Educational Note

Guidance for the 2010 Valuation of Policy Liabilities of Life Insurers

Document 210080

Educational Note

Guidance for the 2010 Valuation of Policy Liabilities of Life Insurers

Committee on Life Insurance Financial Reporting

November 2010

Document 210080

Ce document est disponible en français
© 2010 Canadian Institute of Actuaries

Memorandum

To: Members in the Life Insurance Practice Area

From: Tyrone G. Faulds, Chair
Practice Council

B. Dale Mathews, Chair
Committee on Life Insurance Financial Reporting

Date: November 22, 2010

Subject: **Educational Note: Guidance for the 2010 Valuation of Policy Liabilities of Life Insurers**

Introduction

The purpose of this educational note is to provide guidance to actuaries in several areas affecting the valuation of the 2010 year-end policy liabilities of life insurers for Canadian Generally Accepted Accounting Principles (GAAP) purposes. The educational note provides an update on recently published experience studies. The guidance in this educational note represents a majority view of the members of the Committee on Life Insurance Financial Reporting (hereinafter referred to as CLIFR) of appropriate practice consistent with the Standards of Practice. This educational note has met the requirements of the Policy on Due Process for the Approval of Guidance Material Other than Standards of Practice. However, in accordance with that paper, this educational note is "not binding."

In accordance with the Canadian Institute of Actuary's Policy on Due Process for the Approval of Guidance Material other than Standards of Practice, this educational note has been prepared by CLIFR, and has received final approval for distribution by the Practice Council on November 16, 2010. 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 which 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."

Guidance to Members on Specific Situations

From time to time, CIA members seek advice or guidance from CLIFR. CLIFR strongly encourages such dialogue. CIA members would be assured that it is proper and appropriate for them to consult with the chair or vice-chair of CLIFR.

800-150 Metcalfe, Ottawa ON K2P 1P1
☎ 613.236.8196 📠 613.233.4552
secretariat@actuaries.ca / secretariat@actuaires.ca
actuaries.ca / actuaires.ca

CIA members are reminded that responses provided by CLIFR are intended to assist them in interpreting CIA Standards of Practice, educational notes and Rules of Professional Conduct, and in assessing the appropriateness of certain techniques or assumptions. A response from CLIFR does not constitute a formal opinion as to whether the work in question is in compliance with the CIA Standards of Practice. Guidance provided by CLIFR is not binding upon the member.

Recent Guidance

In September 2010, three documents related to mortality improvement were published:

> Exposure Draft for Revised Standards of Practice for the Valuation of Policy Liabilities: Life and Health (Accident and Sickness) Insurance (Subsection 2350) Relating to Mortality Improvement (210063)
> http://www.actuaries.ca/members/publications/2010/210063e.pdf

> Initial Communication of a Promulgation of Prescribed Mortality Improvement Rates Referenced in the Standards of Practice for the Valuation of Policy Liabilities: Life and Health (Accident and Sickness) Insurance (Subsection 2350) (210064)
> http://www.actuaries.ca/members/publications/2010/210064e.pdf

> Mortality Improvement Research Paper (210065)
> http://www.actuaries.ca/members/publications/2010/210065e.pdf

Any related changes to the Standards of Practice and to prescribed mortality improvement rates are not intended to be effective until October 15, 2011.

The following revisions to the Standards of Practice have been approved in the last 12 months.

> Exposure Draft – Changes to Standards of Practice – Practice-Specific Standards for Insurers – Section 2300 Valuation of Policy Liabilities: Life Insurance regarding Stochastic Modeling and Segregated Fund Valuation (December 2009)
> http://www.actuaries.ca/members/publications/2009/209137e.pdf

> Standards of Practice – Part 2000 Insurance to conform to the adoption of International Financial Reporting Standards (IFRS) as Canadian GAAP (November 2009)
> http://www.actuaries.ca/members/publications/2009/209117e.pdf

> Standards of Practice – Part 1000 General Standards to conform to the adoption of International Financial Reporting Standards (IFRS) as Canadian GAAP (November 2009)
> http://www.actuaries.ca/members/publications/2009/209116e.pdf

Recent CLIFR guidance includes the following material.

> Educational Note – Valuation of Group Life and Health Policy Liabilities (210034) (June 2010)
> http://www.actuaries.ca/members/publications/2010/210034e.pdf

> Educational Note – Calibration of Stochastic Interest Rate Models (209122) (December 2009)
> http://www.actuaries.ca/members/publications/2009/209122e.pdf

> Educational Note – Currency Risk in the Valuation of Policy Liabilities for Life and Health Insurers (209121) (December 2009)
> http://www.actuaries.ca/members/publications/2009/209121e.pdf

In addition, CLIFR expects to publish the following educational notes in the near future:

Educational Note – Valuation of Gross Liabilities and Reinsurance Recoverables – IFRS,

Educational Note – Investment Return Assumptions for Non-Fixed Income Assets,

Revision of the Educational Note on Future Income and Alternative Taxes,

Calibration of Stochastic Interest Rate Models Phase II, and

Revision of the (draft) Educational Note on Valuation of Universal Life Policy Liabilities.

For your convenience all of these publications can be found on the CIA website in the Members Section (Organization > Practice Council > Committees and Task Forces > Committee on Life Insurance Financial Reporting). A list of all the current educational notes and research papers can be found in appendix D.

Some guidance provided last year is still appropriate, and has been duplicated in this educational note. Other guidance has been modified, either to reflect recent developments or to improve clarity. The topics covered herein are:

TGF, BDM

1. Experience Studies *(new)*

The Research Committee has published the following studies.

Construction of CIA9704 Mortality Tables for Canadian Individual Insurance based on data from 1997 to 2004 (May 2010)
http://www.actuaries.ca/members/publications/2010/210028e.pdf

> This research paper describes the data and methodology used to construct the CIA9704 mortality tables based on Canadian Individual Insurance data for years 1997 to 2004. The following mortality tables were developed.
>
> i.   Aggregate, Select and Ultimate Tables,
>
> ii.   Male and Female Tables,
>
> iii.   Smokers, Non-Smokers and Aggregate Tables, and
>
> iv.   Age Nearest and Age Last Birthday Tables.

Canadian Individual Annuitant Mortality Experience Policy Years 2001 to 2004 (March 2009)
http://www.actuaries.ca/members/publications/2009/209024e.pdf

> The study reflects the experience of Canadian individual annuities. The policies included in the study are primarily policies in payout status, but in some cases experience during the deferred period has been included provided that the policy has no cash value and the policy cannot be changed.

Mortality Study – Canadian Standard Ordinary Life Experience 2007–2008 (August 2010)
http://www.actuaries.ca/members/publications/2010/210055e.pdf

Mortality Study – Canadian Standard Ordinary Life Experience 2006–2007 (August 2010)
http://www.actuaries.ca/members/publications/2010/210054e.pdf

> These annual reports submitted by the Individual Life Experience Subcommittee of the Research Committee detail the inter-company mortality experience for Canadian standard ordinary life insurance policies. These studies reflect the mortality experience of Canadian standard individual ordinary insurance issues studied between the 2006 to 2007 and 2007 to 2008 anniversaries respectively. The CIA 86–92 mortality tables were used to calculate the expected death claims for males and females and for smoker/non-smoker distinctions separately.

Mortality Study – Special report on the CIA9704 tables (October 2010)
http://www.actuaries.ca/members/publications/2010/210068e.pdf

> The special report submitted by the Individual Life Experience Subcommittee of the Research Committee details the inter-company mortality experience for Canadian standard ordinary life insurance policies between 2003 to 2008 anniversaries respectively. The CIA9704 mortality tables were used to calculate the expected death claims for males and females and for smoker/non-smoker distinctions separately.

Study on Canadian Group LTD Termination Experience (1988–1997) (January 2010, revised July 2010)

http://www.actuaires.ca/members/publications/2010/210002e_revised.pdf

> The July 2010 study is an update of the earlier termination study done by the Research Committee's Group Life & Health Experience Subcommittee. This study includes data from some additional insurers as well as data for the 1996 and 1997 years. The graduated tables that have been produced reflect the average experience for the 1988–1997 periods and do not include any margins. A number of tables are included, e.g.,
>
> i.   Disabled recovery (Québec/Non-Québec, unisex), and
>
> ii.   Disabled mortality (Québec/Non-Québec, gender specific).

2.   Insurance Mortality *(modified)*

In the Appointed Actuary's Report, the actuary is encouraged to document the best estimate mortality assumption (including any mortality improvement) and the level of MfAD, including the justification and support for such assumptions.

The actuary is encouraged to consider reflecting mortality improvement for the period between the mid-point of the experience studies and the valuation date. The current wording of paragraph 2350.06 of the Standards of Practice states that any reduction in policy liabilities related to insurance mortality improvement after the valuation date would be offset by a corresponding adjustment to the insurance mortality margin for adverse deviations (MfAD) after the valuation date.

Currently no guidance is provided with respect to levels of future mortality improvement.

On September 23, 2010, the Actuarial Standards Board published an Exposure Draft for Revised Standards of Practice for the Valuation of Policy Liabilities: Life and Health (Accident and Sickness) Insurance (Subsection 2350) Relating to Mortality Improvement (210063) and an Initial Communication of a Promulgation of Prescribed Mortality Improvement Rates Referenced in the Standards of Practice for the Valuation of Policy Liabilities: Life and Health (Accident and Sickness) Insurance (Subsection 2350) (210064). The comment period ends December 1, 2010.

With respect to insurance mortality, paragraph 2350.05.01 of the exposure draft of the Revised Standards of Practice states that "The actuary would consider the inclusion of mortality improvement (a secular trend toward lower mortality rates) in the best estimate assumption." Paragraph 2350.06 states further "If, at an appropriate level of aggregation, the inclusion of mortality improvement increases the insurance contract liabilities, then the actuary's assumption would include such improvement."

The proposal outlined in these documents incorporates a minimum policy liability basis with respect to the mortality improvement assumption for both insurance and annuity business. This basis will incorporate an explicit margin on the mortality improvement assumption. The range and level of the mortality rate margin for annuities will be reduced to reflect the introduction of this new additional margin related to annuity mortality improvement. The actuary is encouraged to become familiar with the contents of these draft documents, although they are not applicable for 2010 valuations. Specifically, the changes have a proposed effective date of October 15, 2011.

In addition, on September 23, 2010 CLIFR published a Mortality Improvement Research Paper (210065) that provides a rationale for the proposed insurance and annuity mortality improvement rates. This paper references the results of a research study commissioned in 2004 by CLIFR in concert with the Society of Actuaries (SOA). The final report of this study is available on the CIA

website under CLIFR > Documents > Other Documents or at the link http://www.soa.org/files/pdf/cia-mortality-rpt.pdf.

3. Annuity Mortality (*slightly modified*)

Note that, as stated in the previous section, the Actuarial Standards Board recently released a set of documents that include proposed changes to the Standards of Practice and to prescribed mortality improvement rates. In addition, the documents provide for the range and level of the mortality rate margin for annuities to be reduced to reflect the introduction of the new additional margin related to annuity mortality improvement.

The actuary is encouraged to become familiar with the contents of these draft documents, but is reminded that the draft changes have a proposed effective date of October 15, 2011, and would therefore not be applicable for 2010 valuations.

Therefore, the actuary is referred to the following previous guidance which is still in effect for 2010.

Results of the study commissioned in concert with the SOA indicated that the future mortality improvement rates from the AA Scale are more than likely to be insufficient in Canada and, therefore, for 2010, CLIFR continues to recommend using at least the AA Scale with a minimum improvement of 1.5% for attained ages up to 50, and 1% for attained ages between 51 and 80 as illustrated in appendix A.

Paragraph 1740.05 of the Standards of Practice states, "*The margin for adverse deviations in each assumption should reflect the uncertainty of that assumption and of any related data.*" The common practice in the industry is to apply the annuity mortality MfAD to the best estimate assumption, including the application of the improvement factors to the mortality table. The actuary is reminded that although the MfAD is only applied to the best estimate assumption, it is intended to cover the uncertainty associated with both misestimation risk and mortality improvement risk. In light of the recent annuity mortality improvement studies, the actuary is encouraged to review the appropriateness of the MfAD for annuity mortality.

For markets other than Canada, the improvement scale to be used in conjunction with annuitant mortality would be at least as conservative as the scale used in Canada unless experience indicates otherwise. For all jurisdictions, the use of higher rates of mortality improvement is appropriate if the experience indicates that higher rates are required.

4. Scenario Assumptions – Interest Rates (*slightly modified*)

The actuary is reminded that, according to paragraph 2330.30 of the Standards of Practice, "In addition to the prescribed scenarios, which would be common to the calculation of policy liabilities for all insurers, the actuary would also select other scenarios that would be appropriate to the circumstances of the case. If current rates are near or outside the limits of the prescribed ranges defined, then some scenarios would include rates that, in the near term, would be outside the prescribed ranges. The reasonableness of degrees of change of interest rates would be largely dependent on the period of time being considered. Other plausible scenarios would include parallel shifts up and down as well as flattening and steepening of the yield curve. The scenarios would include those in which the premiums for default risk, [or spreads,] range from 50% to 200% of the actual premiums at the balance sheet date." Further testing could also be done that would examine a cyclical approach to setting assumptions and margins.

In applying premiums for default risk in prescribed scenarios 7 and 8, the actuary may choose to adjust only the underlying risk-free rates, while maintaining the premium for default risk unchanged across these scenarios, since the scenarios examine shock movements to the underlying risk-free rates, without also shocking the spreads.

Derivation of risk-free lower and upper bounds used in the prescribed scenarios is based on moving averages of Canadian risk-free bonds. In the current environment, this approach generates declining lower and upper bounds from one reporting period to the next. For example, based on rates through June 2010 a lower bound of 4.5% is produced. If rates stay at current levels for a period of time, the lower bound will continue to decrease.

Paragraph 2330.09.1 of the Standards of Practice states that in the base scenario the "risk-free interest rates effective after the balance sheet date would be equal to the forward interest rates implied by the equilibrium risk free market curve at that date, for the first 20 years after the balance sheet date." In order to determine the 20-year forward rates out to year 20, a 40-year equilibrium risk-free curve is required. Risk-free interest rates are generally not observable in the market for very long terms (i.e., beyond 30 years) and are highly influenced by supply and demand toward the end of the observable horizon. It is, therefore, acceptable to retain the risk-free yield curve up to the point, in the long end (typically after 20 years) where the spot rate is at its peak ('the yield curve horizon'). Beyond the yield curve horizon, the actuary would assume a continuation of the last observed spot rate and calculate forward rates consistent with that assumption. An example of the process used to derive forward rates is presented in appendix B.

CLIFR has published Calibration of Stochastic Interest Rate Models Phase I which covers long-term risk-free rates. CLIFR encourages actuaries to review the educational note. Work on Phase II, calibration of short- and medium-term risk-free rates, is continuing but not expected to be completed for year-end 2010 valuations. Premiums for default risk and asset depreciation assumptions were not examined in the Phase I report. Work to establish calibration for default risk and asset depreciation has begun but is also not expected to be completed for year-end 2010 valuations.

In the context of stochastic testing, the Conditional Tail Expectation (CTE), CTE (60) to CTE (80) defines the range of policy liabilities (paragraph 2320.51 of the Standards of Practice). For products that are supported by investments in long-term risk-free assets, and therefore fit within the Phase I framework, it would be possible to utilize risk-free interest rate models in the valuation that satisfy the calibration criteria, and in that case, CTE (60) to CTE (80) of the stochastic results may be used as long as the resulting liability is greater than that obtained under the base scenario (see paragraph 2330.09.2 of the Standards of Practice).

For a product with policy liabilities that are sensitive to short- and medium-term interest rates, and any other situations that do not fit within the Phase I framework, and for interest rate models that do not satisfy the calibration criteria or that incorporate premiums for default risk, the actuary would perform scenario testing using the nine prescribed scenarios in addition to the testing performed on a stochastic basis and consider holding policy liabilities at least equal to the result under the worst prescribed scenario. The decision to establish a policy liability that is less than that required under the worst prescribed scenario would be supported by a clearly documented rationale (for example, by being able to demonstrate that the stochastic model satisfies the calibration criteria). In this context, the actuary would ensure that

the stochastic interest rate model, including any parameters required, is appropriately selected for use in determining policy liabilities for Canadian life insurance financial reporting purposes,

the range of stochastic scenarios encompasses the nine prescribed scenarios,

the model parameters are reviewed to confirm their appropriateness if the policy liabilities required under the worst prescribed scenario are greater than the policy liabilities at CTE (80), and

the policy liability is at least equal to the result under both the base scenario and prescribed scenario 9.

5.   Taxes: Harmonization of Sales Taxes and Implications of CICA Section 3855 Financial Instruments on Future Income and Alternative Taxes *(modified)*

CLIFR reminds the actuary of the following changes in sales taxes.

a.   Provincial sales taxes in Ontario and British Columbia have been harmonized with the Federal Goods and Services Tax (GST), with an effective date of July 1, 2010.

b.   Québec has announced modifications in its provincial sales tax rate. The provincial tax rate will increase from 7.5% to 8.5% on January 1, 2011 and to 9.5% on January 1, 2012.

c.   Nova Scotia has also announced modifications in its provincial sales tax rate. The provincial sales tax rate increased from 13% to 15% on July 1, 2010.

d.   Québec announced a temporary increase in compensatory tax on insurance premiums of 0.2% (from 0.35% to 0.55%) starting March 31, 2010 and ending on April 1, 2014.

The actuary would consider the implications of these changes in valuing liabilities. Examples include updating expense studies to reflect HST and the valuation of segregated funds where the cost of the guarantees may be increased as a result of lower fund values due to increased fees.

The introduction of accounting changes under the Canadian Institute of Chartered Accountants (CICA) section 3855 may have created additional tax timing differences for many insurers.

The related legislation, Bill C-10, received Royal Assent on March 12, 2009 and is now effective.

CLIFR reminds the actuary that the effect of changes in accounting standards would be determined as at the start of the first taxation year that begins after October 1, 2006 and that this change would be spread evenly over a five-year period starting at that point.

For more information on the implications of the revisions to Income Tax Legislation, the actuary is referred to

Educational Note – Implications of Proposed Revisions to Income Tax Legislation (November 7, 2007 Department of Finance Proposal) (January 2008) http://www.actuaries.ca/members/publications/2008/208004e.pdf

Educational Note – Implications of *CICA Handbook* Section 3855 – Financial Instruments on Future Income and Alternative Taxes: Update to Fall Letter (April 2007) http://www.actuaries.ca/members/publications/2007/207029e.pdf

The guidance contained in Educational Note – Guidance for the 2007 Valuation of Policy Liabilities of Life Insurers (October 2007) is withdrawn.
http://www.actuaries.ca/members/publications/2007/207088e.pdf

6.   Equity Returns (*unchanged*)

Paragraph 2340.11 of the Standards of Practice bounds the upper limit of the best estimate of investment return on a non-fixed income asset to a benchmark based on historical performance of assets of its class and characteristics.

CLIFR has investigated how to define the most appropriate historical period to determine the best estimate of investment return and has concluded that the longest possible period would be the most appropriate because the projection period for valuations is often very long and possibly even longer than the longest reliable historical period. This approach provides for a more stable projection. It runs over multiple shock periods and shocks will no doubt recur although in an unexpected fashion. An ideal historical period would also cover both increasing and decreasing interest rate periods.

In the Canadian market, data prior to 1956 are limited and do not provide the same market coverage as more recent data. So, as a practical consideration, and for the reasons cited above, CLIFR recommends using January 1956 to current year data as the historical period to establish the upper limit on the best estimate return for Canadian equities.

For other jurisdictions, the actuary would consider the quality and credibility of the historical return data, the relative sophistication of the economy during the period under study, and the correlation of the market in question with other global markets. For mature markets such as the United States, United Kingdom, Japan, and many countries in Western Europe, CLIFR recommends using a consistent historical period as that recommended above for Canadian equities.

For less stable or emerging markets, the availability of reliable historical data spanning a sufficiently long period is unlikely. In this case, the actuary would be cautioned against assuming that a significant risk premium over the risk-free interest rates in the base scenario can be earned on equity instruments. However, it would be reasonable to assume risk premiums higher than those observed in North American markets where the market in question has exhibited higher volatility and where a higher MfAD is assumed. In any event, the implied risk premium assumed by the actuary, reduced by the chosen MfAD, would not exceed the equivalent result assumed for Canadian equities (see appendix C).

The historical benchmark would be routinely updated at least annually, ideally at the end of the same month each year, to provide consistency in the determination of the historical benchmark return. The lag between the valuation date and calculation date would ideally be short and would not exceed 12 months in any event. A lag exceeding 12 months would not adequately recognize recent changes in market values, particularly during periods of economic downturns. Although the historical benchmark is based on returns for historical periods that typically exceed 50 years, the actuary should consider that the benchmark may change by over 100 bps during periods of sustained economic downturns such as experienced in the last 12 months.

When using deterministic scenarios, the historical benchmark return is the geometric average of historical returns over a sufficiently long period. It is appropriate to use the geometric mean rather than the arithmetic mean due to the asymmetric distribution of long-term returns.

Paragraph 2340.13 of the Standards of Practice sets the assumption that the change in value of non-fixed income assets as a percentage of market value of a diversified portfolio of North American common shares is 30%, and of any other portfolio is in the range of 25% to 40% depending on the relative volatility of the two portfolios. The economic downturn of the last 12 months has generally increased the volatility of the historical returns for most indexes. While the volatilities of historical returns generally remain comparable to those determined for previous years, the actuary would consider whether the relative volatilities are still appropriately reflected in the 25% to 40% range for the assumed change in value of non-fixed income assets for the valuation.

The actuary is reminded, however, that if the stochastic process is used to value segregated fund guarantees, then the actuary would ensure that the stochastic model returns meet the calibration criteria as specified in the March 2002 Report of the CIA Task Force on Segregated Fund Investment Guarantees that can be found on the CIA Members Site at http://www.actuaries.ca/members/publications/2002/202012e.pdf.

As noted earlier, CLIFR expects to publish an educational note, Investment Return Assumptions for Non-Fixed Income Assets, in the near future.

7.   International Financial Reporting Standards (IFRS) *(new)*

Phase 1 of IFRS will be effective in Canada for interim and financial statements relating to fiscal years starting on or after January 1, 2011. Changes have been approved to the Standards of Practice with this effective date.

One of the changes is that reinsurance recoverables are not to be offset against the related gross liability. In particular, the revised Standards of Practice include the following elements.

2140.01   *The actuary's <u>report</u> should describe*

> *the valuation and presentation of <u>policy liabilities</u> and <u>reinsurance</u> <u>recoverables</u> for the <u>insurer's</u> balance sheet and income statement,*
>
> *the actuary's opinion on the appropriateness of those liabilities and recoverables and on the fairness of their presentation,*

2140.16   The Appointed Actuary is:

> responsible for ensuring that the assumptions and methods for the valuation of policy liabilities [and reinsurance recoverables] are in accordance with accepted actuarial practice in Canada, applicable legislation, and associated regulations and directives; and
>
> required to provide an opinion on the appropriateness of the policy liabilities [net of reinsurance recoverables] at the balance sheet date to meet all policyholder obligations of [the Company].

The Standards of Practice do not provide guidance on the calculation method or assumptions for the gross liability and the reinsurance recoverables. In the near future, CLIFR expects to publish an educational note, Valuation of Gross Policy Liabilities and Reinsurance Recoverables, that will describe considerations in the valuation and presentation of these items. Note that the amounts of the net liabilities are not expected to change. The educational note will also contain a list of references to other relevant publications.

Phase II of IFRS 4 is intended to result in a single international standard for all insurance contracts. The date for the adoption of Phase II is not yet finalized, but the earliest possible date is January 1, 2013. In July 2010, the International Accounting Standards Board (IASB) issued its Exposure Draft on Insurance Contracts and invited comments to be submitted by November 30, 2010. The pertinent documents are,

IASB – Insurance Contracts, Exposure Draft (July 2010), and

IASB – Insurance Contracts, Basis for Conclusions Exposure Draft (July 2010).

8. Segregated Funds (*new*)

The report of the Task Force on Segregated Fund Liability and Capital Methodologies was published in August 2010 (210053). This task force had been established by the Practice Council in the fall of 2009 with the mandate of exploring alternate methodologies for the determination of policy liabilities and capital requirements for segregated fund guarantees. Following the recommendations of the task force, two working groups reporting to CLIFR have been set up in 2010.

The first working group will review the calibration criteria for investment returns, paying special attention to issues related to hedging, such as the uncertainty of future volatility.

The hedging of segregated fund guarantees has become a common practice in the industry. The practice for recognizing hedging in policy liabilities varies greatly across companies. Paragraph 2320.09 of the Standards of Practice states that, "The actuary would usually apply the Canadian asset liability method to policies in groups that reflect the insurer's asset-liability management practice for allocation of assets to liabilities and investment strategy." Paragraph 2330.05 of the Standards of Practice states that, "The investment strategy for each scenario would be consistent with the insurer's current investment policy."

The second working group will provide guidance on approximation methods to account for hedging in the policy liabilities, consistent with the above references, and will also develop guidance with respect to reflecting potential hedging weaknesses in policy liabilities. The guidance is felt to be needed to narrow the range of practice and to ensure that risks related to hedging are being reflected appropriately in liabilities.

The target date for these two working groups to complete their mandate is the second quarter of 2011.

Where a hedging program is reflected in the valuation of policy liabilities, potential weaknesses in the hedging strategy would be taken into account. Section 2.3 of the 2002 report of the Task Force on Segregated Fund Investment Guarantees provides a list of such risks, which is reproduced here for convenience.

Basis risk between the underlying segregated fund assets (typically mutual fund units) and the hedge positions (e.g., stock index futures and options).

Non-normal asset returns ("fat tails") and uncertain future realized volatility. This will be a particular issue if the hedging strategy depends mainly on linear instruments such as futures.

Uncertain future implied volatility. This will be an issue if the hedging strategy depends on future purchases of short-dated options.

Effect of bid-ask spreads and transaction costs.

Finite intervals between portfolio rebalancing.

Uncertain future interest rates.

Uncertain future correlations between different asset classes. This will be a particular issue if guarantees apply on a "family of funds" basis.

Liquidity risk, in that it may not be possible to rebalance quickly in volatile market conditions. However, extreme illiquidity is a risk that would more appropriately be covered by capital as opposed to policy liabilities.

As stated in the 2002 report, even very detailed modeling is unlikely to capture accurately all these potential risks, and PfADs would be established on a conservative basis. The two working groups mentioned above are expected to provide guidance on these issues.

Where a hedging program is in place, the 2007 educational note Consideration in the Valuation of Segregated Fund Products stated that negative policy liabilities after issue are allowed, but "subject to constraints on the amount of profit capitalized, consistent with an unhedged position". Some companies have interpreted this by allowing policy liabilities to be negative only to the extent that the gain from negative policy liabilities is offset by cumulative losses from the hedge assets. The Task Force on Segregated Fund Liability and Capital Methodologies invited the CIA to provide clarification on this issue. CLIFR's view is that the following approach, which does not depend on the past performance of hedge assets, is consistent with the aforementioned statement. For a new cohort, the fee income allocated to the guarantee at the time of issue would be adjusted such that the initial liability for the guarantee equal to or greater than zero. Once established at issue, the adjusted fee income would be kept constant throughout the remaining life of the cohort. In future periods, the fee income allocated to the guarantee would be that established at issue and the liability for the guarantee would be allowed to move freely up or down, without regard to cumulative gains and losses from the hedge assets. A numerical example is provided in section 7.2 of the report of the Task Force on Segregated Fund Liability and Capital Methodologies.

In the case of a company implementing a hedging program for an in-force block of business, the same principle as for new business would apply, i.e., fee income allocated to the guarantee would be such that the liability for the guarantee post hedging is equal to or greater than zero. In future periods, the fee income allocated to the guarantee would be that established at the inception of the hedging program.

In 2010, OSFI is expected to publish new calibration criteria for companies using an internal model to establish the capital requirements for segregated fund guarantees. The new criteria will apply to the calculation of the total balance sheet requirement for exposures written on or after January 1, 2011. CLIFR reminds the actuary that these calibration criteria apply to the determination of the total requirement only. With respect to the valuation of policy liabilities, the existing calibration criteria (as outlined in the 2002 report of the Task Force on Segregated Fund Investment Guarantees) will continue to apply until promulgation of calibration criteria by the Actuarial Standards Board becomes effective.
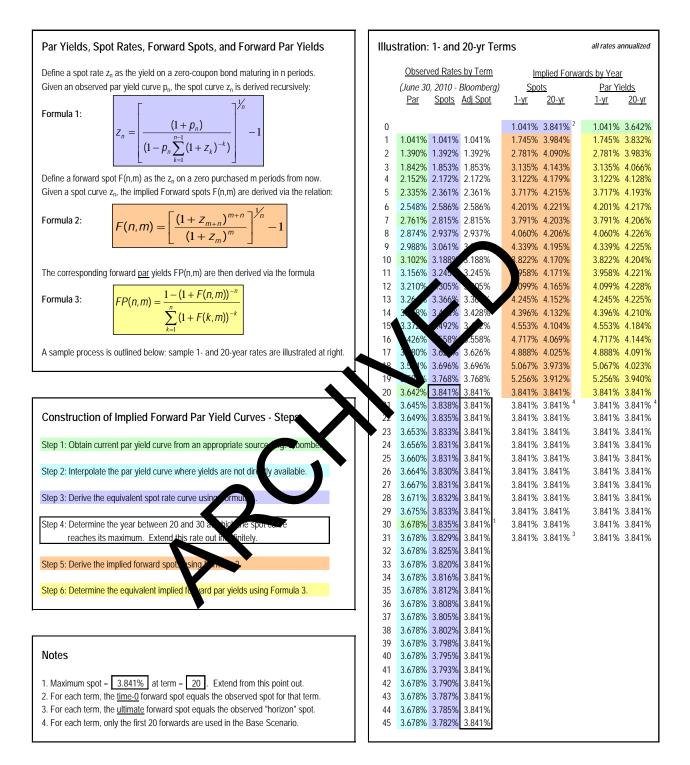
Appendix A: AA Scale Modification

Attained Age	AA Scale		AA Scale modified as per section 2		Attained Age	AA Scale		AA Scale modified as per section 2	
	Male	Female	Male	Female		Male	Female	Male	Female
1	0.020	0.020	0.020	0.020	51	0.019	0.016	0.019	0.016
2	0.020	0.020	0.020	0.020	52	0.020	0.014	0.020	0.014
3	0.020	0.020	0.020	0.020	53	0.020	0.012	0.020	0.012
4	0.020	0.020	0.020	0.020	54	0.020	0.010	0.020	0.010
5	0.020	0.020	0.020	0.020	55	0.019	0.008	0.019	**0.010**
6	0.020	0.020	0.020	0.020	56	0.018	0.006	0.018	**0.010**
7	0.020	0.020	0.020	0.020	57	0.017	0.005	0.017	**0.010**
8	0.020	0.020	0.020	0.020	58	0.016	0.005	0.016	**0.010**
9	0.020	0.020	0.020	0.020	59	0.016	0.005	0.016	**0.010**
10	0.020	0.020	0.020	0.020	60	0.016	0.005	0.016	**0.010**
11	0.020	0.020	0.020	0.020	61	0.015	0.005	0.015	**0.010**
12	0.020	0.020	0.020	0.020	62	0.015	0.005	0.015	**0.010**
13	0.020	0.020	0.020	0.020	63	0.014	0.005	0.014	**0.010**
14	0.019	0.018	0.019	0.018	64	0.014	0.005	0.014	**0.010**
15	0.019	0.016	0.019	0.016	65	0.014	0.005	0.014	**0.010**
16	0.019	0.015	0.019	0.015	66	0.013	0.005	0.013	**0.010**
17	0.019	0.014	0.019	**0.015**	67	0.013	0.005	0.013	**0.010**
18	0.019	0.014	0.019	**0.015**	68	0.014	0.005	0.014	**0.010**
19	0.019	0.015	0.019	0.015	69	0.014	0.005	0.014	**0.010**
20	0.019	0.016	0.019	0.016	70	0.015	0.005	0.015	**0.010**
21	0.018	0.017	0.018	0.017	71	0.015	0.006	0.015	**0.010**
22	0.017	0.017	0.017	0.017	72	0.015	0.006	0.015	**0.010**
23	0.015	0.016	0.015	0.016	73	0.015	0.007	0.015	**0.010**
24	0.013	0.015	**0.015**	0.015	74	0.015	0.007	0.015	**0.010**
25	0.010	0.014	**0.015**	**0.015**	75	0.014	0.008	0.014	**0.010**
26	0.006	0.012	**0.015**	**0.015**	76	0.014	0.008	0.014	**0.010**
27	0.005	0.012	**0.015**	**0.015**	77	0.013	0.007	0.013	**0.010**
28	0.005	0.012	**0.015**	**0.015**	78	0.012	0.007	0.012	**0.010**
29	0.005	0.012	**0.015**	**0.015**	79	0.011	0.007	0.011	**0.010**
30	0.005	0.010	**0.015**	**0.015**	80	0.010	0.007	0.010	**0.010**
31	0.005	0.008	**0.015**	**0.015**	81	0.009	0.007	0.009	0.007
32	0.005	0.008	**0.015**	**0.015**	82	0.008	0.007	0.008	0.007
33	0.005	0.009	**0.015**	**0.015**	83	0.008	0.007	0.008	0.007
34	0.005	0.010	**0.015**	**0.015**	84	0.007	0.007	0.007	0.007
35	0.005	0.011	**0.015**	**0.015**	85	0.007	0.006	0.007	0.006
36	0.005	0.012	**0.015**	**0.015**	86	0.007	0.005	0.007	0.005
37	0.005	0.013	**0.015**	**0.015**	87	0.006	0.004	0.006	0.004
38	0.006	0.014	**0.015**	**0.015**	88	0.005	0.004	0.005	0.004
39	0.007	0.015	**0.015**	0.015	89	0.005	0.003	0.005	0.003
40	0.008	0.015	**0.015**	0.015	90	0.004	0.003	0.004	0.003
41	0.009	0.015	**0.015**	0.015	91	0.004	0.003	0.004	0.003
42	0.010	0.015	**0.015**	0.015	92	0.003	0.003	0.003	0.003
43	0.011	0.015	**0.015**	0.015	93	0.003	0.002	0.003	0.002
44	0.012	0.015	**0.015**	0.015	94	0.003	0.002	0.003	0.002
45	0.013	0.016	**0.015**	0.016	95	0.002	0.002	0.002	0.002
46	0.014	0.017	**0.015**	0.017	96	0.002	0.002	0.002	0.002
47	0.015	0.018	0.015	0.018	97	0.002	0.001	0.002	0.001
48	0.016	0.018	0.016	0.018	98	0.001	0.001	0.001	0.001
49	0.017	0.018	0.017	0.018	99	0.001	0.001	0.001	0.001
50	0.018	0.017	0.018	0.017	100	0.001	0.001	0.001	0.001
					Over 100	0.000	0.000	0.000	0.000

14

Appendix B: Example of Scenario Assumptions – Interest Rates

Prescribed Interest Rate Scenarios

Scenario	Description
0	Base Interest Rate Scenario (forward rates based on the current yield curve grading to long term average)
1	Move to 90% of Current by Year 1; to Prescribed Minimums by Year 20
2	Move to 110% of Current by Year 1; to Prescribed Maximums by Year 20
3	Yield Curve Movements In Full Cycles (Up/Down/Up/Down/Up/Down)
4	Yield Curve Movements In Full Cycles (Down/Up/Down/Up/Down/Up)
5	Inversions and Yield Curve Movements In Full Cycles (Up/Down/Up/Down/Up/Down)
6	Inversions and Yield Curve Movements In Full Cycles (Down/Up/Down/Up/Down/Up)
7	Move to 90% of Scenario 0 by Year 1; 90% of Scenario 0 thereafter
8	Move to 110% of Scenario 0 by year 1; 110% of Scenario 0 thereafter
9	Current yield curve persists

Prescribed Ultimate and Minimum Long Rate - Sample Calculation

Calculation as of **June 30th, 2010**

SELECTED GOVERNMENT OF CANADA BENCHMARK LONG TERM (V12____) SEMI-ANNUAL BOND YIELDS - PERCENT

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000							5.55	5.51	5.67	5.61	5.51	5.56
2001	5.72	5.66	5.79	5.97		5.89	5.94	5.67	5.86	5.31	5.59	5.69
2002	5.68	5.69	5.98	5.92	5.78	5.74	5.73	5.58	5.43	5.63	5.58	5.42
2003	5.49	5.46	5.58	5.__	5.12	5.03	5.40	5.44	5.23	5.38	5.29	5.20
2004	5.23	5.09	5.04	5.__	5.3_	5.33	5.29	5.15	5.04	5.00	4.90	4.92
2005	4.74	4.76	4.77	4.5_	4.4_	4.29	4.31	4.12	4.21	4.37	4.18	4.02
2006	4.20	4.15	_.23	_.57	4.50	4.67	4.45	4.20	4.07	4.24	4.02	4.10
2007	4.22	4.09	_.21	4.2_	4.39	4.56	4.49	4.44	4.50	4.38	4.23	4.18
2008	4.19	4.18	3.9_	4.08	4.12	4.05	4.16	4.01	4.13	4.27	3.94	3.45
2009	3.72	3._	_.74	3.82	4.19	3.91	4.05	3.90	3.84	3.96	3.85	4.07
2010	3.96	4.05	_.07	4.04	3.68	3.65						

	s.a.	a.e.*	
120 Month Average - Effective Annual	4.76	4.82	* *Averages taken from annualized form of above rates.*
60 Month Average - Effective Annual	4.12	4.16	*e.g. Jun 2010 rate = (1+0.0365/2)^2 = 3.68%.*
Average of 2 Averages		4.49	
Rounded To Nearest 0.10		**4.50**	<= Base Scenario 40+ Rate
90% and Rounded To Nearest 0.10		**4.00**	<= Prescribed Scenario Long Term Minimum

Appendix B: Example of Scenario Assumptions – Interest Rates (cont'd)

Par Yields, Spot Rates, Forward Spots, and Forward Par Yields

Define a spot rate z_n as the yield on a zero-coupon bond maturing in n periods. Given an observed par yield curve p_n, the spot curve z_n is derived recursively:

Formula 1:
$$z_n = \left[\frac{(1+p_n)}{\left(1 - p_n \sum_{k=1}^{n-1} (1+z_k)^{-k}\right)} \right]^{\frac{1}{n}} - 1$$

Define a forward spot $F(n,m)$ as the z_n on a zero purchased m periods from now. Given a spot curve z_n, the implied Forward spots $F(n,m)$ are derived via the relation:

Formula 2:
$$F(n,m) = \left[\frac{(1+z_{m+n})^{m+n}}{(1+z_m)^m} \right]^{\frac{1}{n}} - 1$$

The corresponding forward <u>par</u> yields FP(n,m) are then derived via the formula

Formula 3:
$$FP(n,m) = \frac{1 - (1 + F(n,m))^{-n}}{\sum_{k=1}^{n} (1+F(k,m))^{-k}}$$

A sample process is outlined below; sample 1- and 20-year rates are illustrated at right.

Construction of Implied Forward Par Yield Curves - Steps

Step 1: Obtain current par yield curve from an appropriate source (e.g., Bloomberg).

Step 2: Interpolate the par yield curve where yields are not directly available.

Step 3: Derive the equivalent spot rate curve using Formula 1.

Step 4: Determine the year between 20 and 30 at which the spot curve reaches its maximum. Extend this rate out infinitely.

Step 5: Derive the implied forward spots using Formula 2.

Step 6: Determine the equivalent implied forward par yields using Formula 3.

Notes

1. Maximum spot = ⟨3.841%⟩ at term = ⟨20⟩. Extend from this point out.
2. For each term, the <u>time-0</u> forward spot equals the observed spot for that term.
3. For each term, the <u>ultimate</u> forward spot equals the observed "horizon" spot.
4. For each term, only the first 20 forwards are used in the Base Scenario.

Illustration: 1- and 20-yr Terms   *all rates annualized*

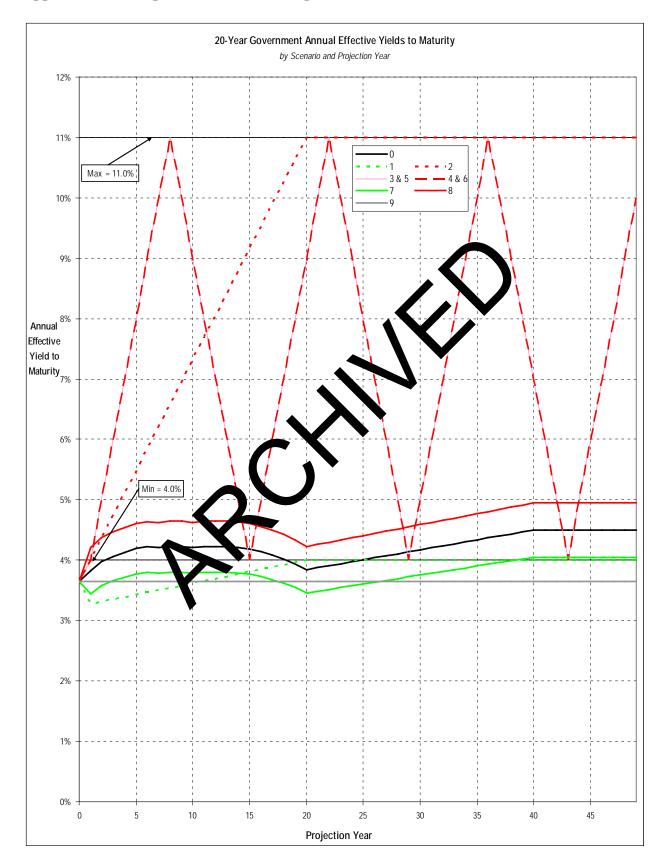|	Observed Rates by Term *(June 30, 2010 - Bloomberg)*			Implied Forwards by Year Spots		Par Yields	
	Par	Spots	Adj Spot	1-yr	20-yr	1-yr	20-yr
0				1.041%	3.841% [2]	1.041%	3.642%
1	1.041%	1.041%	1.041%	1.745%	3.984%	1.745%	3.832%
2	1.390%	1.392%	1.392%	2.781%	4.090%	2.781%	3.983%
3	1.842%	1.853%	1.853%	3.135%	4.143%	3.135%	4.066%
4	2.152%	2.172%	2.172%	3.122%	4.179%	3.122%	4.128%
5	2.335%	2.361%	2.361%	3.717%	4.215%	3.717%	4.193%
6	2.548%	2.586%	2.586%	4.201%	4.221%	4.201%	4.217%
7	2.761%	2.815%	2.815%	3.791%	4.203%	3.791%	4.206%
8	2.874%	2.937%	2.937%	4.060%	4.206%	4.060%	4.226%
9	2.988%	3.061%	3.061%	4.339%	4.195%	4.339%	4.225%
10	3.102%	3.188%	3.188%	3.822%	4.170%	3.822%	4.204%
11	3.156%	3.245%	3.245%	3.958%	4.171%	3.958%	4.221%
12	3.210%	3.305%	3.305%	4.099%	4.165%	4.099%	4.228%
13	3.260%	3.366%	3.366%	4.245%	4.152%	4.245%	4.225%
14	3.318%	3.428%	3.428%	4.396%	4.132%	4.396%	4.210%
15	3.372%	3.492%	3.492%	4.553%	4.104%	4.553%	4.184%
16	3.426%	3.558%	3.558%	4.717%	4.069%	4.717%	4.144%
17	3.480%	3.626%	3.626%	4.888%	4.025%	4.888%	4.091%
18	3.534%	3.696%	3.696%	5.067%	3.973%	5.067%	4.023%
19	3.588%	3.768%	3.768%	5.256%	3.912%	5.256%	3.940%
20	3.642%	3.841%	3.841%	3.841%	3.841%	3.841%	3.841%
21	3.645%	3.838%	3.841%	3.841%	3.841% [4]	3.841%	3.841% [4]
22	3.649%	3.835%	3.841%	3.841%	3.841%	3.841%	3.841%
23	3.653%	3.833%	3.841%	3.841%	3.841%	3.841%	3.841%
24	3.656%	3.831%	3.841%	3.841%	3.841%	3.841%	3.841%
25	3.660%	3.831%	3.841%	3.841%	3.841%	3.841%	3.841%
26	3.664%	3.830%	3.841%	3.841%	3.841%	3.841%	3.841%
27	3.667%	3.831%	3.841%	3.841%	3.841%	3.841%	3.841%
28	3.671%	3.832%	3.841%	3.841%	3.841%	3.841%	3.841%
29	3.675%	3.833%	3.841%	3.841%	3.841%	3.841%	3.841%
30	3.678%	3.835%	3.841% [1]	3.841%	3.841%	3.841%	3.841%
31	3.678%	3.829%	3.841%	3.841%	3.841% [3]	3.841%	3.841%
32	3.678%	3.825%	3.841%				
33	3.678%	3.820%	3.841%				
34	3.678%	3.816%	3.841%				
35	3.678%	3.812%	3.841%				
36	3.678%	3.808%	3.841%				
37	3.678%	3.805%	3.841%				
38	3.678%	3.802%	3.841%				
39	3.678%	3.798%	3.841%				
40	3.678%	3.795%	3.841%				
41	3.678%	3.793%	3.841%				
42	3.678%	3.790%	3.841%				
43	3.678%	3.787%	3.841%				
44	3.678%	3.785%	3.841%				
45	3.678%	3.782%	3.841%				

Appendix B: Example of Scenario Assumptions – Interest Rates (cont'd)

20-year Annual Effective Yields to Maturity
by Scenario and Projection Year

Legend	
= Observed 20-yr rate @ valuation date	
= Implied 20-yr forward par rates	
= Smoothly interpolated rates	
= Ultimate or nodal rate/spread	

Assumptions	a.e.
Observed 20-yr rate @ valn date:	3.642
Ultimate 20 Year Yield Rate:	4.50
Initial Spread:	0.50

Projection Yr (eoy)	Government Par Yield Curves (annualized)							Gross Spread over Governments					Gross Portfolio Par Yields (annualized)						
	0	1	2	4 & 6[1]	7	8	9	0	1-6	7	8	9	0	1	2	3-6	7	8	9
0	3.642	3.642	3.642	3.642	3.642	3.642	3.642	0.50	0.50	0.45	0.55	0.50	4.14	4.14	4.14	4.14	4.09	4.19	4.14
1	3.832	3.28	4.01	4.00	3.45	4.22	3.64	0.50	0.48	0.45	0.55	0.50	4.33	3.75	4.48	4.48	3.90	4.77	4.14
2	3.983	3.32	4.37	5.00	3.58	4.38	3.64	0.50	0.45	0.45	0.55	0.50	4.48	3.77	4.82	5.45	4.03	4.93	4.14
3	4.066	3.35	4.74	6.00	3.66	4.47	3.64	0.50	0.43	0.45	0.55	0.50	4.57	3.78	5.17	6.43	4.11	5.02	4.14
4	4.128	3.39	5.11	7.00	3.71	4.54	3.64	0.50	0.40	0.45	0.55	0.50	4.63	3.79	5.51	7.40	4.16	5.09	4.14
5	4.193	3.43	5.48	8.00	3.77	4.61	3.64	0.50	0.38	0.45	0.55	0.50	4.69	3.80	5.85	8.38	4.22	5.16	4.14
6	4.217	3.47	5.85	9.00	3.80	4.64	3.64	0.50	0.35	0.45	0.55	0.50	4.72	3.82	6.20	9.35	4.25	5.19	4.14
7	4.206	3.51	6.21	10.00	3.79	4.63	3.64	0.50	0.33	0.45	0.55	0.50	4.71	3.83	6.54	10.33	4.24	5.18	4.14
8	4.226	3.54	6.58	11.00	3.80	4.65	3.64	0.50	0.30	0.45	0.55	0.50	4.73	3.84	6.88	11.30	4.25	5.20	4.14
9	4.225	3.58	6.95	10.00	3.80	4.65	3.64	0.50	0.28	0.45	0.55	0.50	4.73	3.86	7.23	10.28	4.25	5.20	4.14
10	4.204	3.62	7.32	9.00	3.78	4.62	3.64	0.50	0.25	0.45	0.55	0.50	4.70	3.87	7.57	9.25	4.23	5.17	4.14
11	4.221	3.66	7.69	8.00	3.80	4.64	3.64	0.50	0.23	0.45	0.55	0.50	4.72	3.88	7.91	8.23	4.25	5.19	4.14
12	4.228	3.70	8.06	7.00	3.81	4.65	3.64	0.50	0.20	0.45	0.55	0.50	4.73	3.90	8.26	7.20	4.26	5.20	4.14
13	4.225	3.73	8.42	6.00	3.80	4.65	3.64	0.50	0.18	0.45	0.55	0.50	4.72	3.91	8.60	6.18	4.25	5.20	4.14
14	4.210	3.77	8.79	5.00	3.79	4.63	3.64	0.50	0.15	0.45	0.55	0.50	4.71	3.92	8.94	5.15	4.24	5.18	4.14
15	4.184	3.81	9.16	4.00	3.77	4.60	3.64	0.50	0.13	0.45	0.55	0.50	4.68	3.93	9.28	4.13	4.22	5.15	4.14
16	4.144	3.85	9.53	5.00	3.73	4.56	3.64	0.50	0.10	0.45	0.55	0.50	4.64	3.95	9.63	5.10	4.18	5.11	4.14
17	4.091	3.89	9.90	6.00	3.68	4.50	3.64	0.50	0.08	0.45	0.55	0.50	4.59	3.96	9.97	6.08	4.13	5.05	4.14
18	4.023	3.92	10.26	7.00	3.62	4.43	3.64	0.50	0.05	0.45	0.55	0.50	4.52	3.97	10.31	7.05	4.07	4.98	4.14
19	3.940	3.96	10.63	8.00	3.55	4.33	3.64	0.50	0.03	0.45	0.55	0.50	4.44	3.99	10.66	8.03	4.00	4.88	4.14
20	3.97	4.00	11.00	9.00	3.46	4.23	3.64	0.50	0.00	0.45	0.55	0.50	4.34	4.00	11.00	9.00	3.91	4.78	4.14
21	3.99	4.00	11.00	10.00	3.49	4.26	3.64	0.50	0.00	0.45	0.55	0.50	4.37	4.00	11.00	10.00	3.94	4.81	4.14
22	4.02	4.00	11.00	11.00	3.52	4.30	3.64	0.50	0.00	0.45	0.55	0.50	4.41	4.00	11.00	11.00	3.97	4.85	4.14
23	4.05	4.00	11.00	10.00	3.55	4.33	3.64	0.50	0.00	0.45	0.55	0.50	4.44	4.00	11.00	10.00	4.00	4.88	4.14
24	4.07	4.00	11.00	9.00	3.58	4.37	3.64	0.50	0.00	0.45	0.55	0.50	4.47	4.00	11.00	9.00	4.03	4.92	4.14
25	4.10	4.00	11.00	8.00	3.61	4.41	3.64	0.50	0.00	0.45	0.55	0.50	4.51	4.00	11.00	8.00	4.06	4.96	4.14
26	4.13	4.00	11.00	7.00	3.64	4.44	3.64	0.50	0.00	0.45	0.55	0.50	4.54	4.00	11.00	7.00	4.09	4.99	4.14
27	4.15	4.00	11.00	6.00	3.66	4.48	3.64	0.50	0.00	0.45	0.55	0.50	4.57	4.00	11.00	6.00	4.11	5.03	4.14
28	4.18	4.00	11.00	5.00	3.69	4.52	3.64	0.50	0.00	0.45	0.55	0.50	4.60	4.00	11.00	5.00	4.14	5.07	4.14
29	4.21	4.00	11.00	4.00	3.72	4.55	3.64	0.50	0.00	0.45	0.55	0.50	4.64	4.00	11.00	4.00	4.17	5.10	4.14
30	4.23	4.00	11.00	5.00	3.75	4.59	3.64	0.50	0.00	0.45	0.55	0.50	4.67	4.00	11.00	5.00	4.20	5.14	4.14
31	4.26	4.00	11.00	6.00	3.78	4.62	3.64	0.50	0.00	0.45	0.55	0.50	4.70	4.00	11.00	6.00	4.23	5.17	4.14
32	4.29	4.00	11.00	7.00	3.81	4.66	3.64	0.50	0.00	0.45	0.55	0.50	4.74	4.00	11.00	7.00	4.26	5.21	4.14
33	4.31	4.00	11.00	8.00	3.84	4.70	3.64	0.50	0.00	0.45	0.55	0.50	4.77	4.00	11.00	8.00	4.29	5.25	4.14
34	4.34	4.00	11.00	9.00	3.87	4.73	3.64	0.50	0.00	0.45	0.55	0.50	4.80	4.00	11.00	9.00	4.32	5.28	4.14
35	4.37	4.00	11.00	10.00	3.90	4.77	3.64	0.50	0.00	0.45	0.55	0.50	4.84	4.00	11.00	10.00	4.35	5.32	4.14
36	4.39	4.00	11.00	11.00	3.93	4.81	3.64	0.50	0.00	0.45	0.55	0.50	4.87	4.00	11.00	11.00	4.38	5.36	4.14
37	4.42	4.00	11.00	10.00	3.96	4.84	3.64	0.50	0.00	0.45	0.55	0.50	4.90	4.00	11.00	10.00	4.41	5.39	4.14
38	4.45	4.00	11.00	9.00	3.99	4.88	3.64	0.50	0.00	0.45	0.55	0.50	4.93	4.00	11.00	9.00	4.44	5.43	4.14
39	4.47	4.00	11.00	8.00	4.02	4.91	3.64	0.50	0.00	0.45	0.55	0.50	4.97	4.00	11.00	8.00	4.47	5.46	4.14
40	4.50	4.00	11.00	7.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	7.00	4.50	5.50	4.14
41	4.50	4.00	11.00	6.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	6.00	4.50	5.50	4.14
42	4.50	4.00	11.00	5.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	5.00	4.50	5.50	4.14
43	4.50	4.00	11.00	4.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	4.00	4.50	5.50	4.14
44	4.50	4.00	11.00	5.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	5.00	4.50	5.50	4.14
45	4.50	4.00	11.00	6.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	6.00	4.50	5.50	4.14
46	4.50	4.00	11.00	7.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	7.00	4.50	5.50	4.14
47	4.50	4.00	11.00	8.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	8.00	4.50	5.50	4.14
48	4.50	4.00	11.00	9.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	9.00	4.50	5.50	4.14
49	4.50	4.00	11.00	10.00	4.05	4.95	3.64	0.50	0.00	0.45	0.55	0.50	5.00	4.00	11.00	10.00	4.50	5.50	4.14

1. *Scenarios 3 & 5 are derived similarly - though the initial direction would be toward the* <u>maximum</u>. *In the above example, the year-1 rate would also be 4.00%.*

Appendix B: Example of Scenario Assumptions – Interest Rates (cont'd)

Appendix C: Example of Equity Returns for Emerging Markets

Data, Assumptions and Comments		

	Canada (50 yrs)	XYZ (20 yrs)
Historical return		
- capital growth (given)	9.50%	17.00%
- dividends (given)	2.50%	3.00%
Total	12.00%	20.00%
Risk-free rate (given)	4.00%	6.00%
Implied Spread:	8.00%	14.00%
Volatility (given - information only):	22%	37%
MfADs (given):		
- on dividends	10%	20%
- on capital growth	20%	20%
- shock (applied in year 5):	30%	40%

This exhibit illustrates how the actuary might test to ensure the best estimate assumption for equity returns for a geography with unreliable historical experience. Here, the actuary initially uses what data he has and chooses appropriate MfADs for dividend income and capital growth (including the shock at worst time per SOP 2340.13).

However, the resulting 'net' risk premium over risk-free rates is 4.22% compared to 2% for Canada. Recognizing this result to be inappropriate given the uncertainty around the data, he then reduces the best estimate capital growth assumption from 17% to 14.08%, which reduces the resulting net risk premium to 2%. Therefore, he should not use a capital growth assumption in excess of 14.08% for this market.

Test Projection											

	0	1	2	3	4	5	6	7	8	9	10
Canada											
Capital Growth		7.60%	7.60%	7.60%	7.60%	7.60%	7.60%	7.60%	7.60%	7.60%	7.60%
Dividends		2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%
Net Return (before shock)		9.85%	9.85%	9.85%	9.85%	9.85%	9.85%	9.85%	9.85%	9.85%	9.85%
Shock		0.00%	0.00%	0.00%	0.00%	-30.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cumulative (after shock)	1,000.00	1,098.50	1,206.70	1,325.56	1,456.13	1,119.69	1,229.98	1,351.13	1,484.22	1,630.42	1,791.01
Net Spread over Risk Free (incl. dividends)	2.00%										
XYZ (Initial, using unmodified empirical estimate of capital growth)											
Capital Growth		13.60%	13.60%	13.60%	13.60%	13.60%	13.60%	13.60%	13.60%	13.60%	13.60%
Dividends		2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%
Net Return (before shock)		16.00%	16.00%	16.00%	16.00%	16.00%	16.00%	16.00%	16.00%	16.00%	16.00%
Shock		0.00%	0.00%	0.00%	0.00%	-40.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cumulative (after shock)	1,000.00	1,160.00	1,345.60	1,560.90	1,810.64	1,260.20	1,461.84	1,695.73	1,967.05	2,281.78	2,646.86
Net Spread over Risk Free (incl. dividends)	4.22%										
XYZ (Revised)											
Revised b.e. capital growth assumption	14.08%										
Capital Growth		11.26%	11.26%	11.26%	11.26%	11.26%	11.26%	11.26%	11.26%	11.26%	11.26%
Dividends		2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%	2.40%
Net Return (before shock)		13.66%	13.66%	13.66%	13.66%	13.66%	13.66%	13.66%	13.66%	13.66%	13.66%
Shock		0.00%	0.00%	0.00%	0.00%	-40.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Cumulative (after shock)	1,000.00	1,136.60	1,291.87	1,468.34	1,668.92	1,138.14	1,293.61	1,470.32	1,671.17	1,899.45	2,158.92
Revised Net Spread over Risk Free (incl. dividends)	2.00%										

Appendix D: CIA Guidance

Accession Number	Title
210034	Valuation of Group Life and Health Policy Liabilities http://www.actuaries.ca/members/publications/2010/210034e.pdf
209122	Calibration of Stochastic Interest Rate Models http://www.actuaries.ca/members/publications/2009/209122e.pdf
209121	Currency Risk in the Valuation of Policy Liabilities for Life and Health Insurers http://www.actuaries.ca/members/publications/2009/209121e.pdf
208004	Implications of Proposed Revisions to Income Tax Legislation (Nov 1, 2007 Department of Finance Proposal) http://www.actuaries.ca/members/publications/2008/208004e.pdf
207109	Considerations in the Valuation of Segregated Fund Products http://www.actuaries.ca/members/publications/2007/207109e.pdf
207029	Implications of *CICA Handbook* Section 3855 – Financial Instruments on Future Income and Alternative Taxes: Update to Fall Letter http://www.actuaries.ca/members/publications/2007/207029e.pdf
206147	Use of Actuarial Judgment in Setting Assumptions and Margins for Adverse Deviations http://www.actuaries.ca/members/publications/2006/206147e.pdf
206134	Best Estimate Assumptions for Expenses http://www.actuaries.ca/members/publications/2006/206134e.pdf
206133	Approximations to Canadian Asset Liability Method (CALM) http://www.actuaries.ca/members/publications/2006/206133e.pdf
206132	Margins for Adverse Deviations http://www.actuaries.ca/members/publications/2006/206132e.pdf
206077	CALM Implications of AcSB Section 3855 Financial Instruments –

	Recognition and Measurement http://www.actuaries.ca/members/publications/2006/206077e.pdf
205111	Valuation of Segregated Fund Investment Guarantees (Revised) http://www.actuaries.ca/members/publications/2005/205111e.pdf
203106	Selection of Interest Rate Models http://www.actuaries.ca/members/publications/2003/203106e.pdf
203083	Aggregation and Allocation of Policy Liabilities http://www.actuaries.ca/members/publications/2003/203083e.pdf
202065	Future Income and Alternative Taxes http://www.actuaries.ca/members/publications/2002/202065e.pdf
202037	Expected Mortality: Fully Underwritten Canadian Individual Life Insurance Policies http://www.actuaries.ca/members/publications/2002/202037e.pdf
Accession Number	Draft Educational Notes
206148	Valuation of Universal Life Policy Liabilities http://www.actuaries.ca/members/publications/2006/206148e.pdf