



EDUCATIONAL NOTE

Educational Notes do not constitute standards of practice. They are intended to assist actuaries in applying standards of practice in respect of specific matters. Responsibility for the manner of application of standards in specific circumstances remains that of the practitioner.

APPROXIMATIONS TO CANADIAN ASSET LIABILITY METHOD (CALM)

COMMITTEE ON LIFE INSURANCE FINANCIAL REPORTING

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MEMORANDUM

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

FROM: Micheline Dionne, Chairperson
Committee on Life Insurance Financial Reporting

DATE: September 22, 2004

SUBJECT: Educational Note on Approximations to the Canadian Asset Liability Method (CALM)

The Committee on Life Insurance Financial Reporting (CLIFR) has developed the attached educational note. It concerns the degree of rigour used in implementing the Canadian Asset Liability Method and outlines considerations for the actuary's use of approximations.

Section 2320.01 of the *Standards of Practice – Practice-Specific Standards for Insurers* states that “the actuary should calculate policy liabilities by the Canadian asset liability method” (hereafter referred to as the CALM). Since this standard's adoption in December 2002, many actuaries have found it practical to use approximations when calculating Generally Accepted Accounting Principles (GAAP) policy liabilities. However, compliance with the “spirit and intent” of the standards is not sufficient if the result does not materially reproduce an exact application of CALM. Approximations may be used when a complete CALM valuation is not possible or practical.

This educational note provides specific techniques as illustrative examples, and does not provide an exhaustive list of approximation techniques.

In accordance with the Institute's policy for Due Process, this educational note on “Approximations to the CALM” has been approved by CLIFR, and has received final approval for distribution by the Practice Standards Council.

Section 1220 of the *Standards of Practice* 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.

We would like to thank the following individuals who were primarily responsible for the development of this educational note: Trevor Howes, Sarah Marr, Dale Pounder, Les Rehbeli, Phillip Watson and Robert Willis.

Questions should be addressed to me at my *Yearbook* address.

MD

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1. INTRODUCTION

Section 2320.01 of the *Standards of Practice – Practice-Specific Standards for Insurers* states that “the actuary should calculate policy liabilities by the Canadian asset liability method” (hereafter referred to as the CALM).

The CALM is a rigorous method. Since this standard’s adoption in December 2002, many actuaries have found it practical to use approximations when calculating GAAP policy liabilities. However, compliance with the “spirit and intent” of standards is not sufficient if the result does not materially¹ reproduce an exact application of CALM. Approximations may be used when a complete CALM valuation is not possible or practical.

This educational note provides guidance on the degree of rigour used in implementing the CALM and outlines considerations for the actuary’s use of approximations. The specific techniques discussed here are illustrative examples. This educational note does not provide an exhaustive list of approximation techniques.

The May 2002 *Standards of Practice - General Standards* includes the following guidance for actuaries with respect to approximation and materiality:

1340.01 *Deviation from a particular recommendation or other guidance in the standards is accepted actuarial practice if the effect of so doing is not material.*

1340.02 Judgement about materiality pervades virtually all work and affects the application of nearly all standards. The words “materiality” and “material” seldom appear in the standards, but are understood throughout them. For example, the recommendation that approximation is appropriate if it does not affect the result means that it does not materially affect the result.

1510.01 *An approximation is appropriate if it reduces the cost of, reduces the time needed for, or improves the actuary’s control over, work without affecting the result.*

1510.04 Like materiality, to which it is related, approximation pervades virtually all work and affects the application of nearly all standards. The words “approximation” and “approximate” seldom appear in standards, but are understood throughout them.

1510.05 Approximation permits the actuary to strike a balance between the benefit of precision and the effort of arriving at it.

2. GENERAL GUIDELINES

The actuary may not be able to perform a complete CALM valuation in the time between a valuation date and a required reporting date. In such situations, an approximation can be based on CALM analysis completed prior to the valuation date. In complying with section 1510.01 of

¹ For more on materiality, refer to the remainder of section 1340.

the *General Standards*, the actuary determines if approximations are appropriate by considering:

1. whether the CALM analysis was conducted within a reasonable time-frame prior to the valuation,
2. whether the liability and asset cash flows, or the economic environment, have changed in a way that materially affect the results, and
3. whether to adjust the results of the CALM analysis to reflect the impact of any material changes.

3. USE OF SERIATIM DISCOUNT CALCULATORS

The actuary might use existing seriatim calculators as an approximation to CALM to establish GAAP policy liabilities at valuation dates. In these situations, the selection of discount rates constitutes the approximation to CALM. Related variables, such as inflation rate and interest rate used for Investment Income Taxes (IIT), are then consistent with the scenario selected.

This method uses a traditional discounted cash flow valuation platform. In fact, such a platform usually generates the liability cash flows as part of the approximation. The ideal platform is capable of forecasting tax cash flows and GAAP policy liability cash flows, so that the GAAP policy liabilities can provide for the temporary differences from the asset and liability sides of the balance sheet as well as policy-related permanent differences (such as the non-deductibility of investment income taxes in Ontario and Québec).

This approach solves for the discount rates needed to reproduce GAAP policy liabilities determined under CALM. There are several ways of determining these rates.

1. Solve for a non-level equivalent interest rate vector that discounts the liability cash flows to the CALM GAAP policy liabilities (determined from the selected adverse scenario).

This approach selects a vector of discount rates based on more traditional approaches. The actuary considers the current and projected gross portfolio yields of the asset segment supporting the GAAP policy liabilities, deducting items like asset default and investment expenses as necessary.

A less sophisticated approach moves the net portfolio yield linearly to an ultimate reinvestment rate assumed in the selected adverse scenario over a number of years. The actuary then reviews the relationship between the projected valuation interest rates and the resulting GAAP policy liabilities and considers the need to perform additional iterations (reasonability checks).

This approach helps ensure future GAAP policy liabilities emerge accurately, as well as consistently with future asset values.

A simplification of this approach solves for a level equivalent interest rate. This approach may be reasonable for blocks of business where the reversal of temporary differences between future statement and tax policy liabilities does not materially impact GAAP policy liabilities (e.g., post 95 policies), and allocation of GAAP policy liabilities to sub-groups is not needed. However, this approach may not be appropriate if it is necessary to accurately project future GAAP policy liabilities. Future GAAP policy liabilities are technically equal to the statement value of assets at each future point in time, moving forward from the initial statement value of assets at the valuation date. The actuary ensures that the projection of future GAAP policy liabilities (discounted cash flows at level equivalent interest rate) is reasonably consistent with the projection of future portfolio yields and the associated statement value of supporting assets.

2. Solve for an explicit mismatch provision.

An alternate approach is to solve for a non-level equivalent interest rate, using the base scenario instead of a selected adverse scenario. The C-3 interest margin on the mismatch between asset and liability cash flows is based on the difference between the calculated CALM tested GAAP policy liabilities and the base scenario liabilities. For example, the actuary might determine that an additional 35 basis points is an appropriate provision for interest risk based on the CALM testing, or the actuary might determine the appropriate provision to be an increasing margin of 10 basis points increasing to 60 basis points in 20 years.

The C-3 interest margin can also be linked to the investment policy, as long as the provision is reasonably equivalent to the CALM tested provision. Through simulated testing, the determination of a basis point margin might recognize the approved limits on deliberate mismatching.

4. USE OF NON-SERIATIM APPROXIMATIONS

It may be possible to develop approximations that do not produce seriatim GAAP policy liabilities. An example may be single premium business where liability cash flows consist only of outflows, limiting the impact of reinvestment activity. Usually, segmented assets correspond directly to the liabilities so that changes in the asset segment are easily identified. The steps in one application of the method are:

Determine the C-3 margin at the testing date:

1. Perform a thorough CALM analysis on the testing date. The result establishes the GAAP policy liability (GPL_0) at the testing date.
2. Discount the projection of the asset and liability cash flows, without reinvestment, using the yield curve on the testing date. This gives the market related value of the assets ($MRVA_0$) and the market related value of the liabilities ($MRVL_0$) at the testing date.

3. Determine an appropriate C-3 margin in basis points that can be added to the liability cash flows so that the GAAP policy liabilities calculated on the approximate basis equals the required CALM reserve from step 1. In formula form: $GPL_0 = (\text{statement value of assets}_0) + (*MRVL_0 - MRVA_0)$, where $*MRVL_0$ includes the C-3 cash flow.

Determine the policy liabilities at the valuation date:

1. Discount the asset and liability cash flows at the current yield curve to establish the $MRVA_1$ and $MRVL_1$ at the valuation date. The $MRVL_1$ includes the C-3 cash flows from item 3 above.
2. The statement value of assets is the amount on the financial statements at the valuation date. The value of the GAAP policy liability (GPL_1) is set equal to the statement value of assets plus the difference between $MRVL_1$ and $MRVA_1$. In formula form: $GPL_1 = (\text{statement value of assets}_1) + (MRVL_1 - MRVA_1)$.

This method can be run in time for quarter-end work. It also ensures that the GAAP policy liability calculation reflects changes in yield curves between the testing and valuation dates. The method is appropriate if the mismatch provision has not materially changed since the last CALM testing (or is within the investment tolerance limits if the C-3 margin is based on the maximum).

Where tax cash flows are not explicitly modelled, section 5's special considerations for income tax apply. Although a discounting rate is unnecessary for the non-seriatim approximation, the actuary needs to quantify and explicitly add the discounted future tax provision (DFTP). In respect of future tax cash flows attributable to existing and future policy related temporary differences, the pattern of the discount rate reflects the selected adverse scenario. It may also involve splitting the assets (book and market value) into Pre-1996 and Post-1995 blocks using an appropriate method. Again, the actuary ensures that the addition of tax cash flows has not materially changed the risk profile, and the discounting approach is reasonable.

5. SPECIAL CONSIDERATIONS – INCOME TAXES

GAAP policy liabilities include provisions for future income taxes. This involves projecting the future tax liabilities, as well as future GAAP policy liabilities under CALM.

The December 2002 Educational Note on *Future Income and Alternative Taxes* outlines considerations for the actuary considering these matters.

In any given CALM scenario, all projected GAAP policy liability (for all years) equal the projected statement value of the assets supporting the GAAP policy liabilities. The difference between these projected GAAP policy liabilities, and policy liabilities prepared on a tax basis with their supporting assets, generates income tax cash flows (considering temporary and permanent differences).

The process for determining the GAAP policy liabilities is iterative. The income tax cash flows depend on the projected GAAP policy liabilities, which depend on future tax cash flows.

For large blocks of business, iteration might not be practical from a computer run-time perspective. The actuary may consider using one of the following approximations.

1. Conduct the CALM analysis on a pre-tax basis, and use results to select the interest rate scenario (and vector) that reproduces the pre-tax GAAP policy liabilities. A full projection of tax cash flows is added to the analysis, and a final set of discount rates is determined. Under this process, the actuary iterates on one scenario. The actuary ensures that, by adding tax cash flows and supporting assets to the projection and the testing, the selected interest rate scenario is still appropriate, and that the net cash flow risk profile over the projection period has not materially changed.
2. Establish GAAP policy liabilities on a pre-tax basis, and use traditional spreadsheet approaches to quantify tax cash flows, including the tax liability or asset and the discounted future tax provision (DFTP). These tax cash flows result from existing and future policy related temporary differences and future policy related permanent differences. Again, the actuary ensures that the addition of tax cash flows does not materially change the risk profile, and the discounting approach reflects the selected adverse scenario.

6. PROJECTING CALM LIABILITIES

Practical considerations may play a greater role when the actuary needs to project future GAAP policy liabilities consistent with the CALM methodology (e.g., for reasons concerning pricing, Dynamic Capital Adequacy Testing (DCAT) reporting, Embedded Value reporting, corporate financial planning, discounted future tax liability, lapse Margins for Adverse Deviation (MfAD) determination).

While the CALM may determine GAAP policy liabilities at a single future valuation date (FVD), there are technical challenges. For example, in DCAT or Embedded Value reporting, the actuary needs to project both assets and liabilities under the experience scenario up to the FVD, as well as under the valuation assumptions (best estimate assumption with MfAD) going forward. This involves two sets of assumptions, some of which are defined and applied on a policy year basis.

The CALM uses a family of adverse scenarios (prescribed, as well as selected others) to combine the experience scenario up to the FVD with various economic trends going forward. The CALM adjusts the amount of assets at the FVD to determine the GAAP policy liability under each scenario at that date. Given available technology, projections over multiple years under multiple scenarios may make a detailed, direct application of the CALM impractical.

However, direct application may be practical (under selected scenarios, at specific future dates) to support an approximated approach such as a seriatim, discounted cash flow valuation method.

The actuary may base either the expected interest assumption or the valuation interest margin on current assumptions if the asset-liability mismatch position, the overall economic

environment, and the initial portfolio yield rates resemble those of the current valuation date. When projections imply change in either of these, further investigation may estimate the impact on the resulting valuation expected interest rate and interest margins.

As the number of different scenarios, and length of the projection increase, the actuary might elect to use simplifying assumptions and use of approximations to keep the process manageable and useful. The GAAP policy liabilities basis is estimated in greater detail at specified future dates with interpolation of either the GAPP policy liabilities assumptions, or the calculated GAAP policy liabilities themselves. (Over an extended projection period, intervals could increase over time to reflect the reduced impact of changes in today's GAAP policy liabilities.)

When the GAAP policy liability projection is needed only under the selected valuation interest rate scenario at the current date (such as for lapse margin determination, or discounted future tax calculation), a discounted cash flow approach is often appropriate. This assumes the valuation interest vector reflects the projected net earned portfolio yield rates, period by period, and is consistent with the final CALM scenario at the current valuation date. If the valuation system applies interest rates on a policy year basis, a portfolio earned interest rate vector based on calendar periods will reasonably approximate and replicate the GAAP policy liability at the valuation date.

The above application of a discounted cash flow valuation to future GAAP policy liabilities may not involve new business. If new business is included in the projection, it may be more practical to separate it, by cohort, from the existing in force. The existing in force is assumed to be a run off of current assets; while the new business starts from a zero base, and builds up assets according to current new money interest rates, and the proposed investment policy.

7. FREQUENCY OF VALIDITY ANALYSIS

The actuary ensures that approximations remain valid, and are assessed from time to time. The actuary considers the sources of differences between the approximated results and the actual results in fine-tuning future approximations. Some general guidelines follow:

- Approximations are assessed at least annually.
- Approximations can be done prior to the reporting date provided that any significant changes to asset cash flows, liability cash flows or the economic environment since the most recent analysis are reflected.
- Unless the actuary can demonstrate its continued appropriateness, the approximation is reassessed for each key reporting date.