

Educational Note

Approximations to Canadian Asset Liability Method (CALM)

Committee on Life Insurance Financial Reporting

November 2006

Document 206133

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Memorandum

To: All Members in the Life Insurance Practice Area
From: Tyrone Faulds, Chairperson
Committee on Life Insurance Financial Reporting
Date: November 8, 2006
Subject: **Educational Note – Approximations to Canadian Asset Liability Method (CALM)**

The Accounting Standards Board (AcSB) has introduced Section 3855, Financial Instruments – Recognition and Measurement, which is effective for annual and interim periods in fiscal years beginning on or after October 1, 2006. The implementation of section 3855 creates some new challenges and complications for life insurance company financial reporting, particularly for actuaries responsible for measuring policy liabilities for Canadian Generally Accepted Accounting Principles (GAAP) financial statements.

This revision to the approximation note proposes methodologies to deal with the issues and challenges this regime creates for valuing policy liabilities under the Canadian Asset Liability Method (CALM), particularly where CALM cannot be performed at the valuation date and a roll forward approximation is used.

In accordance with the Institute’s Policy on Due Process for Approval of Standards of Practice and Other Practice-Related Material, this educational note has been approved by CLIFR, and received final approval for distribution by the Practice Council on October 25, 2006.

This educational note is subject to subsection 1220 of the Standards of Practice (hereafter referred to as “Standards”), which says that “the actuary should be familiar with the relevant educational notes and other designated educational material,” and be aware 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,” and that “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.”

I would like to thank the members who were primarily responsible for the development of this educational note, namely, David Campbell, Byron Corner, Marc St-Jacques, Mary Stock, Phillip Watson, Robert Willis and Julie Wheeler.

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1. INTRODUCTION

Paragraph 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” (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 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 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 Judgment 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 balance sheet date and a required reporting date. In such situations, an approximation can be based on CALM analysis completed prior to the balance sheet date. In complying with section 1510.01 of 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.

Where assets backing the liabilities being valued are categorized as “available for sale” or “held for trading,” the statement value of such assets could change materially between the time of calibration of the approximation and the balance sheet date. The GAAP policy liabilities are to be set equal to the statement value of the assets used to support the liabilities. Adjustments for changes in the statement value of assets are supplementary to the approximation methods outlined in sections 3 and 4 of this note.

Several approximation methods for rolling forward a pre-balance sheet date CALM valuation up to the balance sheet date are described in Appendix A. The method used by the actuary will depend on individual circumstances and should be reviewed regularly to ensure it remains appropriate. Performing a true CALM valuation after the balance sheet date provides a good check on the approximation used.

3. USE OF SERIATIM DISCOUNT CALCULATORS

The actuary might use existing seriatim calculators as an approximation to CALM to establish GAAP policy liabilities at balance sheet 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).

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 balance sheet 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 balance sheet date:

1. Discount the asset and liability cash flows at the current yield curve to establish the $MRVA_1$ and $MRVL_1$ at the balance sheet 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 balance sheet 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 balance sheet 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 – 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. It also involves the projection of future GAAP investment income and tax investment income for assets backing policy liabilities. The 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 ignoring income and capital taxes, and use the results to determine the interest rate vector, as per section 3, that reproduces the target amount ignoring taxes. A full projection of tax cash flows is added to the analysis, and a final set of interest 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 ignoring income and capital taxes, 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., discounted future tax liability, lapse MfAD determination, pricing analysis, Dynamic Capital Adequacy Testing (DCAT), Embedded Value reporting and corporate financial planning).

While the CALM may determine GAAP policy liabilities at a single future balance sheet date (FBSD), 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 FBSD, 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 FBSD with various economic trends going forward. Investments subject to fair value accounting would be valued at the FBSD based on yields consistent with market yields at that time. The CALM adjusts the amount of assets at the FBSD 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 balance sheet date. When projections imply change in any of these, further investigation may be required to 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 GAAP 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 an acceptable approximation. While it is more technically correct to change the future statement values of assets subject to fair value accounting (and thus the projected liability values) to reflect their expected values at the future dates under the projection scenario, it may be quite complicated to do this in some situations. In such circumstances, it may often be acceptable to ignore the mark-to-market effects on the asset values. Considerations noted in the second to last paragraph above need to be evaluated to determine if this approximation is appropriate: if so, then the future CALM liability can be determined as the present value of the liability cash flows beyond the FBSD along the remaining PPM valuation interest rate vector provided that such interest rate vector is non-level and reflects the projected net earned portfolio yields; otherwise, the mark-to-market effects will need to be appropriately reflected in the approximation methodology possibly by developing a projection-only interest rate vector which captures any fair value changes in the matching assets.

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.

APPENDIX A**SOME METHODS FOR ROLLING FORWARD CALM VALUATIONS****A.1. Detailed Roll-forward**

This method uses the actual statement asset returns and requires a good reconciliation of the fair value movement in the period. The basic steps are:

1. Calculate true CALM reserve as of time t-1, sometime between t-1 and t.
2. Add liability movement:
 - a. Determine an interest rate vector based on projected fair value statement returns of the asset portfolio (at t-1) that equates the t-1 liability cash flows to the t-1 CALM result. Methodologies for determining the interest rate vector are described in section 3 of this educational note.
 - b. Liability movement equals PV of liabilities at t minus PV of liabilities at t-1.
 - c. For new business in the period, adjust for the difference between the inforce t-1 interest rate vector and valuation interest rates applicable to new business.
 - d. For unexpected liability movements (for example lapses and deaths), adjust for the difference between the inforce t-1 interest rate vector and valuation rates applicable at the time of these movements.
3. Add the realized capital gains and losses plus the change in unrealized capital gains and losses.
4. Remove any changes in asset values that do not affect policy liabilities. Examples include expected growth in stocks and real estate, and the expected runoff of unrealized gains or losses. The intent is to remove the changes in value that were anticipated in the interest rate vector. Accounting provisions for credit impairment would also be removed. To the extent that the provision is thought to be a good approximation to the foregone future cash flow on a bond, no further adjustment would be needed.
5. Add liability changes that are not captured by the fair value movement – possibilities include:
 - a. Movement in reinvestment rates – re-run CALM as of t-1 using actual reinvestment yields realized in the period t-1 to t and t reinvestment rates thereafter.
 - b. Capitalized impact of trades.
 - c. Credit rating changes.

- d. Proxy assets – effects from priced-for assets that have been delayed.
- e. Changes in: Future Tax Liability, IBNR, amounts on deposit, short-term group contracts, etc.

6. Adjust for any basis changes

The net result from following these steps produces the time t liability estimate. The validity of the estimate would be checked by doing a true CALM reserve as of time t shortly thereafter. This may also be step 1 for the time t+1 estimate.

A.2. Adjusted CALM

This method uses the results of a CALM valuation performed before the balance sheet date to establish assumptions for the balance sheet date liability calculation. Adjustments are then made to this calculation result to produce the final liability estimate. Typical adjustments include:

- 1. Adjust for changes in the yield curve. This can be done based on sensitivity analysis for small changes in the yield curve performed prior to the balance sheet date.
- 2. Adjust for changes in deferred gains/losses on Real Estate.
- 3. Adjust for changes in statement values of assets that were not reflected in step 1. Care needs to be taken for issues such as: asset purchases and sales, changes in credit quality.

A.3. Less detailed methods

These focus on one measure of how liabilities change and may only be appropriate for smaller or simpler blocks of liabilities and supporting assets.

Solve for a spread (j) at time t-1 such that:

$$\text{CALM liability} = \text{pv liability cash flows at t-1 spot rates} + j$$

$$\text{Then liability at time t} = \text{pv liability cash flows at t spot rates} + j$$

Solve for PPM-type interest vector at t-1 such that:

$$\text{CALM liability} = \text{pv t-1 liability cash flows}$$

$$\text{Then liability at time t} = \text{pv t liability cash flows} + \text{change in fair value of assets backing liabilities}$$

Determine C-3 provision at time t-1, in basis points, from CALM testing.

$$\text{Then liability at time t} = \text{statement value of assets}$$

$$+ \text{pv liability cash flows (including C-3)}$$

$$- \text{pv asset cash flows}$$