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Revised Educational Note

Discounting and Cash Flow Considerations for P&C Insurers

Committee on Property and Casualty Insurance Financial Reporting

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Members should be familiar with educational notes. Educational notes describe but do not recommend practice in illustrative situations. They do not constitute Standards of Practice and are, therefore, not binding. They are, however, intended to illustrate the application (but not necessarily the only application) of the Standards of Practice, so there should be no conflict between them. They are intended to assist actuaries in applying Standards of Practice in respect of specific matters. Responsibility for the manner of application of Standards of Practice in specific circumstances remains that of the members.

MEMORANDUM

To: All Fellows, Affiliates, Associates and Correspondents of the Canadian Institute of Actuaries

From: Pierre Dionne, Chair
Practice Council

Julie-Linda Laforce, Chair
Committee on Property and Casualty Insurance Financial Reporting

Date: May 24, 2016

Subject: **Revised Educational Note: Discounting and Cash Flow Considerations for P&C Insurers**

Please find enclosed a revised educational note, Discounting and Cash flow Considerations for P&C Insurers, which has been prepared by the Committee on Property and Casualty Insurance Financial Reporting. This represents an update and replacement of the 2010 educational note Discounting to provide additional guidance to actuaries.

This educational note provides explicit guidance in three areas where no such guidance is provided in the Standards of Practice, namely the consistency in the cash flow for portfolio selection, the selection of a discount rate for the estimation of ceded liabilities, and the discounting of future costs associated with premium liabilities.

The approaches outlined in this educational note are intended to reflect current practice for most property and casualty (P&C) actuaries in Canada. However, we are also aware of alternative approaches that are based on different but valid interpretations of the Standards of Practice and previous educational notes. As we continue to develop guidance on the subject of discounting, we intend to explore these other approaches more fully, and to seek further input from members.

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 endorsed by the Committee on Property and Casualty Insurance Financial Reporting, and has received final approval for distribution by the Practice Council on May 17, 2016.

As outlined in subsection 1220 of the Standards of Practice, "*The actuary should be familiar with relevant Educational Notes and other designated educational material*." That subsection explains further that a "practice that the Educational Notes describe for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation." As well, "Educational

Notes are intended to illustrate the application (but not necessarily the only application) of the standards, so there should be no conflict between them."

Should you have any queries or comments regarding this educational note, please contact Julie-Linda Laforce at julielindalaforce@axxima.ca.

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1. Introduction and Scope

This educational note addresses the discounting aspect of the valuation of policy liabilities in the context of financial reporting for property and casualty (P&C) insurance companies.

The determination of the actuarial present value of the policy liabilities involves the following fundamental elements, each of which is addressed in this educational note:

- The estimation of cash flows arising from the claim liabilities and premium liabilities;
- The selection of discount rates;
- The calculation of the present value of the claim liabilities and premium liabilities; and
- The application of margins for adverse deviations.

This educational note applies to the actuarial present value of the policy liabilities on gross, ceded, and net bases.

For some policy liabilities (e.g., amounts in respect of Facility Association, intercompany pooling, or reinsurance arrangements), it may be appropriate to use the policy liabilities determined on an actuarial present value basis as determined by a qualified actuary reporting on behalf of the ceding entity. Refer to the Standards of Practice (SOP) of the Actuarial Standards Board, subsection 1610 – Actuary's use of another person's work.

Other considerations may apply for applications other than financial reporting, for example, the purchase or sale of an insurance company, or the determination of fair value policy liabilities.

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

- Margins for Adverse Deviations for Property and Casualty Insurance (December 2009), Committee on Property and Casualty Insurance Financial Reporting
- Premium Liabilities (Revised March 2015), Committee on Property and Casualty Insurance Financial Reporting
- Investment Return Assumptions for Non-Fixed Income Assets for Life Insurers (March 2011), Committee on Life Insurance Financial Reporting
- Investment Assumptions Used in the Valuation of Life and Health Insurance Contract Liabilities (September 2014), Committee on Life Insurance Financial Reporting

2. General

2.1 Terminology

To the extent possible, the terminology used in this educational note is consistent with

the SOP. In some cases, however, the definitions have been modified for greater clarity and for consistency with common usage among P & C actuaries. Specifically, it is common practice first to evaluate the policy liabilities on an undiscounted basis, then to consider the time value of money, and lastly to add a provision for adverse deviations (PfAD). Accordingly, we have defined present value (PV) to reflect the time value of money only, and actuarial present value (APV) to be the sum of PV and the PfAD.

Undiscounted	The sum of expected future payments before recognizing the time value of money.
Discount Rate	The expected investment return rate used for calculating the present value of a series of cash flows.
Payment Pattern	The expected distribution of future payments for a given accident, underwriting, or report period.
Duration	The weighted average timing of a series of future cash flows. Duration is often used as a measure of the sensitivity to change in interest rates on a series of cash flows.
Present Value (PV)	The sum of expected future payments after recognizing the time value of money.
Margin for Adverse Deviations (MfAD)	The SOP, paragraph 1110.31, defines margin for adverse deviations as "the difference between the assumption for a calculation and the corresponding best estimate assumption." It is a factor applied to the present value of a best estimate or to the best estimate of an assumption to reflect its uncertainty.
Provision for Adverse Deviations (PfAD)	The SOP, paragraph 1110.39, defines provision for adverse deviations as "the difference between the actual result of a calculation and the corresponding result using best estimate assumptions." It is the additional provision resulting from the application of a margin for adverse deviations.
Actuarial Present Value (APV)	The sum of the present value and the provision for adverse deviations (i.e., APV = PV + PfAD)
Claim Liabilities	The SOP, paragraph 1110.13, defines claim

	liabilities as "the portion of insurance contract liabilities in respect of claims incurred on or before the balance sheet date." Claim liabilities include indemnity amounts and internal and external (allocated and unallocated) claims adjustment expense amounts.
Premium Liabilities	The SOP, paragraph 1110.37, defines premium liabilities as "the portions of insurance contract liabilities that are not claim liabilities." Premium liabilities include the expected costs in connection with the unexpired portion of the in-force insurance contract (i.e., incurred after the valuation date) and all other liabilities related to premium development adjustments (e.g., retro-rated premium and contingent profit commissions). For additional details, refer to the revised educational note Premium Liabilities (released March 2015).

2.2 Discounting Basis (Gross, Ceded, Net)

The following relationship applies whether estimates are on an undiscounted, PV or APV basis:

Net = Gross – Ceded

Normally, amounts or assumptions are estimated directly on two of the three bases above, while the amounts or assumptions on the third basis are computed from the above relationship. The estimation of cash flows, for example, would generally be on a basis consistent with the analysis on an undiscounted basis of claim liabilities and premium liabilities. Regardless of which two of these bases are estimated directly, care would be taken to assess the reasonableness of the third estimate or set of assumptions computed from those on the first two bases. The following are considerations for selecting which two bases are to be estimated directly:

Data availability—It may not be appropriate to directly estimate the ceded present value, for example, if there is a sparse or limited history of ceded data.

Cash flow volatility—Different approaches may be warranted for different lines of business depending on the volatility of cash flows by line.

Reinsurance program—Consideration would be given to the type and consistency of a company's reinsurance programs. For example, it may not be appropriate to use the net as a starting point if the company's net retention level has changed significantly over the experience period.

If the discount rate used for calculating the ceded present value is different from the rate used to calculate the net present value then the gross present value would be

determined as net present value plus ceded present value. If one discount rate is used to estimate the ceded present value and net present value, then any two of the three bases would be estimated directly, subject to the other considerations listed above.

3. Policy Liabilities Cash Flow

3.1 Cash Flow Associated with Claim Liabilities

The first step in deriving the actuarial present value is to estimate the cash flow associated with the claim liabilities in order to derive the present value of expected claim and claim adjustment expense payments. Expected claim payments are calculated by applying an expected payment pattern to the undiscounted unpaid claims. Selected payment patterns would reflect the actuary's best estimate with regard to the timing and amount of payments including, where applicable, both indemnity and claims adjustment expenses. 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.

Claims would be subdivided into reasonably homogeneous groups for the selection of payment patterns. Consideration would be given to the following:

- The groupings used for the valuation of the liabilities on an undiscounted basis;
- The payout period (i.e., the length of time over which payments are expected to be made for a group of claims); and
- The existence of a predetermined schedule of payments for a group of claims.

Selected payment patterns would normally be derived from the company's historical experience. To the extent that a company's historical experience does not exist (e.g., for a line not previously written by the company) or does not have a reasonable level of credibility (e.g., for a company with very low claims volume, or for a line of business such as surety that may have low predictive value), it may be necessary to supplement such experience with other related or external experience. To the extent possible, such other experience would reflect the expected payment and timing characteristics of the grouping under consideration.

Within a grouping, payment patterns may vary by accident or underwriting period to reflect, for example, changes in legislation, mix of business, reinsurance or claims settlement practices.

Timing of expected salvage, subrogation, reinsurance recovery, and loss transfer amounts would be considered in the selection of payment patterns. Gross, ceded, and net payment patterns are likely to be the same for a given line of business if the insurer's reinsurance is in the form of quota-share reinsurance.

For a given line of business, the selected payment patterns would normally be consistent with assumptions used in the estimation of the undiscounted liabilities. For example, expected payment patterns are commonly derived on the basis of historical ratios of paid losses to selected ultimate losses at various maturity dates. Alternatively,

the claim payment patterns may be derived directly from the selected paid development factors if such factors are consistent with the assumptions underlying the selected ultimate amounts.

3.2 Cash Flow Associated with Premium Liabilities

The different cash flow considerations associated with premium liabilities are described in detail in the revised educational note Premium Liabilities, and are summarized below.

Different payment patterns may be selected for each of the individual components of the premium liabilities, such as future claim costs, servicing or maintenance expenses, and future reinsurance costs.

For future claim costs, the payment patterns would normally be consistent with those associated with claim liabilities (refer to section 3.1). Adjustments may be required to reflect the following:

- The average accident date and average payment date underlying future claim costs;
- Legislative or product changes; and
- Other considerations similar to those affecting the payment patterns associated with claim liabilities.

Servicing or maintenance expenses are generally paid over the earning period of the unexpired term of in-force policies. The time value of money may not be material for such expenses and the APV of these items may be equal to the undiscounted value.

In determining the cash flow of future reinsurance costs the actuary would consider the following:

- The timing of the payment of applicable reinsurance premiums;
- The earning period of the unexpired portion of in-force policies; and
- The potential for future reinsurance costs to change (increase or decrease), due to market pressures, changes in the underlying portfolio, or other factors.

Generally, future reinsurance costs are paid over the earning period of the unexpired term of in-force policies. The time value of money may not be material for such expenses and the actuarial present value of these items may be equal to the undiscounted value.

Additional considerations may be required on other items such as installment premiums.

4. Asset Cash Flow and Discount Rate

As stated in the SOP, subsection 2240 – Present values,

> The expected investment return rate for calculation of the present value of cash flow is that to be earned on the assets, taking into account reinsurance recoverables, that support the insurance contract liabilities. [The expected investment return rate] depends on

the method of valuing assets and reporting investment income,

the allocation of those assets and that income among lines of business,

the return on the assets at the balance sheet date,

the yield on assets acquired after the balance sheet date,

the capital gains and losses on assets sold after the balance sheet date, and

investment expenses, and losses from default (C-1 risk).

The actuary need not verify the existence and ownership of the assets at the balance sheet date, but would consider their quality.

Investment return rates (discount rates) are used to discount the expected future payment streams to their equivalent PV.

The discount rates may vary from one claim grouping to the next, from one future period to the next, or from one underlying accident or underwriting period to the next, although it is common to use a single rate for all years and product lines.

The following commentary addresses the derivation or estimation of a portfolio yield rate to determine the present value of the net policy liabilities and considerations affecting the selection of discount rates used to determine the present value of the ceded policy liabilities and gross policy liabilities.

4.1 Selection of Portfolio

The assets that are included in the portfolio for the purpose of estimating a discount rate may vary depending on the circumstance of the organization. Invested assets, such as those invested in fixed income securities, are commonly included as part of the portfolio. Other invested assets, such as those invested in non-fixed income securities, as well as assets such as cash or receivables may be excluded from the portfolio, subject to other considerations described below.

Invested assets may be segregated between investments supporting the policy liabilities (or a portion thereof) and the remaining investments supporting surplus (equity) and other liabilities as applicable, in accordance with the organization's investment policy. In such cases, the actuary may rely on the investment policy to segregate invested assets for inclusion in the selected portfolio. For example, the investment policy may dictate that invested assets be invested in fixed and non-fixed income securities in a ratio that mirrors the ratio of policy liabilities versus surplus. In this case, the actuary may elect to include only fixed income securities in the portfolio.

The actuary may also consider characteristics such as the credit rating, duration, and time to maturity of invested assets in selecting the portfolio.

In addition to the considerations listed above, the assets selected for the purpose of estimating a discount rate would meet the following criteria:

- The selected assets would be sufficient to support the net policy liabilities; and

- The selected assets would generate a cash flow that is consistent with the cash flows associated with the net policy liabilities.

Although it is common practice to select a single discount rate to be applied to both net premium liabilities and net claim liabilities, the comments in this section would apply even if distinct discount rates were derived for purposes of discounting subsets of the overall net policy liabilities.

If the book value of the investment portfolio is insufficient to support the net policy liabilities, then the expected yield on other (non-investment) assets would be considered. A blended rate would be estimated assuming an appropriate yield on such non-investment assets, as discussed in section 4.2. The book value of an asset may be equal to the market value, the amortized value, or such other value consistent with Canadian generally accepted accounting principles.

The asset cash flow is made up of maturing values, liquidated values, income from dividends and coupons, cash including collection of receivables, and other asset-related income attributable to the selected portfolio. The asset cash flow is considered to be consistent with the relevant liabilities cash flow if the amount of the two cash flows is approximately the same in each period, in which case the average asset duration would be consistent with the average duration of the net policy liabilities.

Where matching is not evident, for example when an insurer does not have a rigorous policy in place, the actuary would consider whether the cash flows are sufficient to warrant the use of the portfolio selected for the purposes of estimating a discount rate. If sufficient, the asset portfolio would be expected to give rise to cash flow in each period that would at least provide for the net liabilities cash flow in that period.

By definition, consistency of cash flows would be assessed through the application of a comprehensive cash flow matching model for purposes of deriving a discount rate. An example of such a model is described in section 4.6.

Below is an example of a simple approach for assessing the sufficiency of the asset cash flow when a comprehensive cash flow matching model is not used. In this context, the net cash flow in a period is computed as the asset cash flow in that period less the liabilities cash flow in that period. Appendix A summarizes the scenarios presented in Appendices B, C and D. Each of Appendices B, C, and D provide “a more detailed example” as referenced here.

Net Cash Flow				
Period	**Asset Cash Flow**	**Liabilities Cash Flow**	**Net Cash Flow**	**Cumulative Cash Flow**
t+1	33,000	26,000	+7,000	+7,000
t+2	13,000	9,800	+3,200	+10,200
t+3	6,000	4,800	+1,200	+11,400
t+4	2,500	3,100	-600	+10,800
t+5	2,900	2,200	+700	+11,500
Total	**57,400**	**45,900**	**+11,500**	**-**

Ideally, the net cash flow in each period would be positive. The actuary would consider the timing and magnitude of any negative values for net cash flow (such as in period t+4, above), and the extent to which such incremental negative values would cause the cumulative net cash flow to be negative. In this case, it is obvious that positive net cash flows in the first three periods are more than sufficient to cover the negative cash flow in period t+4,without consideration of the expected rate of return on reinvested assets.

For more complex cases, refer to section 4.3 for a discussion of reinvestment of positive cash flows, and liquidation of assets to address negative cash flows.

4.2 Portfolio Yield Rate

A portfolio yield rate is the internal rate of return (IRR) at which the present value of all future cash flows is equal to the current book value of the portfolio. The portfolio yield rate to maturity of a single Government of Canada bond, for example, would be the IRR such that the current book value of the bond is equal to the sum of the present value of future coupons, and the present value of the par value of the bond (i.e., the book value at maturity).

In some cases, an insurer's investment specialist will provide the actuary with an estimate of the portfolio IRR. Paragraph 1610.01 of the SOP states that "The actuary may use and take responsibility for another person's work if such actions are justified."

The actuary may not have available detail regarding the characteristics of each investment required to precisely determine the asset cash flows in order to estimate the portfolio IRR. A weighted average of the yield rates of individual assets may be used as an approximation of the portfolio IRR if, for example, the weights applied to each asset are equal to the product of the duration and the book value of that asset.

A simple example of an IRR calculation is shown in Appendices B, C, and D, along with the approximation referred to above.

Fixed Income Securities

The following points would be considered when calculating the IRR of fixed income securities:

- T-Bills are sold at a discount and mature at par value. T-Bill "coupon rates" are generally the nominal simple discount rate quoted in most publications. This is the normal convention used for these and similar instruments in Canada. The market convention may be different in other countries.
- It is common for the yield on a bond portfolio to be quoted as a nominal yield, compounded semi-annually. If so, the actuary may need to convert this rate to an equivalent annual effective interest rate.
- Some bonds have call features that result in redemption prior to maturity, which may impact their valuation.
- Accrued investment income is often held by a company in a separate account, but would be included by the actuary in the book value of bonds.
- Retractable preferred shares, and preferred shares with rate reset options, may lend themselves to the same IRR treatment as bonds.

Non-Fixed Income Securities

The following educational notes issued by the Committee on Life Insurance Financial Reporting (CLIFR) may provide useful guidance regarding the calculation of IRR on non-fixed income securities held by P&C insurers.

- Investment Return Assumptions for Non-Fixed Income Assets for Life Insurers (March 2011); and
- Investment Assumptions Used in the Valuation of Life and Health Insurance Contract Liabilities (September 2014).

These educational notes were developed for financial reporting of life and health insurers. In applying the underlying concepts to P&C insurers' valuations, consideration would be given to characteristics of the insurer's claim liabilities, such as the estimated duration of those liabilities, that distinguish them from those of a life and health insurer.

Listed below are illustrations of considerations discussed in the SOP and guidance pertaining to life and health insurance that might be applicable to P&C insurance:

- The actuary's "best estimate of investment return on a non-fixed income asset would not be more favourable than a benchmark based on historical performance of assets of its class and characteristics" [SOP, paragraph 2340.11].
- Guidance from CLIFR suggests that the longest possible historical period is the most appropriate for determining the best estimate of investment return, because the projection period for life and health valuations is very long and possibly even longer than the longest reliable historical period.
- "… the amount of non-fixed income assets supporting liability cash flows at the balance sheet date and at each duration in the projection does not exceed the amount required to support 20% of cash outflows for the first 20 years and 75% thereafter …". [SOP, paragraph 2340.14.1]

Assets with 0% IRR

Normally, the IRR associated with cash and cash equivalents is 0%. If the level of cash held at the valuation date is unusually large, however, it may be appropriate to assume that excess cash will be invested in accordance with the company's investment strategy.

Other assets for which the IRR is normally considered to be 0% include receivables from agents and brokers, policyholders, instalment premiums, and other insurers.

When uncollected premiums (accounts receivable) are included in the assets backing the premium liabilities, it may be appropriate to assume that these amounts will be invested when collected at some future date, and thus will generate investment income over the remaining duration of the premium liabilities.

4.3 Discount Rate – Present Value of Net Policy Liabilities

For the purposes of financial reporting, a portfolio yield rate would be used as the basis for selecting a discount rate for estimating the PV of net policy liabilities. Normally, the same discount rate would be used in the estimation of the PV of both net premium liabilities and net claim liabilities.

Reinvestment Risks and Liquidation of Assets

Unless the asset cash flow is consistent with the liability cash flow, the actuary would consider the effect of reinvesting positive net cash flow, or the effect of the liquidation of assets to address negative net cash flow.

To the extent that reinvestment is required, the actuary would consider the expected future reinvestment rate for new money and the company's investment strategy. For example, the actuary would consider the following: whether the insurer's strategy is one of growth, or a "buy and hold" strategy; whether reinvestment is expected to be in the form Government of Canada bonds; or whether the insurer has a policy for reinvestment of dividends received.

The actuary would also consider if it will be necessary to liquidate a portion of invested assets by determining whether or not the current or future asset portfolio has appropriately scheduled maturity dates and sufficient liquidity to cover the future payments needed.

As an alternative to liquidation of existing assets in the event of negative net cash flow, the actuary may consider expected cash flow from future business. Such cash flow would be the net cash flow after consideration of the payout of expected claims and expenses, as well as the receipt of premiums and other revenue items. In this context, future business would be limited to future renewals on existing in-force policies, after consideration of the company's expected retention rate.

After consideration of future reinvestment and liquidation of assets, the selected discount rate would be a blended rate based on the current portfolio yield rate, expected future reinvestment rates, and the expected capital gain or loss arising from premature liquidation.

Refer to section 4.1 for a discussion of cash flow consistency. Section 4.6 provides an illustration of the use of a comprehensive cash flow matching model for the purposes of selecting a discount rate.

Investment Expenses

The actuary would consider the expected expenses to be incurred in connection with the investment of assets. It may be reasonable, for example, to reduce the discount rate based on historical investment expenses.

Asset Depreciation Risk

The actuary would consider reducing the discount rate to reflect expected losses due to credit-related events, including default, impairment, or restructuring of obligations by the issuer of the invested assets. The actuary would consider the impact that a concentration of investments might have on such expected asset depreciation risk. Unexpected asset depreciation risk would be considered by the actuary in the context of selection of the credit risk component of the investment return rate margin for adverse deviations.

4.4 Discount Rate – Present Value of Ceded Policy Liabilities

Ceded liabilities are shown as recoverable amounts (assets) in the balance sheet. As such, they are not supported by a company's investments. It is reasonable to assume that liabilities ceded to another insurer are supported by assets held by that insurer. Normally, it would be appropriate to reflect the time value of money in the estimation of ceded liabilities. The discount rate used to determine the PV of ceded policy liabilities may be selected from the following or a combination thereof:

- The discount rate selected for the estimation of the PV of net policy liabilities (i.e., a portfolio yield rate);
- A risk-free rate; and
- The discount rate used by the assuming company, such as in the case of cessions to an affiliated company.

The use of a rate based on the portfolio yield for the estimation of the PV of ceded policy liabilities may be appropriate if the company's investments are sufficient to support its gross policy liabilities, or if the assets held by the assuming company to support its net policy liabilities are considered to be similar to the ceding company's investment portfolio. In cases where a high proportion of a company's policy liabilities are ceded to other insurers, the actuary may give more weight to the other bases shown above, i.e., a risk-free rate, or a discount rate used by the assuming company.

The use of a risk-free rate would reflect the current or new money investment return rate for a risk-free or other prudently invested portfolio of assets with appropriate duration. For example, the risk-free rate may be determined using the average market yield on a series of government bonds that match the expected liability duration.

4.5 Discount Rate – Present Value of Gross Policy Liabilities

If it is determined that it is appropriate to use the same discount rate for estimating the PV of ceded policy liabilities as was used to estimate the PV of net policy liabilities, then the PV of gross policy liabilities may be estimated directly using that same discount rate.

If the PV of ceded policy liabilities is estimated using a risk-free rate, or the assuming company's discount rate, then the implied rate underlying the estimation of the PV of the gross policy liabilities is not necessarily equal to the selected portfolio yield rate underlying the PV of net policy liabilities. In such cases, the implied gross discount rate would be computed from the PV (ceded PV + net PV) and the cash flows (ceded cash flows + net cash flows) pertaining to the gross policy liabilities.

4.6 Discount Rate Based on a Comprehensive Cash Flow Matching Model

Section 4.2 describes the selection of a discount rate based on a portfolio yield rate. This approach may be refined by incorporating a comprehensive cash flow matching model. An example is presented in Appendices B and D. In the model shown, the net cash flow for each period is computed as the asset cash flow less the policy liabilities cash flow for that period. A positive net cash flow in a period is reinvested, but only to the extent required to offset negative net cash flows in future periods. Any excess cash flows (i.e., positive cash flows in excess of the amounts required to offset negative cash flows over the course of all periods) are removed from consideration. The discount rate is then determined as the IRR from the market value of initial asset and the total outflow, either from claim payment or the cash withdrawal.

Unless the model is refined to include investment expenses, the resulting IRR would be reduced to reflect the expected level of investment expenses.

If the asset cash flow and policy liabilities cash flow are perfectly matched, the IRR based on this comprehensive cash flow matching model would be the same as the portfolio rate of return described in section 4.2.

5. Actuarial Present Value

Policy liabilities should be calculated on an APV basis, consistent with the SOP. The APV includes the time value of money and explicit PfADs (claims development, investment return rates, and recovery from reinsurance ceded).

5.1 Margins for Adverse Deviations

According to the SOP, paragraph 2250.03,

> The actuary would include a margin for adverse deviations in the assumptions for
>
> claims development,
>
> recovery from reinsurance ceded, and
>
> investment return rates.

Claims development

According to the SOP, paragraph 2250.04, "The margin for adverse deviations for claims development would be a percentage of the claim liabilities excluding provision for adverse deviations." Therefore the PfAD is determined by applying a margin to the PV. The claims development margin may vary by year and by line of business, and may vary between gross, ceded, and net liabilities.

Recovery from reinsurance ceded

According to the SOP, paragraph 2250.05, "The margin for adverse deviations for recovery from reinsurance ceded would be a percentage of the amount deducted on account of reinsurance ceded in calculating the premium liabilities or claim liabilities, as the case may be, excluding provision for adverse deviations." Therefore, the PfAD is determined by applying a margin to the ceded PV. The PfAD is deducted from the ceded PV and added to the net PV. The margin for recovery from reinsurance ceded may vary by year and line of business.

Investment return rates

According to the SOP, paragraph 2250.06, "The margin for adverse deviations for investment return rate would be a deduction from the expected investment return rate per year." Therefore, the PfAD is determined as the difference between PV calculations, before application of other margins, using two different discount rates:

The selected discount rate minus the investment return rate margin; and

The selected discount rate.

The margin for investment return rate may vary by year and by line of business, and may vary between gross, ceded, and net liabilities. The margin consists of three elements: asset/liability mismatch risk margin, timing risk margin, and credit risk margin.

The educational note Margins for Adverse Deviations for Property and Casualty Insurance provides additional guidance on the selection of MfADs.

5.2 Claim Liabilities

The resulting APV of claim liabilities are computed as follows:

Gross APV	=	Gross PV
	+	PfAD for claims development (gross)
	+	PfAD for investment return rate (gross)
Ceded APV	=	Ceded PV
	+	PfAD for claims development (ceded)
	+	PfAD for investment return rate (ceded)
	-	PfAD for recovery from reinsurance ceded

Net APV	=	Net PV
	+	PfAD for claims development (net)
	+	PfAD for investment return rate (net)
	+	PfAD for recovery from reinsurance ceded

In the above equations

Gross	=	Net + Ceded
PfAD for claims development (gross)	=	PfAD for claims development (net)
	+	PfAD for claims development (ceded)
PfAD for investment return rate (gross)	=	PfAD for investment return rate (net)
	+	PfAD for investment return rate (ceded)

5.3 Premium Liabilities

The PfAD would be calculated by applying selected margins to the PV of the estimated future claim and claim adjustment expenses. The calculation of the PfAD associated with premium liabilities would be similar to the calculation of the PfAD associated with claim liabilities as described in section 5.2. The actuary would consider different MfADs if premium liabilities and claim liabilities exhibit different levels of uncertainty. Generally, for example, there would be greater uncertainty for claims that have yet to occur, such as those arising from the unexpired portion of in-force business, than for claims that occurred in a prior period.