Educational Note

Discounting

Committee on Property and Casualty Insurance Financial Reporting

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Memorandum

To:	All Fellows, Affiliates, Associates and Correspondents of the Canadian Institute of Actuaries
From:	Claudette Cantin, Chairperson Committee on Property and Casualty Insurance Financial Reporting
Date:	July 20, 2005
Subject:	**Educational Note: Discounting**

Please find enclosed a new educational note entitled, "Discounting", which has been prepared by the Committee on Property & Casualty (P&C) Insurance Financial Reporting. This represents the first phase of the educational note on discounting, which addresses the following urgent objectives:

- To update and replace the 1999 educational note "Discounting" to make it consistent with the Canadian Institute of Actuaries Standards of Practice (SOP).

- To provide explicit guidance in two areas where no such guidance is provided in the SOP, namely 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 P&C actuaries in Canada. However, we are also aware of alternate approaches, which are based on different but valid interpretations of the SOP 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 for Due Process, this educational note has been approved by the Committee on Property and Casualty Insurance Financial Reporting, and has received final approval for distribution by the Practice Standards Council on June 14, 2005.

Educational notes are covered under Section 1220 of the SOP. Section 1220 prescribes that "*The actuary should be familiar with relevant educational notes and other designated educational material.*" It further explains that a "*practice which the 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.*"

All questions and comments should be addressed to me at my *Yearbook* address.

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1. INTRODUCTION

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.

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.

To the extent possible, the terminology used in this educational note is consistent with the Canadian Institute of Actuaries' Standards of Practice (SOP). However, consideration has been given to methodologies used by P&C actuaries for the valuation of policy liabilities. Specifically, it is common practice to first 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 present value and the provision for adverse deviations.[1]

The discounting aspect of the valuation of policy liabilities involves three fundamental elements:

- The selection of payment patterns.

- The selection of discount rates.

- The application of margins for adverse deviations.

This educational note applies to the valuation of gross, ceded and net policy liabilities.

The following relationship applies whether estimates are on an undiscounted, present value or actuarial present value basis:

<div align="center">

NET = GROSS – CEDED

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Normally two of the three items are estimated directly and the third is computed from the above relationship. Regardless of which two of these items are estimated directly, care would be taken to assess the reasonableness of the computed third estimate. The following are considerations for selecting which two items 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.

- **Cashflow volatility** - Different approaches may be warranted for different lines of business depending on the volatility and duration of cashflows 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

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[1] The use of APV in this educational note is consistent with SOP's use of the term present value. Refer to section 2200.

has changed significantly over the experience period.

- **Discount rate** - 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 the same discount rate is used to estimate the ceded present value and net present value, then any two of the three items would be estimated directly, subject to the other considerations listed here.

For some assumed business (e.g., Facility Association or intercompany pooling or reinsurance arrangements), it may be appropriate to use the policy liabilities as determined by a qualified actuary reporting on behalf of the ceding entity. Refer to the SOP, section 1610 – Actuary's Use of Another Person's Work.

2. TERMINOLOGY

Undiscounted:	The sum of expected future payments.
Discount Rate:	The expected investment return rate used for calculating the present value of a cash flow.
Payment Pattern:	The expected calendar period distribution of payments for a given accident, underwriting, or report period.
Present Value (PV):	The sum of expected future payments after recognizing the time value of money.
Margin for Adverse Deviations: (MfAD)	The SOP 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 a present value or best estimate of a valuation variable to reflect the uncertainty in the variable.
Provision for Adverse Deviations: (PfAD)	The SOP 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 defines Claim Liabilities as "*the portion of policy liabilities in respect of claims incurred on or before the balance sheet date.*" Claims liabilities include indemnity amounts and allocated and unallocated claims adjustment expense amounts.
Premium Liabilities:	The SOP defines Premium Liabilities as "*the portion of policy liabilities which are not claim liabilities.*"

3.   PAYMENT PATTERN

3.1   Cash Flow Associated with Claim Liabilities

The first step in deriving the actuarial present value is to estimate 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 allocated claims adjustment expenses also applies to unallocated claims adjustment expenses.

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

- 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).

- 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 company 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 which has 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 payment and timing characteristics of the grouping under consideration.

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

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

For a given line of business, the selected payment patterns would normally be consistent with assumptions used in the estimation of the undiscounted liabilities, subject to the following considerations:

- If the undiscounted amounts are based on a paid development approach, then the claim payment pattern may be derived directly from the selected paid development factors.
- If the undiscounted amounts are based on other methodologies, then different methods of selecting the payment pattern may be used, such as historical ratios of paid losses at various maturity dates, to selected ultimate losses.

3.2   Cash Flow Associated with Premium Liabilities

It may be appropriate to select different payment patterns for each of the following types of payments associated with premium liabilities:

- Future claims and claims adjustment expenses,
- Servicing or maintenance expenses,
- Future reinsurance costs.

The payment patterns for future claim costs would be consistent with the payment patterns associated with claim liabilities (refer to Section 3.1). Adjustments may be required to reflect:

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

Servicing or maintenance expenses are paid over the earning period of the unexpired term of in-force policies. Normally the time value of money would not be material for such expenses.

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

- The timing of the payment of applicable reinsurance premiums,
- The earning period of the unexpired portion of in-force policies.

4.   DISCOUNT RATE

As stated in the SOP, section 2240.01, "*The expected investment return rate for calculation of the present value of cash flow is that to be earned on the assets which support the policy liabilities. It 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,

investment expenses, and losses from default (C1 risk)."

As stated in the SOP, section 2240.02, *"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 reduce expected future payment streams to their equivalent present value.

The discount rates may vary from one claim grouping to the next, from one future calendar 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 sub-sections address the derivation or estimation of a portfolio yield rate as required by the SOP, and considerations affecting the selection of discount rates used to determine net and ceded present value.

4.1   Portfolio Yield Rate

A portfolio yield rate is the internal rate of return (IRR), which when applied to the cash flows, produces the book value at a future date of the corresponding assets. The book value of an asset may be the market value, the amortized value, or such other value consistent with Canadian generally accepted accounting principles.

The following points would be considered when calculating a portfolio yield rate:

- 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. 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, and which may impact their valuation.

- Early principal repayments are a feature of some securities and would be considered.

- Accrued investment income is often held by a company in a separate account, but would be combined by the actuary with the amortized value of bonds.

- Returns on equities are subject to volatility and care would be taken if equities are selected to support liabilities. For example, historical rates of return may not be indicative of future returns, especially in the short term. In addition, the quality of equities would be considered.

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

In some cases, the actuary may not have enough detail to determine asset cash flows, but will have certain information such as duration, yield and book value for each asset. An approximation of IRR can be developed using the product of the duration and the book value to weight the yield rates of individual assets.

4.2   Selection of Discount Rate for Estimation of Net Present Value

For the purposes of financial reporting, a portfolio yield rate would be used for estimating the net present value. The same discount rate would be used in the estimation of both premium and claim liabilities.

The discount rate may be estimated on the basis of the entire investment portfolio or some categories of assets may be excluded. Assets supporting net policy liabilities are sometimes segregated from assets supporting capital and surplus. If so, it is common practice to assume that a subset of an insurance company's assets, such as bonds, would be matched to net policy liabilities, while riskier assets, such as equities, would be matched to its capital and surplus. Consideration would also be given to the company's policy regarding asset liability matching.

The selected assets must be sufficient to support all 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 (e.g., 0% yield on premium receivables).

Reinvestment Risks and Liquidation of Assets

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

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. Is the company's strategy one of growth, or is it a "buy and hold" strategy? When are dividends received and what is the reinvestment policy?

The actuary would consider whether 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 payments needed.

As an alternative to liquidation of existing assets in the event of negative net cashflow, the actuary might consider expected cashflow from future business. Such cashflow would be the net cashflow 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.

The selected discount rate would be a blended rate based on the current portfolio yield rate, expected future reinvestment rates, as well as the expected capital gain or loss arising from premature liquidation.

To the extent that the asset cashflow is consistent with the liability cashflow, the selected discount rate will be the same as the internal rate of return of the supporting assets.

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.

4.3 Selection of Discount Rate for Estimation of Ceded Present Value

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. Accordingly, it is appropriate to reflect the time value of money in the estimation of ceded liabilities. The discount rate used to determine ceded present value may be selected from the following or a combination thereof [2]

- The discount rate selected for net present value (i.e., a portfolio yield rate).

- A risk-free rate.

- 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 ceded present value 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.

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. The risk-free rate may be determined using the average market yield on a series of government bonds that match the expected liability duration.

4.4 Selection of Discount Rate for Estimation of Gross Present Value

If the same discount rate is used for estimating both the net and ceded present values, then the gross present value can be estimated directly using that same discount rate.

If ceded present value is estimated using a risk-free rate, or the assuming company's discount rate, then the implied rate underlying the gross present value is not necessarily equal to the selected portfolio yield rate underlying the net present value.

5. APPLICATION OF MARGINS

5.1 General

The present value is calculated using the selected discount rate, as described in section 4.

According to the SOP, section 2250.05, "*the actuary would include margin in the assumptions for:*

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[2] Each of the three approaches outlined represents a departure from the SOP (section 2240.01). The SOP provides no specific guidance for the valuation of ceded policy liabilities, although P&C actuaries are required to opine on the ceded policy liabilities.

> *claims development,*
>
> *recovery from reinsurance ceded, and*
>
> *investment return rates."*

For each of the three types of margins listed above, a <u>provision for adverse deviations</u> would be calculated as follows:

Claims development

According to the SOP, section 2250.07, *"The margin for claims development is a percentage of the <u>claims liabilities</u> excluding <u>provision for adverse deviations</u>",* therefore the <u>provision for adverse deviations</u> is determined by applying a margin to the <u>present value</u>. The claims development margin would normally be in the range of 2.5% to 15%. Selection of a <u>margin for adverse deviations</u> above 15% may be appropriate for an unusually high level of uncertainty (e.g., product reform). 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, section 2250.08, *"The margin for recovery from reinsurance ceded is a percentage of the amount deducted on account of reinsurance ceded in calculating the <u>premium liabilities</u> or <u>claim liabilities</u>, as the case may be, without <u>provision for adverse deviations</u>",* therefore, the <u>provision for adverse deviations</u> is determined by applying a margin to the ceded <u>present value</u>. The <u>provision for adverse deviations</u> is deducted from the ceded <u>present value</u> and added to the net <u>present value</u>. The recovery from reinsurance ceded margin would normally be in the range of 0% to 15%. Selection of the <u>margin for adverse deviations</u> above 15% may be appropriate for an unusually high level of uncertainty. The margin for recovery from reinsurance ceded may vary by year and line of business.

Investment return rates

According to the SOP, section 2250.09, *"The margin for investment return rate is a deduction from the expected investment return rate per year",* therefore, the <u>provision for adverse deviations</u> is determined as the difference between <u>present value</u> calculations, before application of other margins, using two different <u>discount rates</u>:

- The selected <u>discount rate</u> minus the investment return rate margin,
- The selected <u>discount rate</u>.

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 investment return rate margin would normally be in the range of between 50 basis points and 200 basis points. Selection of a <u>margin for adverse deviations</u> above 200 basis points may be appropriate for an unusually high level of uncertainty.

5.2   Claim Liabilities

The resulting Actuarial Present Values (APV) are as follows:

Gross actuarial present value	=	Gross PV
	+	PfAD for claims development (gross)
	+	PfAD for investment return rate (gross)

Ceded actuarial present value	=	Ceded PV
	+	PfAD for claims development (ceded)
	+	PfAD for investment return rate (ceded)
	-	PfAD for recovery from reinsurance ceded

Net actuarial present value	=	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 provision for adverse deviations would be calculated by applying selected margins to the present value of the estimated future claim and claim adjustment expenses. The calculation of the provision for adverse deviations would be similar to the calculation of provision for adverse deviations associated with claim liabilities as described in section 5.2. The margins may vary by line of business and/or year and may also differ from those associated with claim liabilities.

The effect of the time value of money is normally insignificant for servicing expenses and future reinsurance costs, and, therefore, it is reasonable in most cases to assume that the undiscounted value of these items is equal to the actuarial present value.