by the various committees.

Although most P&C cash flows are within the observable period, this educational note refers to discount curves in the unobservable period, based on guidance developed by CLIFR in respect of discount rates for Life and Health Insurance Contracts.

The creation of this memorandum and educational note has followed the 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 PCFRC and has received approval for distribution from the AGC on June 14, 2022.

The actuary should be familiar with relevant educational notes. Educational notes are not binding; rather they are intended to illustrate the application of the standards of practice. A practice that an educational note describes for a situation is not necessarily the only accepted practice for that situation nor is it necessarily accepted practice for a different situation. Responsibility for ensuring that work is in accordance with accepted actuarial practice lies with the actuary. As accepted actuarial practice evolves, an educational note may no longer appropriately illustrate the application of standards. To assist the actuary, the CIA website contains a reference of pending changes to educational notes.

If you have any questions or comments regarding this educational note, please contact the Chair of PCFRC at guidance.feedback@cia-ica.ca.

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1. Introduction

IFRS 17 Insurance Contracts (IFRS 17 or the Standard) establishes principles for the recognition, measurement, presentation, and disclosure of insurance contracts. The purpose of this educational note is to provide practical guidance on Canadian-specific issues relating to discounting estimates of future cash flows for property and casualty (P&C) insurance companies under IFRS 17. References to specific paragraphs of IFRS 17 are denoted by IFRS 17.XX, where XX represents the paragraph number.

As indicated in IFRS 17.B72 and summarized below, various discount rates are used for applying IFRS 17. Chapter 3 of the CIA educational note (EN) *Application of IFRS 17 Insurance Contracts* (IFRS17 Application EN) provides general guidance about discount rates. The IFRS 17 Application EN, published in October 2021, is an adoption of the IAN 100 which is accompanied by a preamble. The preamble outlines a number of additional clarifications on the topics discussed in the final version of the IAN 100 that CIA members should be aware of.

Guidance in respect of each of these applications is provided in Question 3.2 of the CIA IFRS17 Application EN:

	Application under IFRS 17	**Discount rate to be used**	**Guidance in IFRS 17 Application EN**
a)	To measure the fulfilment cash flows.	Current discount rates applying IFRS 17.36 to nominal cash flows that do not vary based on the returns on any underlying item.	3.11–3.25
b)	To determine the interest to accrete on the contractual service margin (CSM) applying IFRS 17.44(b) for insurance contracts without direct participation features.	Discount rates determined at the date of initial recognition of a group of contracts, applying IFRS 17.36 to nominal cash flows that do not vary based on the returns on any underlying item.	3.37
c)	To measure the changes to the CSM applying IFRS 17.B96(a)–B96(c) for insurance contracts without direct participation features.	Discount rates applying IFRS 17.36 determined on initial recognition.	3.38

	Application under IFRS 17	Discount rate to be used	Guidance in IFRS 17 Application EN
d)	For groups of contracts applying the premium allocation approach (PAA) that have a significant financing component or contracts that are onerous, to adjust the carrying amount of the liability for remaining coverage (LRC) applying IFRS 17.56.	Discount rates applying paragraph IFRS 17.36 on initial recognition (for onerous contracts, current discount rate when the group becomes onerous and at each subsequent reporting period, which may be different than the discount rate at initial recognition of the group).	3.34 and 3.35
e)	If an entity chooses to disaggregate insurance finance income or expenses between profit or loss and other comprehensive income (OCI) (see IFRS 17.88), to determine the amount of the insurance finance income or expenses included in profit or loss.		
	(i) For groups of insurance contracts for which changes in assumptions that relate to financial risk do not have a substantial effect on the amounts paid to policyholders, applying IFRS 17.B131.	Discount rates determined at the date of initial recognition of a group of contracts, applying IFRS 17.36 to nominal cash flows that do not vary based on the returns on any underlying items.	3.39
	(ii) For groups of insurance contracts for which changes in assumptions that relate to financial risk have a substantial effect on the amounts paid to policyholders, applying IFRS 17.B132(a)(i).	Discount rates that allocate the remaining revised expected finance income or expenses over the remaining duration of the group of contracts at a constant rate or expected credited rate.	3.40
	(iii) For groups of insurance contracts applying the PAA applying IFRS 17.59(b) and IFRS 17.B133.	Discount rates determined at the date of the incurred claim, applying IFRS 17.36 to nominal cash flows that do not vary based on the returns on any underlying items.	3.36

Under IFRS 17, insurance contract liabilities include the liability for remaining coverage (LRC) and the liability for incurred claims (LIC). Fulfilment cash flows for these liabilities, when calculated using the general measurement approach (GMA), are described in IFRS 17.32(a), which states that the fulfilment cash flows comprise:

(i) estimates of future cash flows;

(ii) an adjustment to reflect the time value of money and the financial risks related to the future cash flows, to the extent that the financial risks are not included in the estimates of the future cash flows; and

(iii) a risk adjustment for non-financial risk.

This educational note provides practical application guidance and illustrative examples (basic and with options) on issues relating to determining discount rates and other discounting assumptions and applying such assumptions to the LIC for P&C insurance contracts. In respect of LRC for P&C entities, the discount rate guidance in this educational note should be read in conjunction with the educational note *Liability for Remaining Coverage in P&C Insurance Contracts* (LRC EN).

This educational note supplements the following:

- CIA Final Standards (Document 221137, December 2021): *Changes Required by the Adoption in Canada of IFRS 17 (Insurance Contracts)*
- CIA Educational Note (Document 221117, October 2021): *Application of IFRS 17 Insurance Contracts*, and in particular Chapter 3 (Discount Rates).

In addition, the following educational notes are referenced in the commentary that follows and may serve as additional useful guidance to actuaries:

- CIA educational note (June 2022): *IFRS 17 Risk Adjustment for Non-Financial Risk for Property and Casualty Insurance Contracts (Risk Adjustment EN).*
- CIA draft educational note (April 2020): *IFRS 17 – Actuarial Considerations Related to P&C Reinsurance Issued and Held (Reinsurance EN).*
- CIA educational note (June 2022): *Liability for Remaining Coverage in P&C Insurance Contracts (LRC EN).*

In writing this educational note, PCFRC followed the following guiding principles:

- Consider Canadian-specific perspectives rather than simply repeating international actuarial guidance.
- Develop application guidance that is consistent with IFRS 17 and applicable Canadian actuarial Standards of Practice and educational notes without unnecessarily narrowing the choices available in IFRS 17.
- Consider practical implications associated with the implementation of potential approaches and methods; in particular, ensure that due consideration is given to options that do not require undue cost and effort to implement.

2. Terminology

This educational note applies to the LRC and the LIC of insurance and reinsurance contracts issued, and reinsurance contracts held.

The following terminology is used in this educational note:

- **Discount rate:** Rate used to discount the estimates of future cash flows which is consistent with the timing, liquidity and currency of the insurance contract cash flows. A discount rate may be a single rate, or a curve of rates varying by duration. “Discount rate curve” and “yield curve” are used interchangeably in this educational note.
- **Estimates of future cash flows:** Future undiscounted cash flows arising from the insurance/reinsurance contracts issued or reinsurance contracts held.
- **Forward rate:** The interest rate implied by the yield curve over a given future period. Mathematically, the forward rate over time [n-1, n] is

$$f_n = \frac{(1 + y_n)^n}{(1 + y_{n-1})^{n-1}} - 1 \,,$$

  where y_n denotes the spot rate for maturity *n*. The forward rate over time [n-1, n] can be conceptualized as the interest rate that equates the strategies of

    - investing in the n-year spot rate, and
    - investing in the (n-1)-year spot rate and then in the forward rate.

- **Fulfilment cash flows:** Present value of the estimates of future cash flows plus the risk adjustment for non-financial risk (risk adjustment).
- **Insurance finance income or expense:** The change in the carrying amount of the group of insurance contracts arising from the effect of the time value of money and changes in the time value of money and financial risk. This may be separated into three components, as follows, although it is not a requirement to do so:
    - Unwinding of discount: Insurance finance income or expense arising from the release of the effect of discounting at a subsequent measurement date due to the passage of time.
    - Changes in discounting assumptions: Insurance finance income or expense arising from changes in discount rates at a subsequent measurement date.
    - Changes in the effect of financial risk other than discounting (unlikely to be relevant to P&C insurance contracts).
- **Illiquidity premium:** Adjustment made to a liquid risk-free yield curve to reflect differences between the liquidity characteristics of the financial instruments that underlie the (risk-free) rates observed in the market and the liquidity characteristics of the insurance contracts. The term “illiquidity premium” in this educational note has the

same meaning as the term "liquidity premium" that may be used in other guidance papers.

- **Payment pattern:** Expected pattern of payment of future cash flows.
- **Present value:** Future cash flows discounted to the valuation date.
- **Reference portfolio:** A portfolio of assets used to derive discount rates based on current market rates of return, adjusted to remove returns related to risk characteristics embedded in the portfolio that are not inherent in insurance contracts. For cash flows of insurance contracts that do not vary based on the returns on the assets in the reference portfolio, such adjustments may include:
    - adjustments for differences between the portfolio and the insurance contract cash flows in respect of the timing, currency and liquidity of cash flows; and
    - excluding premiums for credit risk and premiums which are relevant only to the assets included in the reference portfolio.
- **Spot rate:** The current interest rate available for a cash flow with a given time to maturity.
- **Yield curve:** The set of spot rates as a function of time to maturity.
- **Yield to maturity:** The annual rate of return of a bond (or group of bonds) assuming that the investor holds the bond(s) until the maturity date(s).

3. Determining estimates of future cash flows

Unless specified otherwise, "gross" refers to insurance or reinsurance contracts issued, "ceded" refers to reinsurance contracts held, and "net" refers to net of reinsurance contracts held.

Under IFRS 17, fulfilment cash flows are required in respect of insurance contracts issued, reinsurance contracts issued, and reinsurance contracts held. Depending on the organization of the available data and the correspondence between the groups of insurance / reinsurance contracts issued and the groups of reinsurance contract held, the actuary may choose to estimate the future cash flows pertaining to reinsurance contracts held by subtracting net future cash flows (i.e., net of reinsurance held) from gross future cash flows (i.e., insurance and reinsurance contracts issued). When doing so, the implied ceded cash flows would be assessed for reasonableness.

The actuary may consider the following:

- Data availability: If there is sparse or limited data for ceded claims, it may not be possible or appropriate to directly estimate the present value of ceded cash flows.
- Cash flow volatility: Different approaches may be warranted for different segments of business depending on the volatility of cash flows by segment.
- Reinsurance held: Consideration would be given to the type and consistency of an entity's reinsurance held. For example, it may not be appropriate to use the net basis as

a starting point if the entity's retention has changed significantly over the experience period.

Estimates of future cash flows are typically determined by applying payment patterns to selected estimates of future unpaid losses (prior to consideration of the time value of money) on an accident year, policy year, or underwriting year basis using a set of actuarial assumptions and methods.

In accordance with IFRS 17.63, the expected future cash flows of reinsurance contracts held would consider the non-performance of the issuers of the reinsurance contracts. The non-performance includes elements such as delay in payments, default, effect of collateral, and dispute. The actuary would refer to additional details provided in the Reinsurance EN (final version to be published at a later date).

IFRS 17.B65 specifies that cash flows within the boundary of an insurance contract are those that relate directly to the fulfilment of the contract, including cash flows for which the entity has discretion over the amount or timing. Examples of such cash flows may include claim handling costs (i.e., ULAE), receivables, payables, reinstatement premiums and contingent commissions.

3.1 Selecting a payment pattern

Loss payments and estimates of ultimate losses are generally divided into homogeneous business segments for the selection of payment patterns. For this purpose, losses may include loss-related expenses (allocated/external loss adjustment expenses and unallocated/internal loss adjustment expenses), or separate payment patterns may be derived for each of these elements.

Consideration is given to the following:

- The business segments used for the analysis of the liabilities on an undiscounted basis, and which may not correspond to the entity's insurance contract portfolios.
- The payout period (i.e., the length of time over which payments are expected to be made for a segment of claims).
- The existence of a predetermined schedule of payments for a segment of claims.

Selected payment patterns are normally derived from the entity's historical experience. To the extent that an entity's historical experience does not exist (e.g., for a new segment), is not relevant (e.g., changes in claims handling practices) or does not have a reasonable level of credibility (e.g., very low claims volume or significant volatility in claims experience), it may be necessary to evaluate other related or external experience. To the extent possible, such other experience would reflect the expected payment and timing characteristics of the segment under consideration.

Within a segment, payment patterns may vary by accident, policy or underwriting period to reflect changes in legislation, mix of business, reinsurance, or operations (such as claims settlement practices).

Selected payment patterns would reflect the actuary's best estimate with regards to the timing and amount of payments. It may be appropriate to assume that the payment pattern for indemnity and/or external (allocated) claims adjustment expenses also applies to internal (unallocated) claims adjustment expenses.

The payment pattern reflects the timing of expected salvage, subrogation, reinsurance recovery, and loss transfer amounts as applicable. Cash flows would normally be consistent between the reinsurance contracts held and the underlying insurance contracts issued on a direct or gross basis, subject to consideration of any significant recovery lag and the treatment of ceding commissions and ceded claims-related expenses. Consequently, gross, ceded, and net payment patterns are likely to be similar for a given line of business if the entity's reinsurance held is in the form of quota-share reinsurance.

Expected payment patterns are frequently derived by segment based on a review of the historical ratios of paid claims to selected ultimate claims at successive maturity ages. Alternatively, the expected payment patterns may be derived directly from the selected paid development factors if such factors are consistent with the selected ultimate claims.

An example of payment pattern is provided in Appendix 1.

Additional considerations specific to the selection of payment patterns for LRC are addressed in the *LRC EN.*

3.2 Timing of future payments

To determine the expected timing of future payments, the actuary may refer to payment timing studies based on the entity's own data and claims settlement practices. It is common to determine annual, semi-annual, or quarterly payment patterns and assume that payments will, on average, be made in the middle of each period. For example, if the selected payment pattern is annual, the actuary frequently assumes that, on average, payments are made in the middle of each period (i.e., at 6, 18, 30, etc. months) for the purpose of discounting estimates of future cash flows. The mid-period assumption may not be appropriate for books of business with uneven exposures, which may occur when claims are subject to seasonality, for books of business experiencing significant change in volume, or for very short payment patterns.

4. Determining discount rates

4.1 Discount rates

Discount rates are described in IFRS 17.36 as having the following characteristics:

(a) reflect the time value of money, the characteristics of the cash flows and the liquidity characteristics of the insurance contracts;

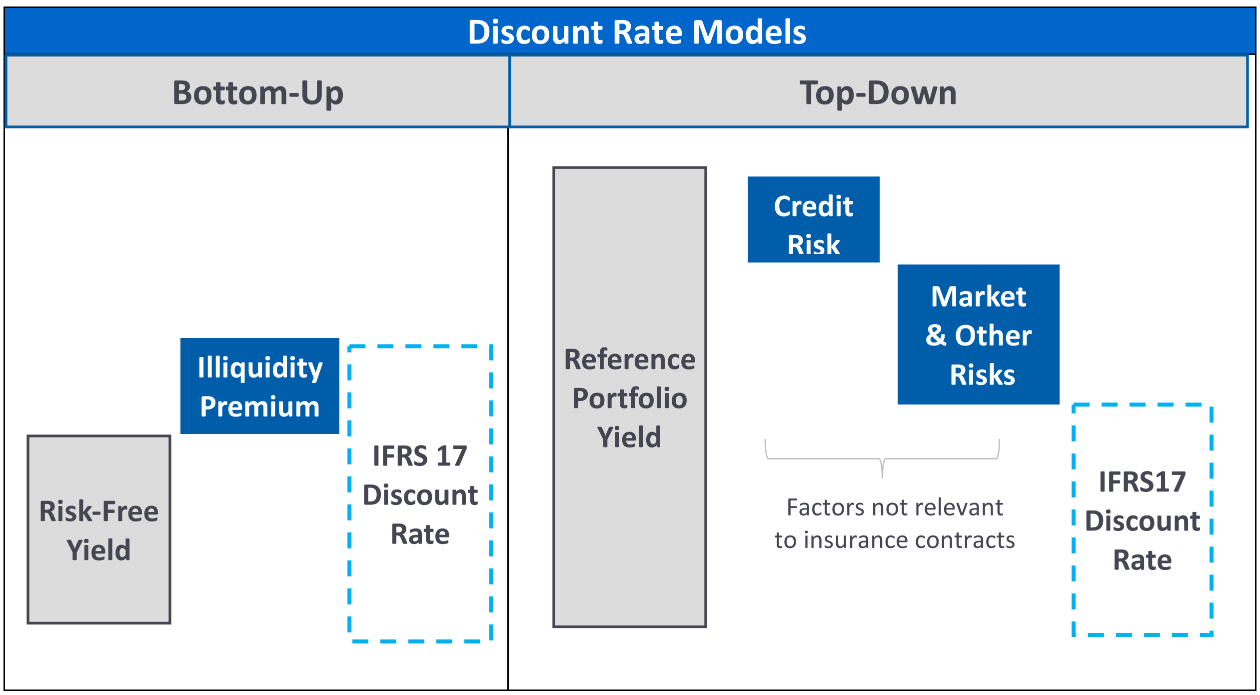
(b) be consistent with observable current market prices (if any) for financial instruments with cash flows whose characteristics are consistent with those of the insurance contracts, in terms of, for example, timing, currency and liquidity; and

(c) exclude the effect of factors that influence such observable market prices but do not affect the future cash flows of the insurance contracts.

Further considerations are provided in IFRS 17.B72–B85.

IFRS 17 permits an entity to use either of two methods to determine the discount rates to be used for the valuation of insurance contract liabilities (IFRS 17.B80–B81):

- A bottom-up approach whereby a liquid risk-free yield curve is adjusted "to reflect the differences between the liquidity characteristics of the financial instruments that underlie the rates observed in the market and the liquidity characteristics of the insurance contracts."
- A top-down approach whereby the yield to maturity of a reference portfolio of assets is adjusted "to eliminate any factors that are not relevant to insurance contracts." Under this approach, the liquidity characteristics of the reference portfolio would reasonably reflect the liquidity characteristics of the cash flows, but the entity "is not required to adjust the yield curve for differences in liquidity characteristics of the insurance contracts and the reference portfolio."



It is possible for the two approaches to lead to the same discount rate, but they may result in different discount rates due to limitations on the way in which adjustments are calculated. Under IFRS 17, an entity will not be required to reconcile the discount rates determined under the two approaches.

The selection of one approach over the other depends on a number of considerations, such as the characteristics of the liability cash flows (including the duration of claim payments), the availability of suitable data, the investment environment, and how frequently the discount rate is expected to be updated.

Also presented in this educational note is an approach to the derivation of illiquidity premiums using a top-down approach applied to a reference portfolio. The resulting illiquidity premiums are then used in a bottom-up approach.

IFRS 17 Discount Rate = Risk-Free Rate[1] + Reference Portfolio Illiquidity premium[2]

1. Risk-free rate as at the valuation date, based on the bottom-up approach.
2. Illiquidity premium, derived at a date that may not be the same as the valuation date, and based on the top-down approach.

As indicated by the formula above, this is fundamentally a bottom-up approach, but the use of a reference portfolio to derive an illiquidity premium curve incorporates certain important features of a top-down approach. One key advantage of this hybrid approach is that it blends the use of a robust model for estimating illiquidity premiums, which can be updated periodically as appropriate (e.g., annually or quarterly), with the use of readily available Canadian risk-free yield curves, which are updated weekly.

IFRS 17 does not specify whether the entity should use a single discount rate or a discount rate curve. This educational note describes the derivation of discount rate curves (i.e., rates that vary by duration), although such a curve may be converted into a single equivalent discount rate for calculation purposes or for information only.

4.2 Bottom-up approach

The bottom-up approach is illustrated in the formula below:

Bottom-Up Discount Rate = Risk-Free Rate + Illiquidity premium

The main advantage of using the bottom-up approach is the availability of risk-free yield curves. The main drawback to this approach is the need to derive an illiquidity premium if or when a non-zero illiquidity premium is required.

4.2.1 Risk-free rate

Government of Canada (GoC) bonds are considered to be risk-free due to the low probability of default of the Canadian government. Other options are available (such as a swap curve), but these options were not explored as they have limited applicability in Canada.

Potential sources for GoC bond rates include the following publicly available data:

- GoC zero-coupon bond yield curves (current rates).
- GoC spot yield curves (current rates).
- Forward 1-year GoC rates (forecast rates).

GoC zero-coupon bond yield curves have the following advantages over the other two sources:

- Timeliness of data, which is updated weekly.
- Availability of the data at a reasonable level of granularity, with maturities ranging from 0.25 years to 30 years in quarterly increments, and thus there is limited need to interpolate or extrapolate values.

4.2.2 Illiquidity premium (theoretical)

The following excerpt from Question 3.16 in Chapter 3 (Discount Rates) of the IFRS17 Application EN pertains to the quantification of the liquidity characteristics of insurance contracts:

> The adjustment to reflect the liquidity characteristics of the insurance contracts has been broadly termed the illiquidity premium. Highly liquid insurance contracts would have a low (or even no) illiquidity premium while very illiquid contracts would have a higher illiquidity premium.
>
> There is no general accepted practice yet for the quantification of the illiquidity premium. Data relating to illiquidity premium of insurance contracts is generally not directly available in the market. Looking beyond insurance contracts, market prices for liabilities where the issuer of debt has the possibility to redeem the debt early are also very limited.
>
> A theoretical approach to determine the illiquidity premium is to assess possible replicating portfolios.

The use of replicating portfolios is theoretically feasible but generally impractical due to the requirement to “exactly match the insurance contract cash flows in all scenarios.” Thus, replicating portfolios are not considered in this educational note.

The following practical estimation approaches for estimating illiquidity premiums are described in Question 3.16 in the IFRS17 Application EN:

- Using a reference portfolio and determining its illiquidity premium using top-down techniques; and
- Comparing yields on illiquid and liquid assets, both with same or similar degree of credit risk.

The first of these approaches (i.e., use of a reference portfolio) was selected for illustrative purposes in Appendix 2. The use of a reference portfolio to derive illiquidity premiums is described later in this educational note.

4.3 Top-down approach

The top-down approach is illustrated in the formula below:

Top-Down Discount Rate = Reference Portfolio Rate – Credit Risk, Market Risk & Other Adjustments

The main advantage of the top-down approach is that it does not require the explicit derivation of an illiquidity premium. A disadvantage of this approach is the potential complexity of the derivation of a reference portfolio rate and applicable adjustments (such as a credit risk adjustment), particularly if the discount rate is expected to be updated frequently.

4.3.1 Selection of a reference portfolio

As described in Question 3.13 in the IFRS17 Application EN:

> An entity may determine appropriate discount rates for insurance contracts using a top down approach (paragraph B81). Under this approach, discount rates are based on current market rates of return of a reference portfolio of assets which are adjusted to remove returns related to risk characteristics embedded within the reference portfolio that are not inherent in insurance contracts. These adjustments are discussed in questions 3.19 and 3.20.
>
> IFRS 17 does not require that adjustments be made for residual differences in liquidity characteristics of the insurance contracts and the reference portfolio. However, the entity would adjust for differences if the liquidity characteristics of the assets in the chosen reference portfolio are not reasonably consistent with the liquidity characteristics of the insurance contracts, as discussed in questions 3.15–3.18

Reference portfolios are key to the top-down approach. If properly adjusted for all risks that are not inherently part of insurance contracts, then the remaining difference relative to a risk-free rate is largely attributable to the asset illiquidity premium.

As indicated in IFRS 17.B85:

> IFRS 17 does not specify restrictions on the reference portfolio of assets used in applying IFRS 17.B81. However, fewer adjustments would be required to eliminate factors that are not relevant to the insurance contracts when the reference portfolio of assets has similar characteristics.

The reference portfolio may be based on actual assets held by the entity or on a theoretical portfolio of assets.

Factors that may differ between a reference portfolio and insurance contracts include:

- liquidity
- investment risk (e.g., credit risk, market risk)
- timing
- currency risk

Liquidity risk and investment risk are addressed in Sections 4.5 and 4.4, respectively.

In selecting the reference portfolio, the actuary would assess the consistency of the timing of payments between the assets in the reference portfolio and the insurance contract liabilities. For example, if the reference portfolio includes bonds with coupons, the actuary may make adjustments to reflect the timing of both the coupon payments and principal repayment if such adjustment is expected to materially affect the selection of discount rates. Potential approaches include:

- considering the duration (rather than the time to maturity) of the securities in the reference portfolio; and
- constructing a reference portfolio that explicitly considers both coupon payments and principal repayments, rather than a simplified approach based only on principal repayments.

Currency risk might be addressed by selecting a reference portfolio made up of investments denominated in the same currency as the insurance contracts.

4.4 Reference portfolio discount rate

4.4.1 Credit risk adjustment

For debt instruments, the effect of credit risk (if non-trivial) is eliminated from the total bond yield. According to Question 3.19 in the IFRS17 Application EN, the effect of credit risk usually comprises two components: the expected credit losses and the unexpected credit losses (i.e., compensation for bearing that risk). The credit risk adjustment includes default risk and downgrade risk.

A bond default occurs when the bond issuer fails to make an interest or principal payment within the specified period. In the case of default, the bondholders will be able to recover part of the value of the bond.

In a downgrade scenario, a bond that is downgraded to a level below investment grade (or other selected threshold) may result in the disposition of the bond below its current value.

There is a wide range of practice to estimate the required deduction for credit risk inherent in bond yields. Observed practices include:

- market-based approaches;
- structural model techniques; and
- historical distribution techniques.

Note that several approaches used to estimate the deduction for credit risk are complex, particularly with regards to the unexpected credit risk. Potential approaches for the derivation of the unexpected default risk include:

- default risk at a probability level greater than the mean (e.g., 90th percentile); and
- default risk derived as a multiple of the expected default risk (e.g., twice the expected value).

Examples of application are presented in Appendix 2.

Similarly, unexpected downgrade risk (if not assessed as part of the default risk) may be incorporated by increasing the downgrade risk adjustment by a selected margin (e.g., five basis points).

4.4.2 Market risk and other adjustments

As per IFRS 17.B81, “an entity shall adjust that (reference portfolio) yield curve to eliminate any factors that are not relevant to the insurance contracts.” A market risk adjustment is generally not required if the reference portfolio is comprised solely of bonds.

IFRS 17 does not require that adjustments to the yield curve be made for residual differences in liquidity characteristics of the insurance contracts and the reference portfolio. Nonetheless, an entity may adjust the yield curve for those differences.

4.5 Illiquidity premium based on reference portfolio

A combined approach is illustrated in the equation below:

IFRS 17 Discount Rate = Risk-Free Rate[1] + Reference Portfolio Illiquidity premium[2]

1. Risk-free rate as at the valuation date, based on the bottom-up approach.
2. Illiquidity premium, derived at the reference portfolio date, a date that may not be the same as the valuation date, and based on the top-down approach.

Risk-free rates as at the valuation date are comparable to those at the reference portfolio date, which are used to derive the illiquidity premium as described below.

After calculating the yield to maturity on the reference portfolio and the corresponding credit risk adjustments, the illiquidity premium is calculated as shown below:

Reference Portfolio Illiquidity premium = Top-Down Discount Rate – Risk-Free Rate

The illiquidity premium used in the rates to discount the insurance contract liabilities may differ from the illiquidity premium derived from the reference portfolio.

As described in Question 3.16 in the IFRS17 Application EN:

> … What follows is an example of a simple method used to relate the illiquidity premium of insurance contracts to the asset portfolios:
>
> > *Assume liability illiquidity premium = r * asset portfolio illiquidity premium + constant illiquidity premium difference* where the constant term and multiplicative factor (r) are set based on judgment and any available data. In the selection of the factors differing market environments may be taken into consideration. For example, using a high multiplicative factor(r) and a constant = 0 may not produce an appropriate result during a credit crisis. It may be difficult to justify insurance contracts having a higher illiquidity premium than the return on assets available for investment earning the illiquidity premium. This, however, is not a directly relevant factor in setting the illiquidity premium level.
>
> The above approach is based on a top-down approach. For those using bottom-up there may be a discernible relationship between the level of the illiquidity premium and other market data such as the level of risk-free rates and / or the level of total asset spreads. For example, one may expect a different illiquidity premium in a 10% rate environment compared to that in a 5% environment. However, if analysis showed the same level of total asset spreads in these disparate environments, and the credit part of the spread was also showed to remain constant, then the level of illiquidity premiums in these environments might be the same.

The combination of the multiplicative factor (r) and the additive constant defines the relationship between the liquidity of the reference portfolio assets and the liquidity of the insurance contracts. In the illustrative example in Appendix 2, the reference portfolio yield is adjusted to remove the estimated credit risk, and the remaining spread over risk-free rates is considered to be attributable to the illiquidity premium. In this example, no adjustments are considered necessary. Accordingly, *r* is set to 100% and the *constant* is set to 0.

Another way of presenting the relationship between the liquidity of the reference portfolio assets and the liquidity of the insurance contracts is as suggested in the educational note *IFRS 17 Discount Rates for Life and Health Insurance Contracts* (June 2022). In this case, the illiquidity premium is expressed as a fixed percentage of the asset reference portfolio spread over risk-free rates and an additional constant adjustment to reflect the difference between the liquidity characteristics of the insurance contract and the asset reference portfolio.

$$Illiquidity\ Premium = r * asset\ reference\ portfolio\ spread\ over\ risk\ free + \ constant$$

The multiplicative factor r represents the portion of the asset spread that relates to the illiquidity premium.

The constant in the formula is to account for the liquidity difference between assets in the reference portfolio and the insurance contracts. The application of the constant adjustment depends on the combination of reference portfolio and the liquidity characteristics of the insurance contracts.

4.6 Liquidity of P&C insurance contract liabilities

IFRS 17.36 states that the discount rates applied shall reflect the liquidity characteristics of the insurance contracts.

The following guidance is from Question 3.15 of the IFRS17 Application EN:

> In order to understand the nature of insurance contract liquidity characteristics one may consider the liquidity characteristics of other financial instruments: for fixed income financial instruments, liquidity is the ability to convert the asset into cash or extinguish the liability on demand. The liquidity arises from either call or put options embedded into the instrument or the marketability of the instrument.
>
> Paragraph BC193 specifically draws the parallel between insurance contracts and fixed income financial instruments and suggests that liquidity characteristics of insurance contracts be viewed from the perspective of the features embedded within the contract. This view is also echoed in the IAA Discount Rate Monograph which, on page 38 of section IV, states: *the liquidity of a liability is a function of the basic contract provisions, and especially any options that might exist for the policyholder that would impact the uncertainty regarding the amount and timing of payments*.
>
> This answer addresses the liquidity characteristics of insurance contracts from the perspective of the contract's features[1].
>
> Note that this answer focuses on qualitative assessments of insurance contract liquidity. See response to Question 3.16 for a discussion on the quantitative assessment of illiquidity premium.
>
> Contract attributes that may influence the liquidity of an insurance contract include:

[1] Some practitioners ask if the liquidity characteristics of insurance contracts should be assessed from the insurer's perspective. The motivation of this view is BC194 which suggests that the motivation of including an illiquidity premium is the entity's ability, or lack thereof, to sell/put the contract.

- **Exit value**: all else being equal, a contract where upon exit all / a large part of the value build-up is paid out is more liquid than one that pays out none or a small part of the value build-up. If on exit of a contract there is:
    - value in the contract and the policyholder receives all / a large part of the value of the contract, then the contract may be considered to be liquid.
    - value in the contract and the policyholder receives no / a small part of the value of the contract, then the contract may be considered to be illiquid.

  […]The concept of exit value aligns with the payments (that would actually be received by the contract holder) as referred to in paragraph BC193 which implies that illiquidity exists if "*the entity cannot be forced to make payments earlier than the occurrence of insured events or dates specified in the contract.*"
- **Exit costs**: all else being equal, a contract with exit costs (e.g., surrender charges / penalties) is likely to be more illiquid than one without. Note exit is contemplated as voluntary exit / cancellation of contract and occurrence of the insured event is not considered a contract exit, as contemplated in this response.
- **Inherent value / value build-up:** The inherent value / value build-up represents the contract holder's perceived value of the contract. The inherent value would include the payment the contract holder might reasonably expect to receive, if the contract holder could force the entity to make a payment. Paragraph BC193 suggests that illiquidity exists if "*the entity cannot be forced to make payments earlier than the occurrence of insured events or dates specified in the contract*."

  For example, one could approximate the inherent value prospectively as the present value of the benefits expected to be received less the premiums that remain to be paid, within the contract boundary. Qualitatively the inherent value, may also capture other considerations such as insurability considerations or considerations regarding the cost of a replacement contract. The inherent value would be less than the insured amount, given that the insured event has not occurred

  For example, yearly renewable non-life [general] insurance contracts, whose design are not intended to build-up value in the contract and are without exit costs, are likely to be considered liquid (for the liability for remaining coverage). [emphasis added]

  For contracts with no cash value, increasing risk and level premium payment, contracts with longer contract boundaries are less liquid than contracts with shorter boundaries as the extended boundary potentially leads to greater inherent value / value build-up.

  […]

Liability for incurred claims would be considered illiquid when there is no potential avenue for the claimant to obtain the exit value yet there is tangible inherent value (else a claim would not have been made.) [emphasis added]

The assessment of liquidity of P&C insurance contract liabilities is subject to judgment in the interpretation of IFRS 17 and related guidance. Guidance in this regard is evolving, and changes in that guidance resulting from new interpretations of IFRS 17 may lead to revisions to the assessments described below.

4.6.1 Insurance contracts and reinsurance contracts issued

For the purposes of this educational note, the LRC and LIC for particular products are identified as either "liquid" or "illiquid." An actuary may determine that it is appropriate to consider "degrees" of liquidity. The "perceived liquidity" is subject to consideration of specific contract provisions that may affect the liquidity of the LRC.

The following table describes the categorization of liquidity of the insurance contract of LRC and LIC. For each category, there are examples of non-standard P&C products that may require special consideration. Furthermore, an actuary would consider specific contract provisions that may have a bearing on the liquidity of insurance contract liabilities.

Liquidity of Canadian P&C Insurance Contract Liabilities		
	LRC	**LIC**
Liquidity of most standard P&C products	Liquid	Illiquid
Basis for varying liquidity	Ability of policyholder to cancel policy before expiry date and to receive value without significant exit costs.	Ability for the policyholder to obtain the exit value in advance of "normal" payment dates.
Examples of non-standard P&C products	Title insurance Warranty insurance	Long-term disability claims for which the claimant has an option to receive a lump sum payment.

The following table contains descriptions of certain non-standard P&C products that may require special consideration in the context of the valuation of the LRC.

Non-Standard Canadian P&C Insurance Contracts (LRC)		
P&C Product	**Description**	**Perceived Liquidity**
Title	• Lump-sum premium earned at issuance. • No cancellation options available that would result in any return of premium, as the policyholder is already beneficiary of the title search that was used to determine the status of the title.	Illiquid
Mortgage	• Lump-sum premium at the issuance of the mortgage. • If mortgage is pre-paid or discharged, policyholder is not entitled to any premium refund.	Illiquid
Contract surety	• Policyholder cannot cancel the policy because the policyholder is not the beneficiary of the policy.	Illiquid

Non-Standard Canadian P&C Insurance Contracts (LRC)		
P&C Product	**Description**	**Perceived Liquidity**
	• The contract expires after the completion of the project (or after completion of all projects specified in the policy).	
Fidelity and fiduciary surety	• In most cases, the policy is mandatory, but the policyholder may cancel the policy if the obligation ends or if the policyholder finds a more attractive policy.	Liquid
Warranty	• In most provinces, contracts are cancellable, and the policyholder would be entitled to a pro-rated refund. • In some provinces, the contract might not be cancellable, in which case it would be considered illiquid.	Liquid Illiquid

4.6.2 Liquidity of reinsurance contracts held

The general concepts outlined in Section 4.6.1 in respect of insurance contracts and reinsurance contracts issued also apply to reinsurance contracts held (ceded).

For a group of reinsurance contracts held, the liquidity of the LRC is evaluated on the basis of the ability of the purchaser of the reinsurance to cancel the reinsurance contract before its expiry date and to receive value. Most reinsurance contracts have a one-year term with limited provision for early cancellation by either party. Treaty-specific cancellation provisions are considered for the purposes of assessing liquidity.

In most cases, the LIC for a group of reinsurance contracts is likely considered illiquid based on the inability of the purchaser of reinsurance to influence the timing of claim payments.

4.6.3 Single illiquidity premium

According to Chapter 3 (Question 3.17) in the IFRS17 Application EN:

> Insurance contracts exhibiting different features may have different terms and conditions for the forced early payments (see paragraph B79), exit costs, inherent value and / or exit value. As such, products are expected to have different illiquidity premiums. For operational reasons, insurance contracts with similar liquidity characteristics can be regrouped together in buckets, in order to perform the illiquidity premium estimation for the bucket as a whole. The buckets (similar liquidity characteristics) should not be confused with the portfolios (similar risks and managed together). Two insurance contracts included in the same portfolio could be allocated to two different buckets. Likewise, two insurance contracts belonging to the same bucket could be included in two different portfolios.

By extension, it is reasonable for an entity to elect to use a single weighted average liquidity term structure (i.e., illiquidity premium curve) for the LRC and LIC of a given portfolio.

P&C actuaries generally assess the LIC and LRC separately for a given portfolio and for its underlying groups. Furthermore, for P&C contracts, the unexpired portion of the contracts and the incurred claims generally exhibit different liquidity characteristics: the first being generally liquid and the second being illiquid. Consequently, it is intuitive to consider that the illiquidity premium or that the yield curve could be different to discount the LIC or the LRC.

However, the IFRS 17 standard does not preclude the actuary from using a single illiquidity premium or a single yield curve for both the LIC and LRC for a given portfolio. IFRS 17 refers to the liquidity characteristics of the insurance contracts and not of the liquidity characteristics of the LIC or of the LRC.

Consequently, the liquidity characteristics of P&C contracts for a given portfolio could be seen as the combination of:

- a portion that is liquid (unexpired portion and contracts with no claims); and
- a portion that is illiquid (expired portion of the contracts with claims incurred).

An approach with a single liquidity curve applied to both LIC and LRC could provide the following benefits:

- Fewer yield curves to manage. Generally, it is operationally simpler to reduce the number of calculations. This could reduce the number of curves to manage by half.
- Single view of the profitability of portfolios. The valuation of the fulfilment cash flows of the portfolios and groups would be more consistent when transitioning from LRC to LIC. This is especially true for long-tail coverages like auto accident benefits and auto bodily injury.

4.7 Duration of the observable market for discount rates

The observable market in Canada is 30 years. For additional details, please refer to Section 1 within Chapter 1 of the CLIFR educational note: *IFRS 17 Discount Rates for Life and Health Insurance Contracts*.

4.8 Long-term discount rate (unobservable ultimate rate)

To determine discounting assumptions beyond the observable period, please refer to Section 2 within Chapter 1 of the CLIFR educational note: *IFRS 17 Discount Rates for Life and Health Insurance Contracts*.

5. Reference curves

5.1 Introduction

The language related to discount rates in the IFRS 17 standard is brief and principles based. The principles-based nature of the Standard could lead to a wide range of practice amongst actuaries. Consequently, CLIFR and PCFRC have created parameters reference curves, that are deemed to be liquid and illiquid, to facilitate comparison of discount curves among entities.

In some instances, it is expected that the actuary would compare the present value of the estimates of future cash flows obtained using the selected discount curve with the present value obtained when using the reference curve parameters for the unobservable period.

Most P&C cash flows are within the observable period. In some instances, when there are estimates of future cash flows in the unobservable period, it is expected that the actuary would compare:

- The present value of the estimates of future cash flows obtained using the company's own discount curve; and
- The present value obtained when using the reference curve parameters for the unobservable period, and the company's own discount curve parameters in the observable period.

This chapter presents reference curves for insurance contracts that are deemed to be liquid and illiquid and outlines how these reference curves are constructed in the observable period and beyond the observable period.

This educational note only defines reference curves for liquid and illiquid cash flows. An entity may have grouped its insurance contracts in more than two liquidity categories. To the extent that an entity has more than two discount curves, the actuary would use judgment to derive the reference curve that would apply to the insurance contracts that fall between the liquid and illiquid categories.

The CIA has retained the services of Fiera Capital (Fiera) to publish the reference curves and market curves used to build the reference curves on a monthly basis. The resulting reference curves can be found on Fiera's website at https://www.fieracapital.com/en/institutional-markets/cia-ifrs-17-curves.

5.2 Defining the reference curve

In this section, the reference curves are defined for liquid and illiquid insurance contract liabilities based on the following parameters:

- The length of the observable period.
- The risk-free rate and illiquidity premiums for the observable period.
- The ultimate risk-free rate, the ultimate illiquidity premiums.
- The approach used to interpolate between the last observable point and the ultimate point.

5.2.1 Defining the reference curve in the observable period

In the observable period, for terms up to 30 years, the risk-free rates are derived from the GoC debt securities.

The last observable point is set at the 30-year term based on GoC debt securities and the findings described in Chapter 1 of CLIFR's educational note: *IFRS 17 Discount Rates for Life and Health Insurance Contracts*. The actuary would not deviate from the 30-year observable period for insurance contracts sold in Canada and in Canadian currency.

The reference curve illiquidity premium for liquid insurance contracts (e.g., amounts on deposit, or LRC for most P&C products) are set using provincial bonds as a reference portfolio and a credit risk adjustment. For each term up to 30 years, the illiquidity premium is defined as the interest rate spread of the portfolio, adjusted for credit risk, over the risk-free rate derived from the GoC debt securities. This is approximately equivalent to an illiquidity premium equal to 90% of the provincial bonds spread.

The reference curve illiquidity premiums for illiquid insurance contract liabilities (e.g., Term 100, or LIC for most P&C products) are set using Canadian investment grade corporate bonds (those with credit ratings of no less than BBB) as a reference portfolio, adjusted with a constant to reflect the fact that these insurance contracts are less liquid than corporate bonds, and a credit risk adjustment. For each term up to 30 years, the illiquidity premium is defined as 0.50% + 70% of the Canadian investment grade bonds spread over the risk-free rate derived from the GoC debt securities.

The resulting reference curves in the observable period are therefore:

a. Liquid curve: Risk-free rate + 90% of provincial bonds spread

b. Illiquid curve: Risk-free rate + 0.50% + 70% of Canadian investment grade bonds spread

5.2.2 Defining the reference curve in the unobservable period

Guidance on the reference curve in the unobservable period is provided in Section 2 within Chapter 2 of the CLIFR educational note: *IFRS 17 Discount Rates for Life and Health Insurance Contracts*.

5.3 Other Considerations

5.3.1 Insurance finance expense versus investment income

There could be cases where the expected return on the assets of the insurer is lower than the discount rate applied to the estimates of future cash flows which would lead to the investment income for the assets supporting the insurance contracts being lower than the insurance finance expense. The actuary would understand the implications of setting discount rates that create a negative bias in investment results.

5.4 Suggested disclosures in the Appointed Actuary's report

The discount curve applied to the estimates of future cash flows is a significant assumption impacting many aspects of the financial statements. The discount curve will be a driver of the fulfilment cash flows, the contractual service margin (CSM which is a component of LRC when the GMA is used) and the insurance finance expense. As a result, it is recommended that the actuary include information in the Appointed Actuary's report to outline the methodology used to develop the discount curves used for all insurance contracts liabilities.

5.4.1 Discount curves within the observable period

For discount curves that do not extend beyond the observable period, the information provided would include a description of the methodology used to set the discount curves for all currencies, and would cover the points outlined below:

1. The last observable point.
2. The derivation of the illiquidity premiums in the observable period.

3. The derivation of reference curves used for liabilities, if any, that fall between the liquid and illiquid categories described in this educational note.
4. For insurance contracts issued in Canadian currency, it is recommended that the actuary comment in general terms on the extent to which the discount curve differs from the reference curve described in Section 5.2.1. A quantitative comparison is not required.

5.4.2 Discount curves beyond the observable period

Recommended disclosures that relate to discount rates in the unobservable period are outlined in Section 4 within Chapter 2 of the CLIFR educational note: *IFRS 17 Discount Rates for Life and Health Insurance Contracts*.

6. Discounting the estimates of future cash flows

In accordance with IFRS 17.36, discount rates are expected to vary with the timing of the cash flows. The use of a yield curve rather than a single discount rate is one way to satisfy this requirement. Using a yield curve, the expected future cash flows at a given payment maturity are discounted using the rate with the corresponding maturity on the yield curve.

To discount the estimates of future cash flows, four assumptions are required:

- The undiscounted liability amount (Section 3).
- The expected payment pattern of the undiscounted liability amount (Section 3.1).
- The expected timing of future payments (Section 3.2).
- The yield curve consistent with the characteristics of future cash flows (Section 4).

7. Applying the risk adjustment and determining the fulfilment cash flows

The actuary is responsible for including a risk adjustment in the fulfilment cash flows. The risk adjustment is determined by the entity in accordance with IFRS 17.37. See *Risk Adjustment EN* for further details.

The fulfilment cash flows are calculated as follows:

Fulfilment cash flows = Discounted estimates of future cash flows + Risk adjustment

8. Locked-in yield curve

Locked-in yield curves refer to yield curves determined either at the initial recognition of the group of contracts or at the date of incurred claims (refer to table in Section 1 for further details). Under IFRS 17, locked-in yield curves are used for three purposes:

- Adjusting and accreting interest on the CSM.
- Systematic allocation of insurance finance income or expense to the income statement if the entity chooses to disaggregate the insurance finance income or expense between profit and loss and other comprehensive income (OCI).
- The entity uses the PAA and there is a significant financing component, as defined in IFRS 15 paragraphs 60–61.

In the context of financial reporting for P&C insurance contracts, locked-in yield curves are typically not used unless:

- the entity uses the GMA to determine the LRC for some or all groups of insurance contracts; or
- the entity elects the OCI option for some or all portfolios of insurance contracts.

Locked-in yield curves are determined in the same manner as current yield curves as described in Section 4.

In accordance with IFRS 17.B72, if the insurance contract liabilities for the group are initially measured using the GMA, the locked-in yield curves are determined at the date of initial recognition of the group of contracts. Based on Question 3.46 of the IFRS17 Application EN, three approaches, amongst others, may be used to determine the locked-in yield curves for a group of contracts:

- Determine the locked-in yield curve for each contract within the group based on each contract's respective issue date and carry calculations at the contract level.
- Determine the locked-in yield curve at the date of initial recognition of the group of contracts (i.e., at the issue date of the first contract included in the group) and carry calculations at the group level.
- Determine the locked-in yield curve using a weighted average discount curve based on the issue dates of the various contracts in the group and carry calculations at the group level.

Based on IFRS 17.B72(e)(iii), for groups of contracts applying the PAA, the locked-in yield curves used for the OCI option are determined at the date of the incurred claims. It may be reasonable for the actuary to determine the locked-in yield curve for the group at the average date of incurred claims for the group. The actuary would consider the reasonableness of this assumption based on the expected seasonality of claims associated with contracts in the group as well as the economic environment during the locked-in period. For example, if interest rates vary significantly during the locked-in period, the yield curve as at the average date may not be appropriate.

The approach selected to determine the locked-in curves should be discussed with the auditors.

9. Insurance finance expense

Under IFRS 17, incurred claims and directly attributable expenses create insurance expenses that are accounted for in two separate lines of the income statement:

- The insurance service expense.
- The insurance finance expense.

IFRS 17.87(a) and (b) state:

> Insurance finance income or expenses comprises the change in the carrying amount of the group of insurance contracts arising from:

(a) the effect of the time value of money and changes in the time value of money; and

(b) the effect of financial risk and changes in financial risk; (…)

In this educational note:

- The “effect of the time value of money” is referred to as the unwinding of the discount and represents the release of the effect of discounting at a subsequent measurement date due to the passage of time.
- The “effect of changes in the time value of money” is referred to as the effect of changes in discounting assumptions and represents the variation in the insurance contract liabilities due to changes in the yield curve relative to prior expectations.

IFRS 17 does not require these two components to be calculated separately, however some companies may have an internal requirement to disclose the effect of changes in the discount curve (market yield adjustment). Additionally, it may be easier to understand the insurance finance expense as being composed of unwinding and effect of changes in discounting assumptions.

10. Unwinding of discount

The release of the effect of discounting during a reporting period can be conceptualized as the difference between discounting the cash flows to the beginning of the period and discounting to the end of the period. Equivalently, the unwinding can be calculated by applying unwinding rates to the beginning of period present value cash flows.

The unwinding of discount does not include the effect of changes in discounting assumptions, however discounting assumptions at a given reporting date may include current expectations about how the discount curve will change over time. Three possible methods for calculating unwinding are presented below, each corresponding to a different a priori assumption about future discount rates.

10.1 Constant yield curve

This method calculates the unwinding expense using the same discount curve at the beginning and end of the period. It corresponds to the a priori assumption that the discount curve will remain the same at the end of the period.

The equivalent unwinding rates are the forward rates implied by the discount curve (see forward rate formula in Section 2). Calculating the unwinding expense by multiplying the forward rates by the beginning of period discounted cash flows will produce the same result as calculating the unwinding expense as the difference between the cash flows discounted to the beginning and end of the period.

(1) Payment year	2021	2022	2023	2024	2025	Total
(2) Undiscounted cash flows (*)	100	100	100	100	100	500
(3) Opening discount curve	1.2%	1.8%	2.3%	2.5%	2.7%	
(4) A priori ending discount curve	n/a	1.2%	1.8%	2.3%	2.5%	
(5) Opening discounted cash flows	98.81	96.49	93.41	90.60	87.53	466.84
(6) A priori ending discounted cash flows	100.00	98.81	96.49	93.41	90.60	479.31
(7) Unwinding expense = (6) - (5)	1.19	2.32	3.09	2.81	3.07	12.47
(8) Forward rates	1.2%	2.4%	3.3%	3.1%	3.5%	
(9) Unwinding rates = (8)	1.2%	2.4%	3.3%	3.1%	3.5%	
(10) Unwinding expense = (5) * (9)	1.19	2.32	3.09	2.81	3.07	12.47

Notes:

(*) Assuming end of year cash flows

(5) = (2) discounted to beginning of 2021 using (3)

(6) = (2) discounted to beginning of 2022 using (4)

10.2 Unwinding using spot rates

This method calculates the unwinding expense using an end of period discount curve that is equal to the beginning discount curve shifted by one period. That is, the 2-year spot rate becomes the 1-year spot rate, the 3-year spot rate becomes the 2-year spot rate, and so on. The equivalent unwinding rates are the beginning of period spot rates.

(1) Time	**2021**	**2022**	**2023**	**2024**	**2025**	**Total**
(2) Undiscounted cash flows (*)	100	100	100	100	100	500
(3) Opening discount curve	1.2%	1.8%	2.3%	2.5%	2.7%	
(4) A priori ending discount curve	n/a	1.8%	2.3%	2.5%	2.7%	
(5) Opening discounted cash flows	98.81	96.49	93.41	90.60	87.53	466.84
(6) A priori ending discounted cash flows*	100.00	98.23	95.55	92.86	89.89	476.54
(7) Unwinding expense = (6) - (5)	1.19	1.74	2.15	2.26	2.36	9.70
(8) Unwinding rates = (3)	1.2%	1.8%	2.3%	2.5%	2.7%	
(9) Unwinding expense = (5) * (8)	1.19	1.74	2.15	2.26	2.36	9.70

Notes:

(*) Assuming end of year cash flows

(5) = (2) discounted to beginning of 2021 using (3)

(6) = (2) discounted to beginning of 2022 using (4)

10.3 Expectations hypothesis

The expectations hypothesis proposes that the term structure of interest rates is solely determined by market expectations of future interest rate changes. Under the expectations hypothesis, the forward rates implied by the current yield curve represent the sequence of expected future single period spot rates.

This method calculates the unwinding expense using the end of period discount curve that is predicted by the expectations hypothesis. The equivalent unwinding rate is the one-period spot rate (i.e., one-year spot rate for annual reporting frequency, one-month spot rate for monthly reporting). Formulas for calculating the a priori ending discount curve can be found in Appendix 6 (Income Statement Calculations) in the Excel file of illustrative examples.

(1) Time	2021	2022	2023	2024	2025	Total
(2) Undiscounted cash flows	100	100	100	100	100	500
(3) Opening discount curve	1.2%	1.8%	2.3%	2.5%	2.7%	
(4) A priori ending discount curve	n/a	2.4%	2.9%	2.9%	3.1%	
(5) Opening discounted cash flows	98.81	96.49	93.41	90.60	87.53	466.84
(6) A priori ending discounted cash flows*	100.00	97.65	94.53	91.68	88.58	472.44
(7) Unwinding expense = (6) - (5)	1.19	1.16	1.12	1.09	1.05	5.60
(8) Unwinding rates = (3) col. 1	1.2%	1.2%	1.2%	1.2%	1.2%	
(9) Unwinding expense = (5) * (8)	1.19	1.16	1.12	1.09	1.05	5.60

Notes:
(*) Assuming end of year cash flows
(5) = (2) discounted to beginning of 2021 using (3)
(6) = (2) discounted to beginning of 2022 using (4)

11. Effect of changes in discounting assumptions

The effect of changes in discounting assumptions in the insurance finance income or expense encompasses changes in the yield curve relative to a priori assumptions, but not changes in payments patterns and changes in risk adjustment (both of which belong in the insurance service expense).

The calculation of the effect of changes in discounting assumptions would be consistent with the unwinding methodology used.

An illustrative calculation is provided in Appendix 6.

12. Financial statement presentation

12.1 Statement of financial position

The LIC presented in the statement of financial position is calculated using current discount rates. For each portfolio of contracts, the combined LIC and LRC are calculated. In accordance with IFRS 17.78, the statement of financial position separately presents:

- portfolios of insurance contracts issued that are assets;
- portfolios of insurance contracts issued that are liabilities;
- portfolios of reinsurance contracts held that are assets; and
- portfolios of reinsurance contracts held that are liabilities.

In addition, the entity establishes an accounting policy that addresses the OCI option in accordance with IFRS 17.88:

> […] an entity shall make an accounting policy choice between:
>
> (a) including insurance finance income or expenses for the period in profit or loss; or

(b) disaggregating insurance finance income or expenses for the period to include in profit or loss an amount determined by a systematic allocation of the expected total insurance finance income or expenses over the duration of the group of contracts […]

Based on IFRS 17.B130, if the entity elects the OCI option, the accumulated other comprehensive income (AOCI) includes the difference between the fulfilment cash flows calculated at current rates and the provision calculated at locked-in rates. There are no amounts related to insurance contracts in AOCI if the entity does not elect the OCI option.

12.2 Statement of comprehensive income

Total portion of the insurance service expenses relating to the LIC are calculated as follows:

Claim and expense payments in the period
+ LIC at the end of the period
- LIC at the beginning of the period

For financial reporting and note disclosure purposes, total incurred claims and expenses are broken down into several components, as follows:

Insurance service expense (P&L)
+ Insurance finance expense (P&L)
+ Insurance finance expense (OCI)

The change in the discounted cash flows from the beginning to the end of the period can be conceptualized as coming from the following sources:

1. Discounting to the end of the period instead of the beginning (unwinding of discount).
2. Update of the discount curve (effect of changes in discounting assumptions).
3. Update of the cash flow assumptions (insurance service expense).

The various components of incurred claims are affected by the order of the calculation. While IFRS 17 does not prescribe an order of calculation, the above order is thought to be consistent with the requirements of IFRS 17.

Irrespective of the order of calculation, the total incurred claims and expenses in the current period would be included in the insurance finance income or expense (IFIE) calculations. The exclusion of claims incurred in the current period could be considered only on the basis of materiality.

12.3 Approaches for calculating breakdown of incurred claims and expenses into its components from first measurement date (beyond the current period)

The complexity of the calculation of the insurance service and insurance finance expense may depend on the accounting requirements tied to the entity's accounting policy choices. As described in Section 8, two accounting policy choices that affect the calculations are the measurement approach selected for LRC (i.e., the GMA or the PAA) and the OCI option.

The following tables summarize three possible approaches for calculating the breakdown of incurred claims and expenses for financial reporting, depending on the accounting policy choices made by the entity. The approaches are ordered in increasing order of complexity and apply from first report date.

	PAA for LRC	**GMA for LRC**
OCI option not elected	Approach #1	Approach #3
OCI option elected	Approach #2	Approach #3

The following terminology is used in this and the next three section:

- AOCI(0) = AOCI at the beginning of the period
- AOCI(1) = AOCI at the end of the period
- PVCF(CF_i, PV_i, DC_i) = present value of the estimates of future cash flows
    - CF = cash flow assumptions as at beginning or end of period (subscript 0 or 1)
    - PV = present value as at beginning or end of period (subscript 0 or 1)
    - DC = discount curve
        - Subscript 0 or 1 indicates beginning or end of period respectively
        - Subscript RF indicates a rolled-forward curve, i.e., the a priori predicted curve for the end of period using beginning of period discounting assumptions
        - Subscript L0 indicates a locked-in curve at the beginning of the period; L1 indicates the locked-in curve rolled-forward to the end of the period
- RA = risk adjustment

Statement of Financial Position at the End of the Period

Element	**Approach #1** **No OCI and PAA for LRC**	**Approach #2** **OCI and PAA for LRC**	**Approach #3** **GMA for LRC**
LIC	PVCF(CF_1, PV_1, DC_1) + RA	PVCF(CF_1, PV_1, DC_1) + RA	PVCF(CF_1, PV_1, DC_1) + RA
AOCI	0	PVCF(CF_1, PV_1, DC_1) - PVCF(CF_1, PV_1, DC_{L1})	PVCF(CF_1, PV_1, DC_1) - PVCF(CF_1, PV_1, DC_{L1})

Statement of Comprehensive Income for the Period

Element	**Approach #1 No OCI and PAA for LRC**	**Approach #2 OCI and PAA for LRC**	**Approach #3 GMA for LRC**
Insurance finance expense for unwinding of discount (P&L)	$PVCF(CF_0, PV_1, DC_{RF})$ - $PVCF(CF_0, PV_0, DC_0)$	$PVCF(CF_0, PV_1, DC_{RF})$ - $PVCF(CF_0, PV_0, DC_0)$	$PVCF(CF_0, PV_1, DC_{L1})$ - $PVCF(CF_0, PV_0, DC_{L0})$
Insurance finance expense for effect of changes in discounting assumptions (P&L)	$PVCF(CF_0, PV_1, DC_1)$ - $PVCF(CF_0, PV_1, DC_{RF})$	$PVCF(CF_0, PV_1, DC_1)$ - $PVCF(CF_0, PV_1, DC_{RF})$ - Insurance finance expense in OCI	Without OCI option: $PVCF(CF_0, PV_1, DC_1)$ - $PVCF(CF_0, PV_1, DC_{L1})$ With OCI option: Zero
Insurance service expense (P&L)	Payments in the period + Change in RA + $PVCF(CF_1, PV_1, DC_1)$ - $PVCF(CF_0, PV_1, DC_1)$	Payments in the period + Change in RA + $PVCF(CF_1, PV_1, DC_1)$ - $PVCF(CF_0, PV_1, DC_1)$	Payments in the period + Change in RA + $PVCF(CF_1, PV_1, DC_{L1})$ - $PVCF(CF_0, PV_1, DC_{L1})$
Insurance finance expense for effect of changes in discounting assumptions (OCI)	Zero	AOCI(1) – AOCI(0) = $PVCF(CF_1, PV_1, DC_1)$ - $PVCF(CF_1, PV_1, DC_{L1})$ - [$PVCF(CF_0, PV_0, DC_0)$ - $PVCF(CF_0, PV_0, DC_{L0})$]	Without OCI option: Zero With OCI option: AOCI(1) – AOCI(0)
Total incurred claims and expenses (sum of above elements)	Payments in the period + Change in RA + $PVCF(CF_1, PV_1, DC_1)$ - $PVCF(CF_0, PV_0, DC_0)$	Payments in the period + Change in RA + $PVCF(CF_1, PV_1, DC_1)$ - $PVCF(CF_0, PV_0, DC_0)$	Payments in the period + Change in RA + $PVCF(CF_1, PV_1, DC_1)$ - $PVCF(CF_0, PV_0, DC_0)$

Approach #3 could be considered if the entity also uses the GMA for its LRC to align financial reporting for the CSM with the financial reporting for the fulfilment cash flows in the LRC and LIC.

In Approach #2, the locked-in curve would be rolled-forward using assumptions consistent with the unwinding method chosen.

Example calculations are presented for Approaches 1 and 2 in Appendix 7 to this educational note.

The approaches shown above assume that an unwinding expense and an expense arising from changes in discounting assumptions is not calculated on the risk adjustment portion of the fulfilment cash flows, however this option is illustrated in Appendix 6. The calculation would be made based on the accounting policy choice elected by the entity, in accordance with IFRS 17.81 which states:

> An entity is not required to disaggregate the change in the risk adjustment for non-financial risk between the insurance service result and insurance finance income or expenses. If an entity does not make such a disaggregation, it shall include the entire change in the risk adjustment for financial risk as part of the insurance service result.

Approaches to determining the insurance service and insurance finance expenses other than those described in this educational note may be suitable. The actuary is encouraged to discuss alternate financial presentations with their auditors.

12.4 Unwinding Claims Incurred in the Current Period

For groups of contracts for which the LRC is estimated using the PAA, the unwinding for claims incurred in the current period should be calculated between the incurred date and either the valuation date for the LIC or the payment date of each of the claims, whichever is earlier.

A seriatim calculation of the unwinding for claims incurred in the current period would generally not be practical for P&C insurers as this would require performing calculations using the accident date and payment date of every claim; this could become rapidly complex especially for short tail portfolios with a potentially large number of claims opening and closing within the reporting period (e.g., quarterly period, annual period).

The method presented below suggests a simplification to calculate the unwinding of the claims incurred in the current accident period from the incurred date of the claim to the valuation date of the LIC which could be considered for groups of contracts for which the LRC is estimated using the PAA. The resulting amount would be recorded on the statement of comprehensive income. There is no effect to the statement of financial position at the end of the period.

The formula to calculate the insurance finance expense for unwinding of discount on the claims incurred in the current accident year can be described as:

Current Accident Year Discounted Reserves @ t=1 *
[1 - (1 + discount rate) ^ -average claim maturity] +
Current Accident Year Paid Losses *
[1 - (1 + discount rate) ^ - (average claim maturity-average time since payment)]

This formula can be interpreted as an application of the formula for insurance finance expense for unwinding of discount presented in Section 12.3 (i.e., $PVCF(CF_0, PV_1, DC_{RF}) - PVCF(CF_0, PV_0, DC_0)$) to the claims incurred in the current accident year. Section 12.3 definitions apply except that, for the current accident year, the subscript 0 refers to the average claim incurred date rather than the beginning of the period and the subscript RF indicates a rolled-forward curve, i.e., the a priori predicted curve for the end of period using the average claim incurred date discounting assumptions as beginning of the period assumptions. CF_0 is built at posteriori using the information that is readily available.

The formula can be generalized as follows:

C_k is the k^{th} expected future cash flow as of period end for the current accident year
C_0 is the total paid claims for the current accident year
t_k is time to maturity of the k^{th} expected future cash flow as of period end
S_i is the spot rate for maturity i
m is the dollar weighted time from average incurred date to valuation date
p is the dollar weighted time from payment date to valuation date

$$Unwinding = \left(\sum_{k=1}^{n} \frac{C_k}{(1+S_{t_k})^{t_k}} + C_0\right) - \left(\sum_{k=1}^{n} \frac{C_k}{\left(1+S_{t_k+m}\right)^{(t_k+m)}} + \frac{C_0}{\left(1+S_{m-p}\right)^{(m-p)}}\right)$$

Where S_{t_k} from DC_0 should be a weighted average of monthly yield curves to reflect the fact that claims incurred in the current period would affect the statement of financial position at different points in time as opposed to unpaid claims already on the statement of financial position at the beginning of the period of a subsequent measurement.

The formula shown in this section would be adjusted depending on the a priori assumption about future discount rates selected by the entity, i.e., constant curve, spot rates or forward rates (expectations).

Using premium or losses as basis to calculate the weighted average of monthly discounting yield curves would be appropriate and should not lead to much difference unless there is major shift in yield curves during the year.

The proposed simplified method relies on accident year data (lowest level of granularity), year-to-date reporting (which is the reporting basis of most P&C insurers), end of period claim data and existing processes. The estimation of the effect of time value of money on claims that already occurred in the current period (accident year) is simplified by

a) assuming an "initial recognition date" of the insurance contracts future cash flows equal to the average incurred date, and

b) assuming claims open and closed in the period can be summarized in a single cash flow expected to be paid in the average time to settlement from the average incurred date.

The calculation is dependent on the following three (3) parameters:

a) **Average claim maturity (m)** (i.e., the dollar weighted time from average incurred date to valuation date) is calculated as the weighted average of the amounts incurred in the period and the claims maturity (calculated from the date of claim occurrence to the end of the reporting period), divided by 360 days[2]. For example, assuming the calculation is done at the end of the accident year, then the claim maturity of a claim that occurred on day 1 of Q1 would be 360 days, for a claim that occurred on day 2 the claim maturity

[2] For simplicity, the example assumes 30 days per month.

would be 359, etc. In this example, under a uniform claim distribution (within the accident year) the average claim maturity would be estimated as 0.5, for a distribution in which 60% of the claims occur in the first quarter, the average claim maturity would be estimated at around 0.68, and for a distribution in which 60% of claims occur in the last quarter, the average claim maturity would be estimated at around 0.3.

b) **Average time since paid (p)** (i.e., dollar weighted time from payment date to valuation date) is calculated as the weighted average of the amounts paid in the period and the number of days from the date of payment of the claims to the end of the reporting period (e.g., if $1,000 is paid at 6 months, it would be $1,000 times 180), divided by 360. Assuming the same underlying payment pattern, a uniform claim distribution would have an average time since paid of about 0.36, a distribution in which 60% of the claims occur in the first quarter would produce an average time since paid of around 0.45, and a distribution in which 60% of claims occur in the last quarter would result in average time since paid of around 0.31.

c) A posteriori future cashflows is the amount of claims paid in the period. This would be a known amount at the valuation date.

An example of calculation of IFIE on claims incurred in the current period is presented in Appendix 8 including the determination of underlying assumptions i.e., the average claim maturity and the average time since paid in details based on an individual claim behavior.

The table below shows the calculation of the average time since paid based on a posteriori cashflows by month.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(1) Incremental Paid	100	200	300	450	600	750	850	950	1050	1100	1150	1200
(2) Time from Payment to Accounting date	0.958	0.875	0.792	0.708	0.625	0.542	0.458	0.375	0.292	0.208	0.125	0.042
(3) Average time since Paid (p)	0.354											

(1) A posteriori cashflow
(2) Assumed mid-months payments (0.958=11.5/12, .875=10.5.12)
(3) Weighted Average of (1) and (2)

In setting the assumptions, considerations should be given to seasonality, change in volume of business, length of payment patterns. The results are sensitive to these assumptions.

The example in Appendix 8 presents the calculation as at year-end (Q4). To calculate the unwinding at other reporting periods, the average claim maturity and average time since paid assumptions must be adjusted to the reporting period (i.e., as at the end of each quarter and year-end).

While this method may be reasonable for calculating the unwinding on the claims incurred in the current period if the PAA is used for LRC, it may not be appropriate if the LRC is based on the GMA approach. Under the GMA, the unwinding is calculated from initial recognition of the group of contracts until the end of the reporting period (until all LRC provisions move to LIC). As a result, unless one truncates the LRC unwinding when claims have been incurred, calculating an IFIE on claims incurred in the current period could result in double counting.

Finally, under PAA, explicit unwinding of the loss component (LC) is not required by IFRS 17. As discussed in the LRC EN, depending on an entity's interpretation and application of the requirements of IFRS 17, an entity may present subsequent adjustments in the LC as insurance service expenses or may separate the subsequent adjustments in LC between insurance service expenses and insurance finance income or expenses within the statement of financial performance.

12.5 Calculating the insurance finance expense for claims incurred in the current accident year using the payment pattern of an individual claim

Some entities may not have all the information necessary to apply the simplified method shown in Section 12.4. In this case, an alternate method based on a "single day of claims calculation" and a single yield curve to estimate the IFIE could be considered. This methodology is highly dependant on the ability of the actuary to estimate the payment pattern for a single claim which would be considered representative of the average claim. This method can only be used for the non-OCI option.

This alternate method also assumes that:

- there is no significant difference in claim payment pattern per claim during the year;
- the year end pattern is assumed to be the same as the payment pattern at the occurrence date of a claim, i.e., payment pattern is the same for all claims for the whole year;
- the ultimate undiscounted amount for a claim is assumed to be the same at the opening of the claim and at the end of the reporting period; and
- only one discount rate curve is used, which represents the average discount rate curve effective during the reporting period.

These assumptions are not always appropriate in every situation and the actuary would ensure that the suggested alternative methodology is suitable for their portfolio/book of business.

The goal of this method is to calculate the IFIE for the unwinding of discount as the difference between the full discounting of every claim assuming the same payment pattern for every claim irrespective of its occurrence date and the difference between undiscounted and discounted unpaid claims at the end of the period. The formula to calculate the insurance finance expense for the unwinding of discount on the claims incurred in the current accident year under this alternative method is as follows:

Current Accident Year Ultimate Incurred claims *

[1 – (1 + average discount rate) ^ - (average payment month for one claim/12)]
– [undiscounted reserves @ t=1 – discounted reserves @ t=1]

All ultimate incurred claims are fully discounted using the same duration (average payment month divided by 12) for all claims irrespective of the occurrence date of each claim. and the remaining discounting at the end of the first reporting period (current reporting period) is subtracted.

An illustration of this method of calculating IFIE is included as Appendix 8F.

This formula can be applied to calculate the IFIE as at quarter-end as well as year-end. Examples of considerations that would be accounted for by the actuary include the type of business (long tail v. short tail) as well as growth in portfolio.

12.6 Calculating the insurance finance expense for claims incurred in the current accident year using the accident year payment pattern and an allocation between the LRC and LIC

Appendices 8G and 9 illustrate an alternate approach to calculate the IFIE, where the full amount of the IFIE for the current accident year – relating to both the unearned (LRC) and earned (LIC) portion of the services provided – and allocating a percentage of the total IFIE to the IFIE generated from the LIC only. This approach may provide a simplification to entities using the PAA (i.e., where only the IFIE related to the LIC would need to be reported) and may not have access to the level of details required for the approaches presented in Sections 12.4 and 12.5.

Appendix 8G illustrates a quarterly calculation, based on the assumptions used in Appendices 8A to 8F. Appendix 9 illustrates an annual calculation based on an annual payment pattern and discount curve which may be available from a valuation report.

As a first step, this approach calculates the total effect of discounting at the inception of the accident year as well as the total effect of discounting at the valuation date. This is done by applying the relevant payment patterns and discount factors to the accident year ultimate losses at two different points in time: at inception and at the valuation date. The difference between these two amounts is the total amount of IFIE for the period. The second step consists of applying a factor to the total IFIE, as described below.

The proportion of the total IFIE that is attributable to the LIC portion would be selected based on judgment. Considerations would include the average incurred claim date during the period as well as the length of the payment pattern (i.e., short tail vs. long tail). The actuary could also consider the average incurred and payment dates in the year. In the extreme case that claims are paid as incurred, then there is no IFIE between the time claims are incurred and paid, and, therefore, 100% of the IFIE would be attributable to the LRC and 0% would be attributable to the LIC.

If, on the other hand, claims are fully unpaid at the valuation date, then if claims are uniform throughout the accident year it may be reasonable to assume that 50% of the IFIE is attributable to the LRC (i.e., the period between the beginning of the accident year and the average claim incurred date) and 50% of the IFIE is attributable to the LIC (i.e., the period between the average claim incurred date and the valuation date).

If claims are partially unpaid at the end of the year, and claims are assumed to be uniform throughout the accident year, then the percentage attributable to the LIC could vary between 0% and 50%, where claims paid quickly would generate percentages closer to 0% and claims paid slowly would generate percentages closer to 50%. Potential simplifications may include:

- Multiplying 50% by the percentage of unpaid claims at the end of the accident year.

- Estimating the breakdown of the unwinding between (a) the time between inception and the incurred date, (b) the time between the incurred date and the payment date for payments in the period, and (c) the time between the incurred date and the valuation date for claims that remain unpaid at the end of the period. Portions (b) and (c) could be attributed to the LIC. Portion (a) would be disregarded from the calculation as it relates to IFIE before the claim is incurred and is therefore not associated with the LIC.

It is worth noting that this method is sensitive to large changes in discounting assumptions and may provide a better approximation to the more comprehensive method discussed in Section 12.5 when the yield curve is flat (rather than sloping significantly upward or downward).

13. Acceptability of allocations

The acceptability of allocations is specifically noted in IFRS 17.24, which states:

> To measure a group of contracts, an entity may estimate the fulfilment cash flows at a higher level of aggregation than the group or portfolio, provided the entity is able to include the appropriate fulfilment cash flows in the measurement of the group ... by allocating such estimates to groups of contracts.

Paragraph 117 of the Basis for Conclusions IFRS 17 Insurance Contracts states:

> Hence, IFRS 17 allows an entity to estimate the fulfilment cash flows at whatever level of aggregation is most appropriate from a practical perspective. All that is necessary is that the entity is able to allocate such estimates to groups of insurance contracts so that the resulting fulfilment cash flows of the group comply with requirements of IFRS 17.

The actuary may perform the valuation of liabilities on a basis other than the portfolios and groups used for financial reporting. The actuary may need to develop methodologies to allocate estimates of the LIC to portfolios.

14. Illustrative example

14.1 Overview

The appendices include two detailed LIC application examples, organized as follows:

- A more complex example allowing the user to determine:
    - The unwinding method among the three presented in Section 10;
    - Whether the OCI option is elected; and
    - Whether the risk adjustment is disaggregated between the insurance service and the insurance finance result.
- A simplified example, assuming that the entity uses the constant yield curve approach to calculate the unwinding expense, does not elect the OCI option and does not elect to disaggregate the risk adjustment between the insurance service and insurance finance result.

14.2 Appendix 1: Selection of payment pattern

This Appendix allows the user to enter assumptions related to the payment pattern of the cash flows.

14.3 Appendix 2: Selection of yield curve assumptions

In the illustrative example detailed in the appendices, the selected IFRS 17 discount rate was derived as follows:

- Development of reference portfolio yield curve based on Canadian bonds.
- Adjust reference portfolio yield curve to eliminate credit risk (no market risk or other risk adjustments required).
- Determine the illiquidity premium curve by subtracting the risk-free curve (valued at the same date as the reference portfolio) from the adjusted reference portfolio yield rate.
- Interpolate and extrapolate the illiquidity premium values as required.
- Add the selected illiquidity premium curve to the current risk-free curve.

14.3.1 Reference portfolio yield curve

The bonds are grouped by maturity. While some of the bonds include coupon payments, the existence of such coupon payments is not assumed to create a material inconsistency between the timing of the cash flows in the reference portfolio and those of the insurance contract liabilities. For each maturity group, the approach derives an estimated yield to maturity based on the market price per $100 of face value at the accounting date, the coupon rate (and timing of coupons), and the maturity date for each bond in the group. In the absence of details regarding the par value or value at maturity of the bonds, the par value is assumed equal for each bond in the portfolio.

Table 2 in Appendix 2A shows the estimated yield to maturity by credit rating (Federal, Provincial & Canada Housing Trust, AAA, AA, A, and BBB) and by average time to maturity in 1-year increments from 0.5 years to 9.5 years, and in 5-year increments from 9.5 years to 27.5 years. Refer to Section 14.6 for additional commentary regarding the results presented in Table 2.

To estimate illiquidity premiums reflecting different levels of liquidity, two distinct reference portfolios were created. The first reference portfolio is made up of GoC bonds, and provincial bonds (including Canada Housing Trust considered to be equivalent to provincial bonds), all of which are assumed to be highly liquid investments. The second reference portfolio is made up of investment-grade corporate and municipal bonds, which are lower liquidity investments than the first group. The last column in Table 2 shows the estimated yield to maturity attributable to the second reference portfolio, comprised of investment-grade corporate and municipal bonds, each assumed to have the same par value. Alternatively, the yields to maturity by credit rating may be combined by applying selected weights, with the weights varying by average time to maturity, or as illustrated in Table 2, with the same weights applying across all maturity dates.

14.3.2 Credit risk adjustment

In the reference portfolio approach, a credit risk adjustment is applied to each individual bond, depending on the credit rating of the bond. The credit ratings assigned by Bank of America Merrill Lynch are based on an average of Standard & Poor's (S&P), Moody's and Fitch pertaining to bonds denominated in US dollars (there being limited credit risk data available regarding Canadian-denominated bonds). For consistency, the same sources for credit risk adjustments were used. Due to the lack of credible credit risk adjustment data from Fitch, only historical data from S&P and Moody's was used to calculate the credit risk adjustments. Table 3 in Appendix 2A shows the cumulative expected probabilities of default by credit rating, and time to maturity, corresponding to the cells for which a yield to maturity is shown in Table 2.

IFRS 17 requires that the credit risk adjustment encompass unexpected credit risk as well as expected credit risk. The example in Appendix 2 presents two approaches for the derivation of the unexpected credit risk:

- Table 4A – Selected credit risk at a probability level greater than the expected value, and specifically shown at the 90th percentile.
- Table 4B – Selected credit risk derived as a multiple of the expected default risk, specifically shown as twice the expected.

The bonds are grouped by maturity, and a yield to maturity with credit risk adjustment estimated for each group (Appendix 2A, Table 6). In the sample calculation shown below Table 6, a recovery rate of 38.4% is applied to the cash flow associated with a defaulting bond. The recovery rate is based on Moody's US-based default study: *Corporate Default and Recovery Rates 1920-2017* and represents a long-term average across credit ratings and durations.

The credit risk adjustments in basis points (bps) for each group are shown in Appendix 2, Table 7. The adjustments are computed as the yield to maturity with no credit risk adjustment less the yield to maturity after the credit risk adjustment (as described above).

Consideration is also given to the probability that a bond will be downgraded, and particularly if that downgrade causes the rating to fall below a threshold credit rating selected for the reference portfolio. If that were to occur, an adjustment would be considered to reflect a loss upon disposition of the bond. Downgrade risk and its potential effect on credit risk are not included in the example.

14.3.3 Market risk and other adjustments

As per IFRS 17.B81, "an entity shall adjust [the reference portfolio] yield curve to eliminate any factors that are not relevant to the insurance contracts". A market risk adjustment is not required if the reference portfolio is comprised solely of bonds, which is the basis selected for the purpose of this educational note.

14.3.4 Determining the illiquidity premium

Risk-free rates as at the valuation date are compared to the credit-adjusted yields from the reference portfolio to determine the illiquidity premium. In the illustrative example, the illiquidity premium applied to the insurance contract liabilities is assumed to be the same as that derived from the reference portfolio without further adjustment.

14.4 Appendix 3: Projection of undiscounted and discounted cash flows – current yield curve

Appendix 3 contains an example of the calculation of discounted cash flows:

- Column (1) presents the undiscounted liability amount, which represents the total estimate of future cash flows.
- Column (2) presents the expected schedule of future cash flows based on the selected payment pattern.
- Line (7) presents the selected yield curve.
- Line (8) presents the expected timing of future cash flows.

Column (3) contains the cash flows discounted using the current yield curve.

If the entity elects the OCI option, the future cash flows are projected by issue year. The actuary may estimate these directly from the data or allocate cash flows determined on an accident year basis to issue years. For the purpose of the illustrative example, cash flows from accident years were allocated to issue years assuming that one issue year spans two accident years (e.g., the cash flows associated with issue year 2018 as 50% and 50% of the cash flows from accident years 2018 and 2019 respectively).

14.5 Appendix 4: Projection of undiscounted and discounted cash flows – locked-in yield curve

Appendix 4 is similar to Appendix 3 and presents the cash flows by issue year discounted at locked-in rates. The example assumes that the entity uses the PAA, and the locked-in rate is assumed to be the rate applicable at the average incurred date of the claims in the group (e.g., for issue year 2018, the locked-in date is assumed to be December 31, 2018, if the group consists of one-year policies written uniformly throughout the year).

For the most recent issue year (i.e., issue year 2022 in the example), the exposure is not fully earned and therefore the average claim date, and correspondingly the locked-in yield curve, would be subject to change until the coverage is fully earned.

14.5.1 Appendix 5: Summary of LIC

This appendix presents a summary of the estimates of future cash flows, the discounted cash flows, the risk adjustment, and the fulfilment cash flows. For the purpose of this example, the risk adjustment is assumed to be a percentage of the discounted cash flows.

14.5.2 Appendix 6: Calculation of insurance finance expense and Appendix 7: Financial statement entries

An illustration of full financial statement entries is provided in Appendices 6 and 7. Calculation details are provided in Sections 10 to 12. This Appendix does not consider insurance finance expense in the current period.

14.6 Appendix 8 and 9: Calculation of insurance finance expense in the current period and underlying assumptions

Appendix 8 is an illustration of the calculation of the insurance finance expense and the income statement entries (8E) for the current period.

- Parameters tab contains the payment pattern, seasonality and yield curves assumptions used in the calculation.
- 8A-Individual Claim Behavior presents the payment pattern, payment amount and undiscounted reserve at each day since the date of loss (0 to 360 days).
- 8B-Payment Activity presents the claim occurrence and payment activity by day and the time since paid and average claims maturity by occurrence day in each quarter.
- 8C-Payment and Reserve Summary contains Cumulative Payment, Cumulative Incurred and Total Undiscounted Reserves by day of occurrence as at end of each quarter,
- 8D-Calculate Time since Paid shows the calculation of average claims maturity and time since paid as at each quarter end.
- 8E-IFIE Calculation includes the IFIE detailed calculation and the income statement amounts.
- 8F-Simplified IFIE Calc shows the calculation of the insurance finance expenses using the approximation described in Section 12.5.
- 8G-Simplified IFIE Calc #2 shows the calculation of the insurance finance expenses using the approximation described in Section 12.6.

Appendix 9 illustrates the calculation using the approximation described in Section 12.6 using annual assumptions.

14.7 Sources of data for illustrative examples

14.7.1 Reference portfolio

The reference portfolio model illustrated in Appendix 2 uses the Bank of America Merrill Lynch (BAML) Canada Bond Market Index at December 2018. From the BAML data, the following bond subsets were created, each grouped by time to maturity.

- A Canada Bond subset, including bonds issued by Canadian federal agencies.
- A Provincial & CHT Bond subset, in which all issuers but one are direct provincial issuers, and most have a credit rating of AA by at least one major rating agency. Canada Housing Trust (CHT) is a quasi-government issue and was included in this subset after consideration of its characteristics and market values.
- Four corporate/municipal bond subsets, based on credit ratings of AAA, AA, A, and BBB. The issuers in these subsets include quasi-governmental entities.

The table below, shows the number of bonds in the BAML Canadian Bond Market Index at December 2018, by subset and by time to maturity.

December 2018 BAML Reference Portfolio Number of Bonds by Subset and Time to Maturity								
Time to maturity (Years)	Canada bonds	Prov. & CHT	Group A	Corporate/Municipal bonds by credit rating				
				AAA	AA	A	BBB	Group B
0.5	0	4	4	1	6	4	3	14
1.5	7	19	26	18	22	31	51	122
2.5	4	17	21	8	26	43	43	120
3.5	3	18	21	4	18	27	43	92
4.5	4	19	23	8	12	22	35	77
5.5	2	13	15	3	6	18	32	59
6.5	2	20	22	6	9	14	28	57
7.5	1	14	15	3	7	12	21	43
8.5	2	13	15	3	8	7	25	43
9.5	1	14	15	2	3	11	13	29
12.5	3	28	31	5	9	28	24	66
17.5	1	25	26	3	17	27	28	75
22.5	1	33	34	4	21	49	43	117
27.5	2	26	28	3	16	62	37	118
Other	2	26	28	4	18	23	12	57
Total #	**35**	**289**	**324**	**75**	**198**	**378**	**438**	**1089**
Weight by #	11%	89%	100%	7%	18%	35%	40%	100%
Weight by MV	37%	63%	100%	9%	28%	28%	35%	100%

Bonds maturing up to 31 December 2028 were grouped in 1-year maturity increments, each assumed to have a time to maturity at the mid-point of the group (i.e., 0.5 years up to 9.5 years). Bonds maturing on or after 1 December 2029 were grouped in 5-year maturity increments, each assumed to have a time to maturity at the midpoint of the group (i.e., 12.5 years up to 27.5 years). Bonds maturity beyond 30 years were excluded. The reference portfolio constructed on this basis is referred to in the remainder of this paper as the "December 2018 BAML Reference Portfolio."

The BAML Index does not include market or par values, but market values were obtained for about 85% of the bonds referenced below from iShares (Core – Canadian Universe Bond Fund). These market values were not used directly in this analysis but were used as the basis for selecting the weights to combine various categories of bonds.

For illustrative purposes only, the December 2018 BAML-based Reference Portfolio was converted into a December 2022 reference portfolio by adding five years to the valuation date and the maturity date of each bond. The market prices at December 31, 2022, were assumed to be equal to the actual market prices at December 31, 2017.

14.7.2 Risk-free rates

Government of Canada zero-coupon bond yield curves as of December 31, 2018 (used to derive the illiquidity premium in Section 4.4).
bankofcanada.ca/rates/interest-rates/bond-yield-curves/

14.7.3 Credit default and downgrade risk

There is insufficient Canada data to use as the basis for estimating either of the credit default risk and downgrade risk. Instead, the Committee relied on global studies published by Moody's and S&P. Defaults analyzed by Moody's include bonds from North America (about 75%), Europe (about 15%), and Latin America/Asia Pacific/Africa/Middle East (about 10%). S&P have a comparable distribution of bonds.

1. Moody's Investors Service

   Annual Default Study: Corporate Default and Recovery Rates, 1920–2017 (published yearly in February):

   i) Exhibit 33 – Average Cumulative Issuer-Weighted Global Default Rates by Letter Rating

   ii) Exhibit 41 – Cumulative Issuer-Weighted Default Rates by Annual Cohort

   iii) Exhibit 21 – Average Sr. Unsecured Bond Recovery Rates by Year Prior To Default

   iv) Exhibit 29 – Average One-Year Alphanumeric Rating Migration Rates.

2. S&P Global Ratings

   2017 Annual Global Corporate Default Study and Rating Transitions (published yearly in April)

   i) Table 24 – Global Corporate Average Cumulative Default Rates

   ii) Table 23 – Average One-Year Transition Rates for Global Corporates by Rating Modifier

1) US bond spread

Federal Reserve Bank of St. Louis (https://fred.stlouisfed.org)

The data is updated daily. The average as of December 31, 2017, was used, based on the following tables:

i) ICE BofAML US Corporate AAA Option-Adjusted Spread, Percent, Daily, Not Seasonally Adjusted (BAMLC0A1CAAA)

2) US bond index average maturity

S&P 500 Bond Indexes (https://us.spindices.com/)

The data is updated monthly. We used data as of July 31, 2018, based on the following tables:

i) S&P 500® AAA Rated Corporate Bond Index
ii) S&P 500® AA Rated Corporate Bond Index
iii) S&P 500® A Rated Corporate Bond Index