Educational Note

Guidance for the 2008 Valuation of Policy Liabilities of Life Insurers

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Committee on Life Insurance Financial Reporting

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Memorandum

To: Members in the Life Insurance Practice Area

From: Jacques Tremblay, Chairperson
           Practice Council

           Tyrone G. Faulds, Chairperson
           Committee on Life Insurance Financial Reporting

Date: November 19, 2008

Subject: **Educational Note: Guidance for the 2008 Valuation of Policy Liabilities of Life Insurers**

The purpose of this educational note is to provide guidance to actuaries in several areas affecting the valuation of the 2008 year-end policy liabilities of life insurers for Canadian Generally Accepted Accounting Principles (GAAP) purposes. 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 (SOP). This educational note has met the requirements of the *Policy for 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 Institute's *Policy for 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 13, 2008. 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 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."

CLIFR expects to publish the following additional educational notes in the near future:

Currency Risk in the Valuation,

Revision of the note on Valuation of Universal Life Policy Liabilities,

Valuation of Group Life and Health Policy Liabilities, and

Long-Term Equity Returns.

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

The sections that covered these topics in previous years' fall guidance have been removed. Actuaries would refer to last year's guidance.

CLIFR also expects to publish a draft educational note in the near future on:

Calibration of Interest Rate Models.

Other recent CLIFR guidance includes,

Educational Note: Implications of Proposed Revisions to Income Tax Legislation (November 7, 2007 Department of Finance Proposal), January 2008 (208004),

Educational Note: Considerations in the Valuation of Segregated Fund Products, November 2007 (207109), and

Educational Note: Implications of *CICA Handbook* Section 3855 – Financial Instruments on Future Income and Alternative Taxes: Update to Fall Letter, April 2007 (207029).

In June 2008, two Notices of Intent were published,

Notice of Intent to Revise the Standards of Practice – Practice-Specific Standards for Insurers, Subsection 2320 – Term of the Liability (208050), and

Notice of Intent Regarding a Change to the Treatment of Secular Trends for Insurance and Annuitant Mortality in the Standards of Practice – Practice-Specific Standards for Insurers, Subsection 2350 Life and Health Insurance (208049).

Any resultant changes to the Standards of Practice are not intended to be effective until year-end 2009.

For your convenience all of these publications can be found on the CLIFR website in the Members Section (Organization/Practice Council/Committees and Task Forces/Committee on Life Insurance Financial Reporting).

In addition, the Research Committee intends to publish the 2004-2005 individual life mortality experience study before the end of the year.

On December 28, 2005, the Department of Finance published its backgrounder ("Finance Proposal") regarding changes in the taxation of financial institutions relating to the effects of the accounting changes under CICA Handbook Section 3855. On November 7, 2007, the Department of Finance followed up on this proposal by issuing draft revisions to the income tax legislation.

On July 14, 2008, the Minister of Finance released for consultation draft legislative proposals to implement the remaining tax measures from Budget 2008 along with several previously announced tax initiatives. The proposed changes to the taxation of financial institutions relating to the effects of the accounting changes under CICA Handbook Section 3855 are essentially unchanged from those issued in November 2007.

Further guidance in this regard is contained in Section 7.

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

The topics covered herein are,

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1. **Insurance Mortality (*unchanged*)**

Currently no guidance is provided with respect to levels of future mortality improvement. The Notice of Intent released on June 25, 2008 indicates that CLIFR intends to publish such guidance in early 2009.

CLIFR had also, in concert with the Society of Actuaries (SOA), commissioned a research study to help in this regard. Preliminary results of the SOA research were presented at the 2005 Seminar for the Appointed Actuary and are available on the CIA website at the following link: http://www.actuaries.ca/members/resources/meetings/pdf/aa/2005/PD-8-Hardy.pdf.

The final report has been completed and is also available on the CIA website under CLIFR/Documents/Other Documents or at the following link: http://www.soa.org/files/pdf/cia-mortality-rpt.pdf.

Please note, however, that the current wording of paragraph 2350.06 of the Standards of Practice states that any reduction in policy liabilities related to insurance mortality improvement would be offset by a corresponding adjustment to the insurance mortality margin for adverse deviations (MfAD).

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

2. **Annuity Mortality (*unchanged*)**

Paragraph 2350.11 of the Standards of Practice states, "It is prescribed that the actuary's best estimate includes a secular trend toward lower mortality rates as promulgated from time to time." Recent annuity mortality improvement studies have yielded significantly different and sometimes contradictory results. As such, the uncertainty around the mortality improvement assumption could be significant, particularly as the time period from the valuation date increases.

CLIFR has appointed a subcommittee to review the appropriateness of the mortality improvement scale AA. This scale is applicable to both individual and group annuitants. CLIFR has commissioned, in concert with the SOA, a research study to review mortality improvement rates. Results of the SOA research to date, indicate that the future mortality improvement rates from the AA Scale are more than likely to be insufficient in Canada and, therefore, for 2008 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. Note that, as stated in the Notice of Intent released on June 25, 2008, CLIFR intends to publish updated guidance in early 2009 but this guidance will not be applicable in 2008.

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 an 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.

3.   Scenario Assumptions – Interest Rates (*modified*)

Revisions were made to subsections 2320 and 2330 of the Standards of Practice in 2006. Modifications were made to the base scenario and seven prescribed scenarios and two more prescribed scenarios were added.

The actuary is reminded that, in addition to the nine prescribed scenarios, the actuary would select other scenarios including those in which the premiums for default risk range from 50% to 200% of the actual premiums at the balance sheet date. When spreads are wider than historical averages, which is currently the case, further testing could include changes to asset depreciation best estimate and/or margin assumptions.

Derivation of risk-free lower and upper bounds is based on moving averages of Canadian risk-free bonds.

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 are 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 up to year 20, 40 years of spot rates are 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 and has been updated from last year to provide a more detailed derivation of implied forward par yields.

CLIFR is concerned that the guidance on the selection of interest rate models for stochastic testing is limited[1] and that no calibration criteria have been established. This may result in an inappropriately wide range of practice. CLIFR is working on developing calibration criteria, with Phase I expected to be published in draft form in Fall 2008. Preliminary results of this work have been presented at the June 2007 CIA Annual Meeting, the September 2007 Seminar for the Appointed Actuary, the June 2008 CIA Annual Meeting, and the September 2008 Seminar for the Appointed Actuary (http://meetings.actuaries.ca/meetings/aa/2008/Presentations/PD-11%20-%20Bridel.ppt).

CLIFR would encourage actuaries to review these presentations. Phase I of the calibration criteria will provide full calibration of long-term, risk-free interest rates.

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[1]CLIFR recommends that the actuary be familiar with the educational note on the *Selection of Interest Rate Models* that was published in December 2003.

In the context of stochastic testing, the Conditional Tail Expectation, CTE (60) to CTE (80) defines the range of policy liabilities (paragraph 2320.51 of the Standards of Practice). Pending completion and adoption of final calibration criteria for long-term interest rates, and for short- and medium-term interest rates and situations that do not fit within the Phase I framework, the actuary would perform scenario testing using the nine prescribed scenarios in addition to the testing performed on a stochastic basis and consider holding actuarial liabilities at least equal to the result under the worst prescribed scenario.

The decision to establish a policy liability that is less than required under the worst prescribed scenario would be supported by a clearly documented rationale. In this context, the actuary would ensure the following:

> 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.

CLIFR also encourages the actuary to take into consideration the draft calibration criteria when developing this rationale.

4. Lapse Studies - Universal Life Level COI and Term to 100 *(modified slightly)*

The CIA published a study on the Lapse Experience under Universal Life Level COI Policies in October 2007. The scope of the study was limited to guaranteed Level COI and contains experience through the first ten policy durations. Multi-dimension tables are included in this updated study. The studies do not include analysis by UL-specific drivers (e.g., fund values, credited rates, interest environment).

Universal Life lapse-supported policies frequently exhibit some of the following characteristics:

> minimum funded policies,

> policies purchased for tax considerations,

> joint last-to-die,

> presence of persistency bonuses,

and may experience ultimate lapse rates similar to stand alone Term to 100 products.

A Term to 100 lapse study was also released in October 2007 reflecting experience through the first 25 policy durations. Multi-dimension tables were introduced in this study.

CLIFR suggests that the actuary review the degree of lapse support within its Universal Life and Term to 100 portfolios and assess the applicability of the CIA lapse studies on lapse-supported products.

5.   Value of Minimum Interest Guarantees and Embedded Options *(unchanged)*

With continuing low interest rates, it is suggested that actuaries assess and make appropriate provision for the potential cost of any minimum interest guarantees or other embedded economic options (e.g., guaranteed purchase options). These costs may not be captured appropriately in the deterministic base and prescribed scenarios within the Standards of Practice since these scenarios may continue to ascribe zero value to these features when, in reality, guarantees or options near to or in the money can have a substantial value. Stochastic modeling or option pricing techniques (stochastic or mathematical) could, therefore, ascribe material value to these features in the current interest environment.   While the actuary is not required to model these features stochastically, he or she would review the exposure to minimum interest guarantees and other embedded options in the business being valued and determine whether an increase in the policy liabilities is warranted.

6.   Considerations for Amounts on Deposit and Claims Provisions under CICA Section 3855 Financial Instruments (*unchanged*)

With the implementation of CICA Section 3855, concerns were raised with respect to the effect on liabilities for amounts on deposit and claims provisions, particularly if a company had been approximating the CALM liability by holding the amount expected to be paid without interest adjustment.

Paragraph 2320.01 of the Standards of Practice states that "*The actuary should calculate policy liabilities by the Canadian asset liability method.*"

Paragraph 2320.02 states that "*The amount of policy liabilities by that method for a particular scenario is equal to the amount of supporting assets at the balance sheet date which are forecasted to reduce to zero at the last liability cash flow in that scenario.*"

Feedback suggested that further guidance was needed with regard to the term over which liability cash flows should be projected for amounts on deposit and claims provisions. This would include considerations on determining when an element of a policy should be treated separately from the other elements (i.e., bifurcated).

Paragraph 2320.16 states that

"If an element of a policy operates independently of the other elements, then it would be treated as a separate policy with its own term of liabilities. Examples are

> a flexible premium deferred annuity where the interest guarantee and cash value attached to each premium are independent of those for the other premiums, and
>
> a certificate of voluntary non-contributory association or creditor group insurance."

Paragraphs 2320.17 to 2320.27 then follow with guidance on determining the term of the liability.

In CLIFR's view, important considerations in determining if an element of a policy operates independently of another include

> when risks on these elements are passed through to policyholders as part of the dividend policy they would not be considered as independent,

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approximation techniques (e.g., estimating the impact of the claims lag as the value of incurred but not reported claims at a point in time) do not drive the treatment of the cash flow,

treatment for accounting purposes does not drive the treatment of the cash flow, and

when the provision for a claim is the recognition of a lag on a claim payment normally valued within the base liability it would not generally be considered independent.

Specific examples are

dividends on deposit included in a closed par fund where any gain/loss is reflected in future dividends would not be considered independent. The term of the liability for these amounts would be the same as that of the related participating policies and the actuary would value the dividends on deposit as a component of the cash flows in the CALM valuation.

the term of the liability for medical and dental IBNRs would be close to zero, consistent with the term of the underlying contracts, and

the term of the liability for Group Long-Term Disability claims and their associated IBNRs would be longer, consistent with the expected timing of the claims terminations.

Because of the linkage under CALM between the value of the policy liabilities and the accounting value of the supporting assets, much of the period to period change in the accounting value of the assets under Section 3855 would be expected to be balanced by a corresponding change in the value of the liabilities, provided asset and liability cash flows are well matched and the held for trading designation is used.

Specific concerns have been raised with regard to situations where policy liabilities are determined to have a very short term, but management has chosen to invest longer. Under CALM valuation, this mismatch would be expected appropriately to result in a sensitivity of the surplus to changes in the interest rate environment and this result would be expected to continue under Section 3855 (i.e., the value of the policy liabilities would not respond completely to changes in the value of the underlying assets).

A final consideration relates to the balance sheet presentation of certain liabilities that have a mandated presentation in a separate line. Under these circumstances, the actuary would determine the appropriate CALM liability using the considerations outlined above. This liability would be presented by showing the mandated separate provision on the balance sheet with the balance of the CALM liability shown as part of the provisions for future policy benefits line in the balance sheet.

The following example is taken from Section 4.4 of the educational note *CALM Implications of AcSB Section 3855*.

"… suppose that the actuary has determined that the term of the liabilities for certain dividends on deposit is the same as the term of the liabilities for the related participating whole life insurance policies. The actuary would then value the dividends on deposit as a component of the cash flows of the participating policies making appropriate assumptions for credited interest, accumulated dividend withdrawals, and so forth. The end result following CALM testing would be the appropriate policy liability for the participating policies including provision for the dividends on deposit. The mandated presentation requirement would then result in the

accumulated value of the dividends on deposit being reported as a separate line item with the balance of the policy liability determined as above being reported as part of the provisions for future policy benefits line in the balance sheet."

7. Implications of CICA Section 3855 Financial Instruments on Future Income and Alternative Taxes *(modified)*

The introduction of accounting changes under CICA Section 3855 may have created additional tax timing differences for many insurers. In response to these accounting changes, the Department of Finance issued a press release and backgrounder ("Finance proposal") on December 28, 2006 regarding changes in the taxation of financial institutions to deal with the effect of accounting changes under CICA Section 3855. On November 7, 2007, the Department of Finance followed up on this proposal by issuing draft revisions to the Income Tax Legislation and on July 14, 2008 the Minister of Finance released for comment draft proposals which are essentially unchanged from those of November 2007. The comment period extended to September 15, 2008.

In most respects, this draft legislation was similar to the original December 28, 2006 proposal. One significant change, however, is the proposal to treat tracking property (which may include certain unit trusts and derivative instruments) as mark-to-market property.

As of the writing of this note the process of incorporating these proposals into a bill and having it passed in Parliament has not been completed. If, however, an organization's accountant and auditor agree, for purposes of determining the balance sheet tax provision, to treat the legislation as if it is substantively enacted, then CLIFR view is that the policy liabilities would be calculated consistent with this position.

Otherwise, the actuary is referred to

> Educational Note: Implications of Proposed Revisions to Income Tax Legislation (November 7, 2007 Department of Finance Proposal), January 2008 (208004), and

> Educational Note: Implications of CICA Handbook Section 3855 – Financial Instruments on Future Income and Alternative Taxes: Update to Fall Letter, April 2007 (207029).

The first of these notes states,

> "Under the current tax legislation, the accounting changes caused by CICA 3855 may result in additional tax temporary timing differences. The actuary would recognize that certain tax benefits arising from application of the current tax regulations (specifically those that are the subject of the draft legislation) may not be sustainable, and would exercise caution before reducing liabilities in respect of these benefits, relative to a pre-3855 environment."

The implication of the above guidance led to some insurers maintaining liabilities at the pre-3855 level. This guidance is now modified to

> CLIFR believes that if the liabilities currently held are higher than those calculated on the post-3855 basis on both the current and proposed tax bases then it would be appropriate to reflect the proposed tax revisions in the calculation of 2008 year-end policy liabilities. However, the actuary would not reduce liabilities relative to the liabilities that arise in a post-3855 environment in conjunction with current tax rules.

This guidance reflects the considerations of

  the amount of time which has passed since the initial backgrounder was issued,

  the consistency of the most recent draft revisions with those published in November 2007,

  the difficulty some insurers are having continuing to track liabilities on the pre-3855 basis, and

  the understanding that some insurers have filed their 2007 returns on the basis of the draft legislation as the Canada Revenue Agency has indicated that interest penalties would apply retroactively on this basis.

Appendix A: AA Scale Modification

Attained Age	AA Scale Male	AA Scale Female	AA Scale modified as per section 2 Male	AA Scale modified as per section 2 Female	Attained Age	AA Scale Male	AA Scale Female	AA Scale modified as per section 2 Male	AA Scale modified as per section 2 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

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, 2007**

SELECTED GOVERNMENT OF CANADA BENCHMARK **LONG-TERM (V122544) SEMI-ANNUAL** BOND YIELDS - PERCENT

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997							6.32	6.63	6.26	6.05	5.96	5.95
1998	5.81	5.78	5.70	5.76	5.61		5.61	5.83	5.32	5.45	5.47	5.23
1999	5.23	5.43	5.36	5.41	5.3	5.63	5.74	5.68	5.91	6.36	6.10	6.23
2000	6.27	5.83	5.84	5.9	5.63	5.61	5.55	5.51	5.67	5.61	5.51	5.56
2001	5.72	5.66	5.79	5.7	6.03	5.89	5.94	5.67	5.86	5.31	5.59	5.69
2002	5.68	5.69	5.98	5.	5.78	5.74	5.73	5.58	5.43	5.63	5.58	5.42
2003	5.49	5.46	5.58	5.41	5.1	5.03	5.40	5.44	5.23	5.38	5.29	5.20
2004	5.23	5.09	5.04	5.31	5.32	5.33	5.29	5.15	5.04	5.00	4.90	4.92
2005	4.74	4.76	4.7	4.59	4.46	4.29	4.31	4.12	4.21	4.37	4.18	4.02
2006	4.20	4.1	4.23	4.57	4.50	4.67	4.45	4.20	4.07	4.24	4.02	4.10
2007	4.22	4.0	4.21	4.20	4.39	4.56						

120 Month Average - Effective Annual*	5.36	* Averages taken from annualized form of above rates.
60 Month Average - Effective Annual	4.87	e.g. Jun 2007 rate = (1+0.0000/2)^2 = 0.05%.
Average of 2 Averages	5.12	
Rounded To Nearest 0.10	**5.10**	<= Base Scenario 40+ Rate
90% and Rounded To Nearest 0.10	**4.60**	<= 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:

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

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:

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

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 various data sources

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 indefinitely.

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 = 4.599% 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 | | | Implied Forwards by Year | | | |
| | | | | Spots | | Par Yields | |
	Par	Spots	Adj Spot	1-yr	20-yr	1-yr	20-yr
0				4.699%	4.599% [2]	4.699%	4.602%
1	4.699%	4.699%	4.699%	4.568%	4.594%	4.568%	4.594%
2	4.635%	4.634%	4.634%	4.670%	4.596%	4.670%	4.597%
3	4.646%	4.646%	4.646%	4.586%	4.592%	4.586%	4.591%
4	4.632%	4.631%	4.631%	4.511%	4.593%	4.511%	4.592%
5	4.610%	4.607%	4.607%	4.630%	4.597%	4.630%	4.598%
6	4.613%	4.611%	4.611%	4.637%	4.596%	4.637%	4.596%
7	4.616%	4.614%	4.614%	4.585%	4.594%	4.585%	4.593%
8	4.613%	4.611%	4.611%	4.577%	4.595%	4.577%	4.593%
9	4.609%	4.607%	4.607%	4.568%	4.596%	4.568%	4.595%
10	4.606%	4.603%	4.603%	4.600%	4.597%	4.600%	4.597%
11	4.606%	4.603%	4.603%	4.599%	4.597%	4.599%	4.597%
12	4.605%	4.603%	4.603%	4.598%	4.597%	4.598%	4.597%
13	4.605%	4.602%	4.602%	4.597%	4.597%	4.597%	4.597%
14	4.604%	4.602%	4.602%	4.596%	4.597%	4.596%	4.597%
15	4.604%	4.601%	4.601%	4.595%	4.597%	4.595%	4.597%
16	4.604%	4.601%	4.601%	4.594%	4.598%	4.594%	4.597%
17	4.603%	4.601%	4.601%	4.592%	4.598%	4.592%	4.597%
18	4.603%	4.600%	4.600%	4.591%	4.598%	4.591%	4.598%
19	4.602%	4.600%	4.600%	4.590%	4.599%	4.590%	4.598%
20	4.602%	4.599%	4.599%	4.599%	4.599% [3]	4.599%	4.599%
21	4.599%	4.594%	4.599% [1]	4.599%	4.599% [4]	4.599%	4.599% [4]
22	4.596%	4.589%	4.599%	4.599%	4.599%	4.599%	4.599%
23	4.593%	4.584%	4.599%	4.599%	4.599%	4.599%	4.599%
24	4.590%	4.579%	4.599%	4.599%	4.599%	4.599%	4.599%
25	4.587%	4.574%	4.599%	4.599%	4.599%	4.599%	4.599%
26	4.583%	4.569%	4.599%	4.599%	4.599%	4.599%	4.599%
27	4.580%	4.564%	4.599%	4.599%	4.599%	4.599%	4.599%
28	4.577%	4.558%	4.599%	4.599%	4.599%	4.599%	4.599%
29	4.574%	4.553%	4.599%	4.599%	4.599%	4.599%	4.599%
30	4.571%	4.547%	4.599%	4.599%	4.599%	4.599%	4.599%
31	4.571%	4.548%	4.599%	4.599%	4.599%	4.599%	4.599%
32	4.571%	4.548%	4.599%				
33	4.571%	4.549%	4.599%				
34	4.571%	4.550%	4.599%				
35	4.571%	4.550%	4.599%				
36	4.571%	4.551%	4.599%				
37	4.571%	4.552%	4.599%				
38	4.571%	4.552%	4.599%				
39	4.571%	4.553%	4.599%				
40	4.571%	4.553%	4.599%				
41	4.571%	4.553%	4.599%				
42	4.571%	4.554%	4.599%				
43	4.571%	4.554%	4.599%				
44	4.571%	4.555%	4.599%				
45	4.571%	4.555%	4.599%				

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

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

- = 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:	4.602
Ultimate 20 Year Yield Rate:	5.10
Initial Spread:	0.50

Projection Yr (eoy)	Government Par Yield Curves (annualized) 0	1	2	4 & 6[1]	7	8	9	Gross Spread over Governments 0	1-6	7	8	9	Gross Portfolio Par Yields (annualized) 0	1	2	3-6	7	8	9
0	4.602	4.602	4.602	4.602	4.602	4.602	4.602	0.50	0.50	0.45	0.55	0.50	5.10	5.10	5.10	5.10	5.05	5.15	5.10
1	4.59	4.14	5.06	4.60	4.13	5.05	4.60	0.50	0.48	0.45	0.55	0.50	5.09	4.62	5.54	6.08	4.58	5.60	5.10
2	4.60	4.17	5.41	5.60	4.14	5.06	4.60	0.50	0.45	0.45	0.55	0.50	5.10	4.62	5.86	7.05	4.59	5.61	5.10
3	4.59	4.19	5.75	6.60	4.13	5.05	4.60	0.50	0.43	0.45	0.55	0.50	5.09	4.62	6.18	8.03	4.58	5.60	5.10
4	4.59	4.21	6.09	7.60	4.13	5.05	4.60	0.50	0.40	0.45	0.55	0.50	5.09	4.61	6.49	9.00	4.58	5.60	5.10
5	4.60	4.24	6.44	8.60	4.14	5.06	4.60	0.50	0.38	0.45	0.55	0.50	5.10	4.61	6.81	9.98	4.59	5.61	5.10
6	4.60	4.26	6.78	9.60	4.14	5.06	4.60	0.50	0.35	0.45	0.55	0.50	5.10	4.61	7.13	10.95	4.59	5.61	5.10
7	4.59	4.29	7.13	10.60	4.13	5.05	4.60	0.50	0.33	0.45	0.55	0.50	5.09	4.61	7.45	11.93	4.58	5.60	5.10
8	4.59	4.31	7.47	11.60	4.13	5.05	4.60	0.50	0.30	0.45	0.55	0.50	5.09	4.61	7.77	10.90	4.58	5.60	5.10
9	4.59	4.33	7.81	10.60	4.14	5.05	4.60	0.50	0.28	0.45	0.55	0.50	5.09	4.61	8.09	9.88	4.59	5.60	5.10
10	4.60	4.36	8.16	9.60	4.14	5.06	4.60	0.50	0.25	0.45	0.55	0.50	5.10	4.61	8.41	8.85	4.59	5.61	5.10
11	4.60	4.38	8.50	8.60	4.14	5.06	4.60	0.50	0.23	0.45	0.55	0.50	5.10	4.60	8.73	7.83	4.59	5.61	5.10
12	4.60	4.41	8.85	7.60	4.14	5.06	4.60	0.50	0.20	0.45	0.55	0.50	5.10	4.60	9.05	6.80	4.59	5.61	5.10
13	4.60	4.43	9.19	6.60	4.14	5.06	4.60	0.50	0.18	0.45	0.55	0.50	5.10	4.60	9.37	5.78	4.59	5.61	5.10
14	4.60	4.46	9.54	5.60	4.14	5.06	4.60	0.50	0.15	0.45	0.55	0.50	5.10	4.61	9.69	4.75	4.59	5.61	5.10
15	4.60	4.48	9.88	4.60	4.14	5.06	4.60	0.50	0.13	0.45	0.55	0.50	5.10	4.60	10.00	5.73	4.59	5.61	5.10
16	4.60	4.50	10.22	5.60	4.14	5.06	4.60	0.50	0.10	0.45	0.55	0.50	5.10	4.60	10.32	6.70	4.59	5.61	5.10
17	4.60	4.53	10.57	6.60	4.14	5.06	4.60	0.50	0.08	0.45	0.55	0.50	5.10	4.60	10.64	7.68	4.59	5.61	5.10
18	4.60	4.55	10.91	7.60	4.14	5.06	4.60	0.50	0.05	0.45	0.55	0.50	5.10	4.60	10.96	8.65	4.59	5.61	5.10
19	4.60	4.58	11.26	8.60	4.14	5.06	4.60	0.50	0.03	0.45	0.55	0.50	5.10	4.60	11.28	9.63	4.59	5.61	5.10
20	4.62	4.60	11.60	9.60	4.14	5.06	4.60	0.50	0.00	0.45	0.55	0.50	5.10	4.60	11.60	10.60	4.59	5.61	5.10
21	4.65	4.60	11.60	10.60	4.16	5.09	4.60	0.50	0.00	0.45	0.55	0.50	5.12	4.60	11.60	11.60	4.61	5.64	5.10
22	4.67	4.60	11.60	11.60	4.18	5.11	4.60	0.50	0.00	0.45	0.55	0.50	5.15	4.60	11.60	10.60	4.63	5.66	5.10
23	4.69	4.60	11.60	10.60	4.21	5.14	4.60	0.50	0.00	0.45	0.55	0.50	5.17	4.60	11.60	9.60	4.66	5.69	5.10
24	4.72	4.60	11.60	9.60	4.23	5.17	4.60	0.50	0.00	0.45	0.55	0.50	5.20	4.60	11.60	8.60	4.68	5.72	5.10
25	4.74	4.60	11.60	8.60	4.25	5.20	4.60	0.50	0.00	0.45	0.55	0.50	5.22	4.60	11.60	7.60	4.70	5.75	5.10
26	4.77	4.60	11.60	7.60	4.27	5.22	4.60	0.50	0.00	0.45	0.55	0.50	5.25	4.60	11.60	6.60	4.72	5.77	5.10
27	4.79	4.60	11.60	6.60	4.30	5.25	4.60	0.50	0.00	0.45	0.55	0.50	5.27	4.60	11.60	5.60	4.75	5.80	5.10
28	4.81	4.60	11.60	5.60	4.32	5.28	4.60	0.50	0.00	0.45	0.55	0.50	5.30	4.60	11.60	4.60	4.77	5.83	5.10
29	4.84	4.60	11.60	4.60	4.34	5.31	4.60	0.50	0.00	0.45	0.55	0.50	5.32	4.60	11.60	5.60	4.79	5.86	5.10
30	4.86	4.60	11.60	5.60	4.36	5.33	4.60	0.50	0.00	0.45	0.55	0.50	5.35	4.60	11.60	6.60	4.81	5.88	5.10
31	4.89	4.60	11.60	6.60	4.39	5.36	4.60	0.50	0.00	0.45	0.55	0.50	5.37	4.60	11.60	7.60	4.84	5.91	5.10
32	4.91	4.60	11.60	7.60	4.41	5.39	4.60	0.50	0.00	0.45	0.55	0.50	5.40	4.60	11.60	8.60	4.86	5.94	5.10
33	4.93	4.60	11.60	8.60	4.43	5.42	4.60	0.50	0.00	0.45	0.55	0.50	5.42	4.60	11.60	9.60	4.88	5.97	5.10
34	4.96	4.60	11.60	9.60	4.46	5.44	4.60	0.50	0.00	0.45	0.55	0.50	5.45	4.60	11.60	10.60	4.90	5.99	5.10
35	4.98	4.60	11.60	10.60	4.48	5.47	4.60	0.50	0.00	0.45	0.55	0.50	5.47	4.60	11.60	11.60	4.93	6.02	5.10
36	5.00	4.60	11.60	11.60	4.50	5.50	4.60	0.50	0.00	0.45	0.55	0.50	5.50	4.60	11.60	10.60	4.95	6.05	5.10
37	5.03	4.60	11.60	10.60	4.52	5.53	4.60	0.50	0.00	0.45	0.55	0.50	5.52	4.60	11.60	9.60	4.97	6.08	5.10
38	5.05	4.60	11.60	9.60	4.54	5.55	4.60	0.50	0.00	0.45	0.55	0.50	5.55	4.60	11.60	8.60	4.99	6.10	5.10
39	5.08	4.60	11.60	8.60	4.57	5.58	4.60	0.50	0.00	0.45	0.55	0.50	5.57	4.60	11.60	7.60	5.02	6.13	5.10
40	5.10	4.60	11.60	7.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	6.60	5.04	6.16	5.10
41	5.10	4.60	11.60	6.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	5.60	5.04	6.16	5.10
42	5.10	4.60	11.60	5.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	4.60	5.04	6.16	5.10
43	5.10	4.60	11.60	4.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	5.60	5.04	6.16	5.10
44	5.10	4.60	11.60	5.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	6.60	5.04	6.16	5.10
45	5.10	4.60	11.60	6.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	7.60	5.04	6.16	5.10
46	5.10	4.60	11.60	7.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	8.60	5.04	6.16	5.10
47	5.10	4.60	11.60	8.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	9.60	5.04	6.16	5.10
48	5.10	4.60	11.60	9.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	10.60	5.04	6.16	5.10
49	5.10	4.60	11.60	10.60	4.59	5.61	4.60	0.50	0.00	0.45	0.55	0.50	5.60	4.60	11.60	11.60	5.04	6.16	5.10

1. Scenarios 3 & 5 are derived similarly - though the initial direction would be toward the maximum. In the above example, the year-1 rate would be 5.60%.

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

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