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Educational Note

Valuation of Universal Life Insurance Contract Liabilities

Committee on Life Insurance Financial Reporting

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Members should be familiar with Educational Notes. Educational Notes describe but do not recommend practice in illustrative situations. They do not constitute Standards of Practice and are, therefore, not binding. They are, however, intended to illustrate the application (but not necessarily the only application) of the Standards of Practice, so there should be no conflict between them. They are intended to assist actuaries in applying Standards of Practice in respect of specific matters. Responsibility for the manner of application of Standards of Practice in specific circumstances remains that of the members in the life insurance practice area

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Memorandum

To: Members in the Life Insurance Practice Area

From: Phil Rivard, Chair
Practice Council

Edward Gibson, Chair
Committee on Life Insurance Financial Reporting

Date: February 28, 2012

Subject: **Educational Note – Valuation of Universal Life Insurance Contract Liabilities**

The Committee on Life Insurance Financial Reporting (CLIFR) has developed the attached Educational Note – Valuation of Universal Life Insurance Contract Liabilities. This Educational Note presents considerations and examples of the application of the Standards of Practice (SOP) to the valuation of Universal Life (UL) insurance contract liabilities in Canadian financial statements prepared in accordance with Generally Accepted Accounting Principles (GAAP).

The guidance in this Educational Note represents a majority view of the members of CLIFR with respect to appropriate practice consistent with the Standards of Practice. This Educational Note has met the requirements of Due Process for Approval of Practice-Related Material other than Standards of Practice. However, in accordance with paragraph 1220.04 of the Standards of Practice, this note is "not binding." It received final approval for distribution by the Practice Council on October 13, 2011.

As outlined in subsection 1220 of the Standards of Practice, the "*actuary should be familiar with relevant Educational Notes and other designated educational material*," considering that a practice described "for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation."

I would like to thank the members of CLIFR who were primarily responsible for the development of this Educational Note: David Gourlay, Ralph Ovsec, Hélène Pouliot, Les Rehbeli, Nazir Valani and Anne Vincent.

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1. INTRODUCTION

This Educational Note presents considerations and examples of the application of the Standards of Practice to the valuation of Universal Life (UL) insurance contract liabilities for Canadian financial statements prepared in accordance with Generally Accepted Accounting Principles (GAAP).

Universal Life (UL) is the generic name given to a plan of insurance where premiums are deposited into one or more funds and charges for insurance and expenses are deducted from these funds. The timing of premium payments may be fixed or variable and is not necessarily related to the timing of the deduction of insurance and expense charges.

2. VALUATION METHOD

2.1 General Approach to Valuation

The Canadian Asset Liability Method (CALM) of valuation (as defined in paragraph 2320.02 of the Standards of Practice) combines the projected liability cash flows and the projected asset cash flows for the policies being valued to calculate a liability in the aggregate for those policies. This section provides guidance on the application of CALM with respect to some elements that are particular or important to the valuation of UL. The appendix illustrates a step-by-step approach that could be followed in calculating the insurance contract liabilities.

The valuation of UL can be particularly complex because it may involve a significant amount of scenario testing and because of the possible inter-relationship of some assumptions with policy components.

The degree of risk transfer allowed for in the design of UL is important to the valuation. At one extreme, a UL policy could transfer no risk to the policy owner and be similar, for valuation purposes, to a fully guaranteed non-participating policy. At the other extreme, it could transfer all of the risk to the policy owner and be similar, for valuation purposes, to a traditional participating policy. Most UL policies will fall somewhere between these two extremes.

This paper covers the whole range of possible factors and considerations for valuing UL, some of which will be important to a specific UL segment being valued and some of which will not. The valuation planning process for UL is particularly important (i.e., identifying issues and priorities correctly and concentrating on these facets of the valuation in designing the valuation practice). The appendices describe possible processes for developing the valuation of a UL product, many of the steps of which apply to all valuations but some of which are more important or unique to UL. Whether or not this step-by-step process is followed, the key is to develop the methodology and process carefully, focusing on the material elements that create the most risk/exposure for the company. The segmentation of UL into relatively homogeneous sub-segments is a particularly important judgment-based decision that would be supported by appropriate scenario testing and analysis.

2.2 Term of the Liability

Generally, the term of a UL insurance contract liability is the maturity date of the contract unless, in the opinion of the actuary, the contract is substantially a deferred annuity or

deposit contract rather than a life insurance contract. Examples of deposit contracts would include single premium contracts or highly funded contracts with minimal insurance. In these cases, the term of the liability, as stated in paragraph 2320.22 of the Standards of Practice, is determined as for a deferred annuity or deposit contract.

2.3 Needed Assumptions

In addition to the economic and non-economic actuarial assumptions, the actuary makes an assumption, for valuation purposes, about each projected variable policy component. It is important to identify and understand all variable elements that require assumptions. Specific considerations for setting these assumptions are described in sections 4 and 5 below.

Generally, the actuary would consider, in addition to company and industry experience, policy owner reasonable expectations, policy pass-through features and policy owner behaviour. The actuary would use sensitivity testing to understand which assumptions are most significant and to understand the inter-relationships of the various assumptions and policy elements, including investment returns.

Under subsections 2340 and 2350 of the Standards of Practice, each assumption requires a Margin for Adverse Deviations (MfAD). Considerations for determining MfADs, specific to UL, are described in section 7 below.

Due to the interrelationship of many of the assumptions, the actuary would consider whether the chosen assumptions are each independently reasonable and also whether they are appropriate in the aggregate.

Paragraph 1720.01 of the Standards of Practice states: "*The assumptions that the actuary selects or for which the actuary takes responsibility, other than alternative assumptions selected for the purpose of sensitivity testing, should be appropriate in the aggregate. These assumptions should also be independently reasonable unless the selection of assumptions that are not independently reasonable can be justified*."

2.4 Policy Owner Reasonable Expectations

The application of the CALM to UL policies has many elements in common with its application to participating insurance or to adjustable non-participating contracts. An important concept in the valuation of such policies is that the liabilities make a provision for the policy owners' reasonable expectations with respect to guaranteed benefits, non-guaranteed benefits, premiums, charges, and credited rates.[1]

When the policy elements are fixed by contract, the actuary need only consider whether representations, sales or administrative practices may have created policy owner reasonable expectations that augment the insurer's contractual obligations. When policy elements are not fixed, several factors may serve as a guide to the actuary in selecting the assumed policy elements. One is to consider the insurer's policy, if any, for the adjustment of policy elements. Another is to consider the insurer's past practice with respect to adjusting policy elements. The actuary would also consider what representations and communications (e.g., the sales policy illustrations) have been made to policy owners with respect to the adjustment of those policy elements.

[1] Additional guidance on policy owners' reasonable expectations can be found in paragraphs 2320.28 to 2320.34 of the Standards of Practice.

If the insurer makes a change that would alter policy owners' reasonable expectations, the actuary would consider whether or not the change was appropriately communicated to the policy owners before reflecting it in his or her valuation. If the insurer decides to change the way it sets non-guaranteed factors of the policy in favour of the policy owners (i.e., improves the policy's performance), this will be readily accepted by policy owners and would be fully reflected in the valuation, resulting in an increase in liabilities. The same is not necessarily true in the converse situation and the actuary would apply judgment before reducing liabilities.

If there are deviations from its past practice or policy in the insurer's current practice with respect to adjusting policy elements, the actuary would inquire as to whether the insurer plans to restore practice consistent with its policy. If so, the actuary would set assumed policy elements that reflect management's plan, including the time that will be required to implement it. If not, the actuary would consider whether expectations reasonably have been created that the insurer has, in fact, modified its policy, and, if so, how, and would set the policy elements accordingly.

2.5 Policy Owner Behaviour

Some UL policies offer great flexibility to their policy owners and, as a result, various elements of UL policies may be chosen or modified by the policy owners subject to the limitations of the contracts. Examples of such flexible features include amount of premium and frequency of payments, increase and decrease in face amount levels, selection of policy fund accounts, transfer of funds between accounts, and partial withdrawals. The actuary would consider the extent to which these flexible elements affect the valuation. For example, if all investment options produce the same spread (the difference between the assumed investment rate and the policy owners' credited rate) for the insurer, then assumptions such as fund transfers or asset mix become less important, unless there are significant minimum guarantees. This is discussed in more detail below in section 4.5.

In applying the CALM, the actuary would consider the flexible elements of the product and takes them into consideration in the valuation. Policy owner behaviour may be reflected explicitly as a separate assumption (e.g., premium persistency), as an addition to an existing assumption (e.g., partial withdrawal included in withdrawal assumption) or implicitly (e.g., use of more conservative assumptions).

Consistent with policy owners' reasonable expectations, choices that are currently available to the policy owners would generally be assumed to be available in the future. The actuary would be careful, however, in assuming that current behaviour is indicative of long-term behaviour.

When setting assumptions affected by policy owner behaviour, the actuary would assume that policy owners generally act in their best interests unless evidence exists to the contrary. This is not necessarily the same action or behaviour that most negatively impacts the insurer. It may also, in certain situations, be appropriate to assume some inertia from the policy owners because not all policy owners have the knowledge or the motivation to react appropriately in their own favour. Some examples of policy owner behaviour considerations are provided in section 4.

The actuary would use the best estimate assumption for each aspect of policyholder behaviour, revised from time to time with any supporting evidence. Where possible, the actuary would use historical experience to set the assumption, and would apply judgment where such experience is not available. The actuary would test the sensitivity of the liability to changes in these assumptions and use this sensitivity as a guide to establish an appropriate MfAD. In general, circumstances where there is less certainty would lead to the use of larger MfADs.

In selecting assumptions affected by policy owner actions, a reasonable grouping of policies could be made. The grouping would apply to products with similar policy owner behaviour. Considerations to take into account when grouping policies can be found in the Educational Note, Aggregation and Allocation of Policy Liabilities.

2.6 Projected Cash Flows

Projection of UL policy features may be complex (e.g., several investment accounts, flexible premiums, bonuses and options). The actuary would be familiar with all policy features and would test that the valuation system accurately reflects them in the projected cash flows. The actuary would also test that the projected cash flows adequately reflect the impact of the different economic scenarios and related changes to assumptions and policy components.

2.7 Modelled Cash Flows

The actuary may choose to use a model office approach instead of a policy-by-policy calculation for a number of reasons (such as complexity of the product or limitations on available resources). The use of a model does not change the underlying valuation process and calculation approach.

Care would be taken such that the model office approach would give results that do not differ materially from the policy-by-policy approach. Therefore, the construction of the model would take into account any policy owner behaviour and expectations (e.g., lapse rates on minimally funded policies vs. lapse rates on maximally funded policies) that would materially affect the amount of the liability. The actuary would also take care where product features such as bonus interest credits that are contingent on the amount of premiums paid or the size of the policy owner funds may result in a material difference in the amount of the liability when modelled as compared to policy-by-policy.[2]

2.8 Approximate Methods

The valuation of UL policies may be very complex because of the large number of assumptions required and the inter-relationships among those assumptions. As a result, many actuaries would choose to use approximate methods.

As per subsection 1510 of the Standards of Practice, the actuary would justify the use of any approximation such that it would be appropriate and does not materially affect the amount of the insurance contract liabilities. For UL, it is generally more difficult to justify the use of an approximation when there are material differences between

[2] If a model assumes that all policies are average funded, bonus interest credits dependent on fund size may not apply. If the actual in force is made up of some maximum funded policies and some minimum funded policies, then it is quite likely that the maximum funded policies will make up most of the total policy owner funds and that they will receive the bonus interest credits.

experience and the reflection of that experience in policy components (i.e., if the policy does not pass through experience gains or losses, or does so in a limited way).

3. ECONOMIC ASSUMPTIONS

3.1 General

Expected assumptions for investments, asset defaults, reinvestment strategies, and inflation are required as they are for the valuation of any life insurance policy. This section sets out special considerations that need to be taken into account when determining the expected economic assumptions for UL policies under CALM.

Policy owner behaviour with respect to the investment account options under UL contracts may be complex to model. A UL portfolio may contain several types of investments. Policy owners often have a large selection of funds that they can choose to invest their policy funds. Crediting rates on equity funds are sometimes linked to an index. The assets supporting these policy funds may closely match the index. New deposits may be modeled to follow in-force policy owners' current choices. The insurer may have a separate investment policy for the assets supporting the insurance cash flows. Those two investment policies may be subject to different limits. For these reasons, the assets supporting the policy fund component are often kept separate from the assets supporting the insurance component. Other separations might be done (e.g., Level Cost of Insurance (LCOI) vs. Yearly Renewable Term (YRT) cost of insurance or some product features).

If the policy owner controls the investment decisions (e.g., policy owner fund), the actuary would assume investment according to the expected policy owners' fund selection. If the insurer controls investment decisions (e.g., insurance component), the actuary would assume investment according to the insurer's investment policy.

Paragraph 2330.12 of the Standards of Practice states

"For a prescribed scenario, if the net cash flow forecasted for a period is positive, then the actuary would. . .

> assume reinvestment in non-debt investments
>
> not to exceed their proportion of investments at the balance sheet date if the insurer controls investment decisions and if such reinvestment is consistent with its investment policy, or
>
> in the proportion expected to be selected by policy owners if policy owners control investment decisions."

When using non-debt investments, the actuary would normally assume that the proportion of non-debt investments at each duration would be in accordance with the insurer's current investment policies (regardless of whether net cash flows for the period are positive or negative). The review would be performed without considering any business issued after the valuation date (new sales) even for a valuation done on a going concern basis as stipulated in paragraph 2130.02 of the Standards of Practice.

This may create a situation where the actuary needs to assume divestment of non-debt investments. This assumed disinvestment is not limited to non-debt instruments acquired after the valuation date.

The actuary would consider situations such as where

the current investment position is not the same as the current investment policy,

the overall investment limits may apply to more than one block of business for which separate CALM projections are done, in that the separate liability amounts may vary significantly over time and/or the maturity of the blocks may be very different, creating situations where it is more difficult to verify the application of the investment policy's limits, and

the investment policy may include limits that vary over time, for instance, an investment policy may assume that investment in non-debt investments may be 20% of the total asset portfolio but reduces to 0% if the cash flows are within a certain number of years of maturity.

3.2 Scenario Testing: Interest Rate Risk

Both deterministic and stochastic modeling to provide for interest rate risk can be used under CALM. In this Educational Note, an interest scenario refers to a scenario in both applications, unless otherwise noted.

Stochastic modeling is helpful in assessing exposure to certain risks, such as interest guarantees and bonuses linked to interest rates. For example, providing for an interest guarantee or a bonus in a deterministic application may not provide appropriately for these features. Typically an interest rate scenario would either always trigger the interest rate guarantee or never trigger it. In the presence of material interest rate guarantees or bonuses, the actuary would consider stochastic modeling to determine an appropriate provision. Unfortunately, the complexity of UL products may present challenges in the application of stochastic modeling. If stochastic modeling proves impractical, the actuary would, at a minimum, test additional interest scenarios that are appropriate to the circumstances.

Guidance on stochastic modeling can be found in other CIA publications, such as:

Calibration of Stochastic Interest Rate Models (Educational Note released in December 2009),

Selection of Interest Rate Models (Educational Note released in December 2003), and

Use of Stochastic Techniques to Value Actuarial Liabilities under Canadian GAAP (Research Paper released in August 2001).

3.3 Scenario Testing: Non-fixed Income Assets

In the presence of substantial equity investments supporting the insurance contract liabilities (supporting the policy owners' fund or the insurance component), the actuary may choose to determine the PfAD on non-fixed investment returns by scenario testing instead of by applying the methodology described in paragraph 2340.13 of the Standards of Practice. The actuary is reminded that the provision resulting from applying the methodology in paragraph 2340.13 constitutes a minimum provision if scenario testing is not employed.

If scenario testing for non-fixed income investment returns is used, the actuary would determine two sets of scenarios to be tested: interest rate scenarios and equity scenarios. Where a relationship can be demonstrated or plausibly postulated to exist between another assumption and the forecasted interest rates, it may be appropriate to take such a relationship into account in the cash flow projections. However, the actuary would be careful when deciding to vary the non-fixed interest assumption with the interest rate scenarios. Although many believe that such a relationship between equity returns and interest rates exists, there is little guidance on the subject at the moment.

If a relationship between interest rates and equity returns is assumed, it would be good practice to test both interest rate scenarios and equity scenarios independently to understand the effect of the assumed relationship.

Guidance can be found in the CIA Educational Note, Investment Return Assumptions for Non-Fixed Income Assets for Life Insurers, published in 2011.

3.3.1 Risks Related to Investment in Equity

To identify the equity risk contained within the product properly, the actuary may consider the assets supporting the policy owners' fund separately from the assets supporting the insurance and expense cash flows. A further refinement is to model the cash flows that are related to equity risks (e.g., the equity fund, fee income and expenses that are proportional to the equity fund) separately from the other cash flows.

The following are some of the risk elements that actuaries would consider when valuing policies that are supported by equity investments.

Market Risk

Market risk is the risk that equity markets will move in a direction that is detrimental to the insurer. For instance, if an insurer were relying on the proceeds from a sale of equities to provide for cash flows that have to be met on a life insurance product, a fall in equity values would result in the insurer having to find resources from elsewhere to meet these cash flows.

Basis Risk

If an insurer issues a product that provides equity returns to policy owners (for example, returns linked to the S&P 500 index), and matches this with a basket of assets designed to match the returns on the S&P 500 index, then it is possible that the asset returns will be different from those credited to policy owners. The difference will be either a profit or loss to the insurer.

To match appropriately, scale is often a consideration. For example, there may be minimum size requirements to purchase certain instruments. These types of constraints may result in lags that would add to the basis risk.

There will also be basis risk if a financial instrument is used to hedge, for example, fee income where the financial instrument has returns different from the underlying funds.

The insurer may use financial futures to hedge liabilities to policy owners. The returns from a future may not be the same as the returns on the underlying asset. For

instance, an insurer credits TSX 60 returns to policy owners and aims to meet this liability by investing in a TSX 60 future. The price at which the future is bought will not be the same as the current level of the index, and there is a further risk if the future is sold before it matures. The difference in returns made on the future and the underlying asset will depend on the prevailing level of interest rates and dividend income on the underlying assets at the time the future is bought or sold. A risk management strategy that depends on buying futures at a later date would consider the potential costs of hedging.

In some cases, the insurer may purchase options instead (for example, if a product has guaranteed the higher of, say, zero or the returns on the TSX 60). If the insurer intends to hedge using traded options, the potential costs of changes in market volatility and interest rates, as well as the possibility that an option may not be available at the required date (say, due to liquidity constraints), would be considered.

The actuary would also consider the risk that a particular traded derivative will not be available at a later date. For instance, the exchange may discontinue a particular series of options or futures.

Currency Risk

If foreign market index returns are credited to the policy owners' account, the insurer could be exposed to currency risk. The degree of currency risk depends on whether or not the return credited to the policy owners and the asset return earned by the insurer are of the same currency. Currency swaps may help hedge any currency risk.

Considerations for selecting the expected assumption and MfAD for future currency exchange rates are prescribed in paragraphs 2340.16–2340.19 of the Standards of Practice. Further guidance can be found in the Educational Note, Currency Risk in the Valuation of Policy Liabilities for Life and Health Insurers, published in December 2009.

Counterparty Risk

Counterparty risk refers to the risk that a party to a financial transaction will not meet its contractual obligations.

Over-the-counter derivative contracts tend to exhibit greater counterparty risk than traditional fixed income securities. This is primarily due to the wide range of potential cash flows payable under such contracts. The counterparties are typically banks. Credit analysis for hedging instruments generally focuses on an actual default of the counterparty or a failure by the counterparty to honour its contractual obligations.

If the contracts are exchange traded, there is negligible counterparty risk. Exchange traded options are standardized and are available with adequate liquidity and variety but only for short durations.

Liquidity Risk

Liquidity risk arises when there is limited ability to hedge, close out, or sell a financial risk position. This risk refers to the inability to buy or sell assets quickly at a fair price. The risk may be more important if continuous asset re-balancing is needed as in the case of a dynamic hedging strategy.

Volatility Risk

Volatility is represented by the standard deviation of the total return of a stock or an index. Volatility risk is the risk associated with changes in volatility. Option prices are very sensitive to volatility. A hedging strategy that requires future purchases of options may be exposed to increased volatility risk.

If options are used then the implied volatility is the important measure. If no options are used and frequent re-balancing is required, then realized volatility is important.

Taxation

For valuation purposes, the actuary would assume that the current (or substantially enacted) tax environment and tax rates would persist into the future for all classes of assets and all classes of income (e.g., bond interest, dividends from stocks, and capital gains or losses).[3] There is a risk that particular tax situations, especially those that are overly favourable to the insurer, may not continue indefinitely.

3.4 Considerations for Investments Supporting Policy Owners' Fund

Asset/liability matching may be difficult when the insurance contract liability is less than the amount of funds in the investment option (e.g., UL contracts with YRT cost of insurance (COI) charges where the COI charges exceed the valuation mortality assumption, thereby resulting in a negative liability). Unless the company accepts the mismatch position, inter-segment notes may be used to improve the overall matched position of the policy owners' fund and the insurer's assets.

Equity pass-through products are not immune to the need for special attention. On the contrary, these products often require special attention, particularly in the areas of policy owner behaviour and valuation of underlying assets (options).

3.4.1 Non-fixed Income Assets: Investment Returns

The actuary would project the investment returns for the assets supporting the policy owner funds. Policy owners may have several funds from which to choose. The actuary might blend some or all of the equity-linked funds in setting the expected investment return assumption by making assumptions about policy owners' fund mix in future years. Alternatively, the actuary might model each equity fund separately and make explicit assumptions about fund transfers made by policy owners to achieve a target mix in future years. In this case, the actuary would make an assumption about the extent to which these funds are correlated.

Section 4.5 gives additional guidance on future policy owners' fund mix and fund transfer assumptions.

3.5 Considerations for Investments Supporting Insurance Component

When the insurance contract liability is less than the amount of funds in the investment option (e.g., UL contracts with YRT COI charges and minimal interest rate guarantees and the policy owner funds are matched with an equal amount of assets), the insurance funds are then supported by negative assets that are equivalent to the present value of

[3] Paragraph 2340.15 of the Standards of Practice.

future gains (e.g., mortality charges less mortality costs, expense charges less actual expenses, actual crediting spreads less actual expenses covered by spread, etc.).

A sizeable insurance component may build up for UL contracts with Level COI charges. The resulting insurance cash flows usually have a very long duration and could be supported by long-term fixed income assets or by non-fixed income assets. If the latter situation is assumed, the actuary would then consider the risks described in section 3.3.1 above. The prescribed scenario reinvestment assumption may limit the use of non-fixed income assets for valuation purposes.

3.6 Inflation

The Standards of Practice state that the inflation rate be consistent with the interest rate scenarios. In the case of UL policies, the inflation rate may have an effect on policy owner benefits such as death benefits and critical illness benefits linked to the Consumer Price Index (CPI).

4. NON-ECONOMIC ASSUMPTIONS

Expected assumptions for mortality, expenses, and policy lapse will be required as they would be for the valuation of any life insurance policy. This section is primarily concerned with the special features of UL policies that would be taken into account when setting such assumptions. For example, UL policies require a premium persistency assumption.

4.1 Mortality Assumption

Some UL policy designs create a possibility for anti-selection that is not usually found in other policy types.

The actuary would consider the possibility of anti-selection when policy owners treat the plan as a YRT policy, and pay the minimum amount of premium necessary to keep the contract in force. Evidence of this activity could require an assumption for anti-selection, particularly when combined with high lapse experience.

Usually, mortality studies of standard underwritten policies exclude mortality from extended term and reduced paid-up non-forfeiture options. (These are options under which policy owners stop making premium payments and instead use the existing cash value of the policy to pay for future premiums for a limited term or to buy a paid-up life policy for a reduced sum assured). The mortality under these options has generally been seen to be higher than mortality of similar policies issued at standard rates. Under UL policies, it may not be possible to separate the coverages that would fall under these non-forfeiture options. The actuary would judge the extent to which this might affect the overall mortality result of UL policies.

If the policy allows increases in the amount at risk without underwriting, the policy owners that elect the increased coverage might exhibit higher mortality than that of policies where no election is made. This may occur due to either an increase in coverage or by a partial withdrawal that does not result in a decrease in coverage. The actuary would judge the extent to which this anti-selection might affect the mortality assumption.

An assumption for mortality improvement may be considered in the mortality assumption as outlined in paragraph 2350.05.1[4] of the Standards of Practice. In particular, for policies where the inclusion of mortality improvement increases insurance contract liabilities, a mortality improvement assumption is to be included as discussed in paragraph 2350.06[5] of the Standards of Practice. This latter situation can occur when the amount ceded under a reinsurance treaty, currently or prospectively, exceeds the direct net amount at risk. This situation is not specific to UL policies, but is not uncommon with level COI UL policies when high percentage quota share YRT reinsurance arrangements ceding a level net amount at risk have been used.

4.2 Expense Assumption

UL unit expense assumptions would usually be different from unit expense assumptions on traditional policies for a number of reasons. UL policies generally have additional complexities and policy owner options that require additional administrative effort. The actuary would consider the rate at which policy owner options (premium dump-ins, ad hoc requests to transfer funds between investment funds, changes in amount of insurance, in force illustration requests, etc.) might be exercised when selecting expense assumptions. Other additional expenses (such as exempt testing, annual (or more frequent) policy owner reporting, automatic policy modifications, etc.) would also be considered.

Investment expenses incurred on UL policies may also be different from those incurred on traditional policies due to the wider range of investment choices available to policy owners.

4.3 Policy Lapse Assumption

There are some considerations for lapses of UL policies that are not necessarily applicable to other policy types. Some of these considerations are

policy design features may influence policy owner behaviour, such as surrender charges, persistency bonuses and access to cash values without requiring a full policy surrender,

policy owner behaviour may be affected by the taxation aspects of the policy, since, for example, policies issued on a joint life last survivor basis for estate protection purposes would be expected to have very low lapse rates,

policy owner behaviour may also vary under different economic scenarios,

how the policies are being marketed (e.g., maximally funded policies may be marketed as long-term investment contracts, while minimally funded level COI policies may be marketed as term to 100), and

form of agent compensation (e.g., commissions may be payable on premium deposits or on fund accumulations, which may provide different incentives to the agent).

[4] This paragrah reference refers the reader to the revised final Standards of Practice on mortality improvement, effective October 15, 2011.
[5] *Idem.*

The existence of heavy back-end surrender charges may create reluctance on the part of the policy owner to surrender the policy for a period of time. If the back-end surrender charges are severe enough, it may create a cash surrender value cliff, with lower than normal lapse rates prior to the end of the surrender charge period, followed by heaped lapse rates when the surrender charge scale ends. A persistency bonus may create a similar effect. For policies that have level COI charges and where the policy owner can access the cash value without surrendering the policy, the existence of cash values would likely result in partial cash surrenders instead of full policy surrenders.

Some UL polices have significant premium deposits in addition to the minimum premiums required for the continuation of the insurance. These policies may be attractive to the policy owner due to the ability to defer tax on investment income. The policy lapse rate may be affected by this ability to defer tax and by the reluctance to pay tax on surrender of the policy.

UL policies frequently exhibit some of the following characteristics,

minimum funded policies,

policies purchased for tax considerations,

joint last to die, and

presence of persistency bonuses.

These may result in ultimate lapse rates similar to standalone T-100 products. In these cases, the actuary would review the degree of lapse support within the UL portfolio and assess the applicability of the most recent CIA studies on lapse supported products and of the Lapse Experience under Universal Life Level COI policies.

If a projection of policy owner fund balances results in a zero balance, an assumption regarding the continuation of the policy beyond that point would be required. For policies where there is little incentive for the policy owner to maintain the policy in force, a heaped lapse rate may occur at that point. In setting this assumption, the actuary would consider the potential for anti-selection. If an assumption that all policies lapse when the fund reaches zero does not produce a materially different result, then it would be appropriate to assume that all policies lapse at that point. For policies where there is an incentive to keep the policy in force (e.g., level COI policies), unless the actuary can justify otherwise, the actuary would normally assume that a heaped lapse rate would not occur and that the policy owner would pay sufficient premiums to avoid lapsing the policy due to insufficient funds.[6]

Another aspect of the policy lapse rate is the relationship of the credited rate to external interest rates. For example, if an insurer is crediting interest based on portfolio rates, then

[6] Many level COI policies allow the policy owner to access the cash value and keep the insurance in force. This means that the decision to keep a minimally funded level COI policy in force will most likely be similar to a decision about a term to 100 policy with no values. An argument for allowing heaped lapses at the point where funds reach zero is that the insurance may not be needed at that point and the policy owner may no longer want to pay for it. However, lapses prior to this time could be below the level expected for term to 100 policies, since no premium is required to pay the cost of insurance. In the absence of experience, it is difficult to determine the impact of these offsetting considerations. Due to the sensitivity of the lapse rate for many of these policies, significant diversity of practice could result if a heaped lapse assumption were permitted without justification based on experience.

the policy lapse rates would be sensitive to the external interest rate environment. In this case, the actuary would consider the possibility of higher policy lapses occurring if new money interest rates were to rise. For some policies, there may be a right to transfer funds into other funds. Instead of the policy lapsing in this situation, transferring funds may satisfy the policy owners' investment objectives.

If any of the funds are registered, then those funds will be matured by the latest retirement age. It may not be necessary to terminate the policy at that point if the plan design allows it to continue on a non-registered basis. For policies where there is an incentive to keep the policy in force (e.g., many level COI policies), unless the actuary can justify otherwise, the actuary would normally assume that no additional policy lapses will occur at maturity of the registered funds, if the plan design allows continuation of the policy.

4.4 Expected Premium and Partial Withdrawal Assumptions

An important assumption for the valuation of a UL policy is the future premium deposit assumption. The most sophisticated valuation would determine the situation for each policy individually. It is more likely that policies will be grouped for this assumption. The number of groupings will depend on how the product has been marketed or any other identifying characteristic.

UL policies have a variety of premium requirement features. Some of these features are

no specific required premium is payable,

premiums are required between minimum and maximum premium ranges,

minimum premiums are required for a period of time and then no specific minimum premium is required thereafter,

there is a specific required premium that must be paid and is guaranteed by the insurer not to change,

there is a specific required premium that must be paid, but is adjustable by the insurer, and

premium holidays; that is, a temporary stoppage of premiums.

No premium persistency assumption is necessary when there is a specific required premium payable. In other situations, a premium persistency assumption is needed, subject to the limitations specified in the policy design.

When premiums are flexible, the future premiums that are assumed may produce significant differences in liabilities for different assumptions. The initial premium assumption chosen would be consistent with the information available from the policy administration system. As a check, the actual premium received could be compared to the amount of premium that would have been generated by the future premium assumption applied to the prior period in force policies. This analysis may be valuable in determining the appropriateness of the future premium assumption.

Low premium persistency rates may be expected if

marketing material places emphasis on premium flexibility,

sales illustrations feature quick-pay premiums or policies are administered to target a specific paid-up date (which could lead to low premium persistency rates in later years),

presence of large lump sum premiums in the past, and/or

interest rate crediting is based on portfolio rates and new money rates spike upwards.

High premium persistency rates may be expected if

most business is paid by pre-authorized cheque,

marketing material places emphasis on credited interest rates, tax advantages and savings aspects of the plan prior to retirement,

interest rate crediting is based on portfolio rates and new money rates decrease, and/or

presence of persistency bonuses.

Policy owner behaviour may be influenced by guarantees inherent in the product design. For example, the policy may have a No Lapse guarantee, under which the policy is guaranteed not to lapse under certain conditions, regardless of the policy owner account value. The actuary would be aware of the conditions necessary to bring such guarantees into effect and would consider that the policy owner will act consistently with these conditions.

Policy owner behaviour may be affected by the interest rate scenario. For example, the actuary would assume that, during the period when minimum interest rate guarantees are being credited and are above current market rates, the policy owners would tend to increase premium persistency.

Policy owner behaviour may also be affected by Exempt Testing under the current Canadian income tax rules, to the extent that a high funded policy accumulates a fund balance that fails the Exempt Testing limits. This is discussed further in section 6.4.

The partial withdrawal assumption may be as important as the premium persistency assumption since both affect the size of the fund balance for the policy. Considerations for choosing partial withdrawal assumptions are similar to the considerations for choosing premium persistency assumptions. In addition, the actuary would consider the impact of tax on disposition of proceeds and on death benefits for level face and indexed designs.

4.5 Transfer of Funds and Premium Deposit Allocation Assumptions

Some UL policies have multiple investment fund options and may allow transfers among investment funds. For some policies, material differences in investment spread may exist among the funds, especially when minimum credited rate guarantees exist on certain funds.

When material differences in investment spread exist, assumptions for transfers among funds and for the allocation of future premium deposits among funds are likely to have a material effect on the valuation. The actuary would test the sensitivity of the liability to these assumptions in this situation, using one or more economic scenarios as appropriate.

It would be appropriate to base the expected premium deposit allocation assumption on actual experience (with consideration for the economic environment), that is on the actual deposit allocation selected by the policy owners. Using the current fund mix as a proxy for the actual deposit allocation may result in an assumption quite different from the expected policy owner behaviour.

In general, the actuary would assume that policy owners will tend to act to the insurer's detriment, to the extent that they expect to benefit. This anti-selection is an important consideration in setting assumptions about allocations among funds. As discussed in section 2.4, however, it may be appropriate in some circumstances to assume that some policy owners do not always act to the insurer's detriment. For example, the actuary may be able to demonstrate that policy owners tend to shift their assets from index-linked funds to guaranteed funds as they age, even if this is not necessarily in their best interest. As another example, policy owners may choose to invest in index-linked funds in low-interest environments because they expect superior returns, even though it would be to the insurer's detriment if the policy owners transferred their funds to the guaranteed accounts with minimum interest rate guarantees. As much as possible, the actuary would use actual company experience to establish such assumptions.

Tax consequences of policy owner actions would also be considered when the policy owner taxation of funds is different (e.g., some policies have both segregated funds and general account funds in the same contract).

The charges debited to the policy on transfer are also taken into account. They could affect the number of transfers in a given policy year.

It would normally be inconsistent with policy owners' reasonable expectations to assume that investment fund options that are currently available would be withdrawn in the future.

5. POLICY COMPONENTS RELATED TO EXPECTED ASSUMPTIONS

Policy components consist of charges or credits to the policy. They include COI charges, expense charges, premium loadings, and investment income credited to the policy and any other charge or credit to the policy.

For some UL policies, some of the policy components are guaranteed. For these components, the guaranteed rates would be used in the valuation unless lower charges or higher credits to the policy reflect policy owner reasonable expectations.

For policy components that are not guaranteed, it is necessary to determine a proper set of policy components that are consistent with each economic scenario and the assumptions used.

In order to determine appropriate assumptions for policy components, it is important for the actuary to consider the insurer's philosophy, policies and practices with respect to these items.

5.1 Policy Owners' Credited Rate

It may be possible to relate the expected policy owners' credited rate to the assumed asset investment rate when policy owners' credited rate guarantees are not present. It may also be possible to relate the expected policy owners' credited rate to the assumed asset

investment rate in the case where credited rate guarantees are present (such as linkage to an external index) and asset investments are chosen to match these guarantees.

It may be necessary to establish expected policy owners' credited rates unrelated to the asset investment rate in cases where, for example,

management tends to set rates based on the declared rates of other insurers, and

the policy owners' credited rate is linked to an external index and asset investments do not match these guarantees.

In such cases, if the selection of interest rate scenarios is deterministic, a larger number of interest rate scenarios would be tested subject to any materiality considerations.

The 'spread' available in the future is the difference between the assumed investment rate and the policy owners' credited rate, which may be a key element of the valuation. It may be inappropriate to assume that the current level of this spread will continue to be available because

future competitive pressures may reduce the spread available,

contractual guarantees, especially minimum credited rates, may reduce the spread available under some interest rate scenarios, and

assets and liabilities may become mismatched, causing a potential decrease in spread.

When projecting a reduction in the spread available, the actuary would calculate the spread such that it would not be inappropriately reduced twice (for example, projected spread is reduced to provide for an interest rate guaranteed and to account for competitive pressures).

Normally, it would not be assumed that the spread will increase in the future unless it results from a crediting rate strategy where the spread is related to the level of interest rates,[7] or spreads are currently narrow and are expected to increase. Current rates being credited would be assumed to create policy owner reasonable expectations that the current level of competitiveness in the credited rates will continue or that current spreads will continue. In certain circumstances, it would be appropriate to assume that spreads would decline in the future.

In some cases (e.g., where a credited rate decrease has been temporarily delayed), it may be appropriate to assume that the spread will increase, if supported by the existence of a clear plan by the insurer to rectify the situation. However, the actuary would be satisfied that the insurer by its delay has not effectively changed policy owner reasonable expectations. This is meant to be consistent with a planned change in dividend scales for participating policies. However, usually the reaction time for UL credited rate changes is considerably shorter than the reaction time for participating insurance dividend scale changes. Therefore, the actuary would exercise caution in assuming that the spread will increase in the future.

[7] For example, the spread may cover for the Investment Income Tax expense that varies with the level of interest rates.

5.2 Cost of Insurance (COI) Charges

For some policies, the COI charges are guaranteed, and the expected COI charges would be equal to the guaranteed rates. For other policy types, it may be possible to relate the expected COI charges to the expected mortality experience, consistent with the valuation mortality assumption. One complication is that the expected COI charges may contain some loading to recover acquisition expenses (e.g., the reverse select and ultimate COI charges scale). The actuary would attempt to quantify how any change in mortality experience will be passed on to the policy owners in the form of revised COI charges.

For policies with adjustable COI charges, if illustrations projected at various interest rates do not adjust the level COI charges, the actuary would assume that policy owner reasonable expectations are that COI charges are not adjustable for interest rate changes. However, if management has taken action to change these expectations, the actuary may assume that the level COI charges are adjustable for interest to the extent that the expectations have been changed. Even if management has the ability to change COI charges, the actuary would consider the likelihood of such management action, including any historical precedents.

5.3 Expense Charges and Premium Loadings

For some policies, the expense charges and premium loadings are guaranteed, and the expected charges and loadings would be equal to the guaranteed rates. For other policy types, the actuary would quantify how any change in administrative expenses would be passed on to the policy owners.

For policies with adjustable expense charges or adjustable premium loadings, if illustrations do not adjust these charges or loadings, the actuary would assume that policy owner reasonable expectations are that they are not systematically adjustable. For example, if illustrations project level expense charges, the actuary would assume that expense charges are not increased for inflation. However, if management has taken action to change these expectations, the actuary would assume that the charges or loadings are adjustable to the extent that the expectations have been changed. Even if management has the ability to change expenses, the actuary would consider the likelihood of such management action.

6. TAX CONSIDERATIONS

The valuation of the insurance contract liabilities would provide for projected income taxes and other taxes not related to income, as specified in subsection 2320 of the Standards of Practice. In providing for these taxes, the actuary would consider the CIA Educational Note, Future Income and Alternative Taxes, published in 2002.

This section is primarily concerned with tax issues that are specific to the valuation of UL insurance contract liabilities and that are not discussed in the CIA Educational Note Future Income and Alternative Taxes.

6.1 Canadian Investment Income Tax (IIT)

The insurance contract liabilities for Canadian policies would include a provision for future Investment Income Taxes (IIT) payable under Part XII of the Canadian Income Tax Act. The IIT in each future year is related to the tax reserve determined for IIT purposes, associated with the policy in each future year, as well as the five-year rolling

average bond interest rate (currently, this is defined as Series V122487. It was previously defined as Series B14013). The actuary would calculate the projected tax reserve for this calculation consistently with the tax reserve basis used in the annual filing of the Part XII Investment Income Tax return.

The actuary would project tax reserves consistently with the economic scenario. This is especially important if the IIT cash flows are not explicitly projected in the valuation. For example, if the provision for IIT is approximated by a reduction in available interest spread, the actuary would review the appropriateness of that assumption for each interest scenario.

The actuary would consider the extent to which the Management Expense Ratio (MER) charged on policy owner funds can be adjusted to recover unexpected variations in IIT. Even if the policy contract allows for IIT to be explicitly recovered, the actuary would consider whether the insurer has exercised this right in practice, and if not, whether the insurer has created a reasonable expectation that variations in IIT will not be recovered.

6.2 Canadian Tax Treatment of Unit Trusts (e.g., Exchange Traded Funds)

The insurer may attempt to support the policy owners' account balances with matching assets. One asset class that may be used for this purpose is unit trusts, which include, for example, Exchange Traded Funds (ETFs). These are funds that track or replicate a specific index and are listed on major Canadian and US stock exchanges just like individual equities. The actuary is reminded that under the Canadian tax laws enacted in March 2009, many of these investments in unit trusts have a tax treatment similar to the direct investments that the insurer holds in equities.

Unit trusts are flow-through entities for tax reporting purposes. The unit trust's income, including dividends from taxable Canadian corporations, and any net capital gains that the unit trust realizes, should retain their character for purposes of the flow-through reporting of such amounts to the insurer.

The actuary would make a number of assumptions in computing the tax implications of these investments in unit trusts and will need to work with tax professionals to ensure the appropriate tax treatment related to the taxation of realized capital gain distributions from the trust, which may need to be subjected to full taxation. The assumptions may be directly available from modeling performed by the actuary, or a specific assumption may be made. Some of the assumptions include, for example,

> the annual yields available from the unit trust, separated between the capital gain distribution component, the dividend component and any annual fair value adjustment, and
>
> the proportion of Canadian dividends earned by the unit trust (as Canadian dividends are not included in taxable income).

The actuary would perform sensitivity testing to understand the effect of these assumptions on the insurance contract liabilities.

6.3 Foreign Withholding Tax

Some of the policy owners' account balances may be invested in foreign (non-Canadian) assets that may be subject to a withholding tax by the local tax authorities. The actuary would be aware of these situations, and would note that these withholding taxes cannot

be deducted from Canadian taxable income (i.e., are unrecoverable), under current tax laws. Further, the actuary would determine whether this withholding tax is recoverable directly from the policy owners under the policy contract. The actuary would provide for any withholding tax that is not recoverable. Such a provision would result in temporary differences between statement and tax reserves, and the impact of this temporary difference would also be included in the insurance contract liabilities.

6.4 Exempt Status

In most jurisdictions, life insurance policies are generally exempt from tax, provided that the policy can be demonstrated to qualify as a life insurance contract as opposed to an investment contract. To qualify as life insurance in Canada, for example, a UL policy would typically have to pass an Exempt Test, which measures the relationship of the policy owners' fund balance with the sum assured. If the policy fails the Exempt Test, then investment build-up in the fund would become taxable to the policy owners, unless the policy is modified to pass the test (for example, by increasing the sum assured).

In valuing the insurance contract liabilities, the actuary would consider whether the policy was intended to be tax-exempt or not. The actuary would normally assume that this treatment persists throughout the valuation projection. For example, if the policy was intended to remain tax exempt, then the actuary would perform an Exempt Test at each future point in the valuation projection and assume that appropriate action takes place such that the policy remains exempt under the scenario being tested. For example, the actuary could assume that the sum assured is increased in this situation. Or, the actuary might assume that excess funds are transferred into side funds that are taxable to the policy owners. These side accounts may have different investment characteristics and may therefore result in different spreads to the company. As well, there may be increased expenses due to additional tax reporting requirements.

7. MARGINS FOR ADVERSE DEVIATIONS (MfADs)

In addition to the regular considerations regarding MfADs for mortality, expense, asset default for fixed income assets, cash flow default for non-fixed income assets, and policy lapse, some additional considerations with respect to MfADs apply to the valuation of UL policies. These include changes in policy owner behaviour, basis risk (where assets are invested differently from investment return credited), and options that may have been granted to the policy owners where the policy owners are likely to select against the company.

The level of margin would be appropriate to the risk or uncertainty present, and would be determined consistent with methodologies for setting assumptions on MfADs discussed elsewhere in the Standards of Practice and in the Educational Note, Margins for Adverse Deviations, published in November 2006.

Given the nature of some of the policy owner options, the valuation assumptions may not always be the sum of a best estimate assumption plus a MfAD, but would be determined by substituting an alternative choice for these assumptions that produces a higher insurance contract liability than the liability resulting from the use of the expected assumption. In these cases, the actuary would use judgment in determining reasonable alternative assumptions. It would be reasonable to produce, through sensitivity testing, a

range of results from which to choose and to compare the resulting provisions with other provisions related to assumptions presenting similar risk or uncertainty.

7.1 Interest Rate Risk

Risk due to changes in interest rates would largely be addressed through the scenario-testing process. The actuary would consider the need to test additional scenarios as described in paragraph 2330.30 of the Standards of Practice.

Generally, the forecasted net cash flow arising from UL policies is sensitive to the interest rate scenario. In addition, many UL policies have a significant amount of uncertainty in liability cash flows due to uncertainty with respect to policy lapses, partial withdrawal of cash values, premium persistency, transfer of funds, premium allocation and other assumptions that may be required. Therefore, matching of assets and liabilities may be less certain than it would be for policies with more predictable liability cash flows. To the extent that this uncertainty exists for the policies being valued, additional interest scenarios would be tested and larger PfADs would be produced.

7.2 Mortality Assumption

Certain circumstances may create a situation where a decrease in mortality rates increases the insurance contract liabilities. Section 2.3 of the Educational Note, Aggregation and Allocation of Policy Liabilities, provides advice in this regard. The actuary is reminded that the application of a MfAD would result in an increase to the value of the liability, and that it would be appropriate for the actuary to assume a negative mortality MfAD if this is necessary to produce a positive mortality PfAD at the chosen level of aggregation.

The MfAD for the mortality assumption encompasses the MfAD added to the base assumption and the MfAD included in the assumption for mortality improvement. These both would be considered when assessing the level of mortality MfAD.

7.3 Policy Lapse Assumption

Special considerations for UL policies that lead to a need for high margins include:

premium persistency rates show great volatility,

the existence of persistency bonuses,

credited rate structures such as ‘bucketing’ (higher credited rates for higher fund amounts), and

minimum crediting rates.

7.4 Expected Premium and Partial Withdrawal Assumptions

Due to the interaction of the many variables in UL policies, sensitivity testing may be required to determine the appropriate application of MfADs for these assumptions. For example, lower premium persistency may increase the liability for some policies while a higher premium persistency may increase the liability for other policies. Moreover, the appropriate application of the MfAD may be different for different economic scenarios.

Expected premiums may vary with different economic scenarios. The policy design may encourage dump-ins of premiums when rates are rising, or conversely, a reduced level of premium funding when interest rates are low. Particular attention would also be given to

the run-off of any back-end loads on deposits, and the effect this may have on expected lapses.

No MfADs are necessary when there is a specific required premium payable or when there is no partial withdrawal feature. In other situations, MfADs would be needed, subject to the limitations specified in the policy design.

Given the nature of these assumptions, the MfAD would often be applied by substituting an alternative choice for these assumptions which produces a higher liability than the liability resulting from the use of the expected assumption. The actuary would use judgment in determining reasonable alternative assumptions. Refer to the introduction of this section for additional considerations.

7.5 Transfer of Funds and Premium Deposit Allocation Assumptions

For policies where transfer of funds and premium deposit allocation assumptions are necessary, MfADs would be required for these assumptions. Given the nature of these assumptions, the MfAD would be applied by substituting an alternative choice for these assumptions that produces a higher liability than the liability resulting from the use of the expected assumption. The actuary would use judgment in determining reasonable alternative assumptions. Refer to the introduction of this section for additional considerations.

The actuary would consider the effect of the alternative assumptions on the aggregate provision. It may be appropriate to have an explicit provision of zero for the reasons that

> provision may be provided elsewhere (e.g., in the crediting rate assumptions or by varying the transfer of funds and premium deposit allocation assumptions with the interest rate scenarios), and
>
> there may be no material differences in net spreads assumed on the different investment funds.

7.6 Policy Components

For policy components that are not guaranteed, the use of a margin may be appropriate to reflect the uncertainty of the assumption. For example, a margin may be added to the policy owners' credited rates to account for potential market pressure to increase credited rates.

7.7 Equity Returns

If the interest rate testing described above does not involve testing of alternate equity scenarios, then a margin on expected equity returns would be needed. Under paragraphs 2340.12 and 2340.13 of the Standards of Practice, elements include

> 5 to 20% margin on annual dividend and 20% margin on capital appreciation,
>
> 30% immediate drop in market value of diversified North American equities, to occur at the worst time (25% to 40% for other portfolios).

Depending on the equity investments that support liabilities, a margin for tracking error would be considered. Determining the appropriate time for the immediate drop in equity market values, as well as the direction of the 20% margin, may require sensitivity testing, as there may be a variety of opposing factors involved that influence the outcome. Lower

equity returns may result in lower bonuses being paid out, therefore, increasing the spread on policy owners equity funds, but reducing the asset base upon which the spreads are collected. To the extent that equities are also supporting liabilities in excess of the policy owner's fund, lower equity returns would normally increase liabilities. The effect of income tax would be considered, depending on the types of investments that support the liabilities.

7.8 Aggregate Provisions for Adverse Deviations (PfADs)

It is important to note that PfADs would be appropriate in aggregate. The actuary would consider any potential undesirable compounding of PfADs. This is a particularly important consideration for UL policies that require additional assumptions regarding policy owner behaviour that may not be necessary in the valuation of other products.

APPENDIX A

SAMPLE UL VALUATION PROCESS

The following describes a process that could be used to develop the valuation of a UL product. Many of the following steps apply to valuations of any product type, but some of these steps are particularly important or unique to UL because they focus on the effect of policy owner behaviour on the structure of the valuation process. Whether this step-by-step process is followed or not, the key is to develop the methodology and process carefully, focusing on the material elements that create the most risk/exposure for the company, in particular

understand the product design, credited rate setting, adjustment plan, illustrations and market(s),

identify the policy elements that have imperfect flow-through (adjustability) and rank them in priority,

identify the distinct market or in-force subsets, differentiating between subsets on the basis of expected behaviour under the control of the policy owner (funding level, premium persistency, investment account selection, partial withdrawals, etc.),

define an initial set of valuation sub-segments (i.e., 'round 1'), based on the above considerations, which would all be distinct in force subsets where the distinction relates to a material risk for which the product doesn't allow significant flow-through/adjustability,

review the considerations and guidance in this note for the material risks identified in the last step,

define the non-scenario-tested assumptions that apply across all sub-segments (for example, possibly mortality, certain administration expenses and investment account spreads) and identify the methodology for measuring, monitoring and setting these assumptions (this Educational Note and others provide guidance for developing these assumptions),

develop the projection model for the product which would materially reproduce the customer illustration software results assuming like inputs, or the differences would be explainable,

set up the valuation model incorporating the policy projection tool,

conduct sensitivity testing for all of the policy owner controlled assumptions considered material, keeping the investment spreads and assumptions constant. If some of these policy owner assumptions are deemed to be strongly correlated to economic assumptions, then the relationship needs to be described/defined. This testing would result in a refinement of the valuation subsegments (i.e., 'round 2').

identify the methodology for measuring, monitoring and setting these policy owner behaviour assumptions by subsegment (this Educational Note and others provide guidance for developing these assumptions),

understand the investment strategy for the product and create a tool for modeling it, conducting roll forward scenario testing for each subsegment using the investment model incorporating the linkages/correlations defined in the prior item in this list, for example, policy bonuses or policy owner account switching which is assumed to be economic scenario dependent (This testing would lead to the final refinements to the valuation subsegments; in particular, additional subsegments may be needed to capture and reflect appropriately the risks associated with the economic assumption correlations.) and identify the methodology for measuring, monitoring and setting the scenario dependent assumptions (this Educational Note and others provide guidance for developing these assumptions), and

finalize the assumptions and procedures for valuing the various subsegments testing the model and process for reasonableness and establishing appropriate controls. (If a Policy Premium Method-style (PPM) approximation is to be used to value the portfolio, develop and test any approximations that may be needed.)

APPENDIX B

APPLICATION OF CALM

The following describes one approach that could be used in applying the Canadian Asset Liability Method (CALM). It is assumed that the actuary would already have followed a process such as that illustrated in appendix A, to divide the product into appropriate valuation segments. For illustration purposes, it is assumed, further, that only the interest rates are scenario tested (i.e., equity returns are not scenario tested). Where equity returns are scenario tested, the actuary would consider making an assumption about the correlation between equity returns and interest rates.

This approach could be applied by either ignoring or including income taxes. If income taxes are ignored, then the provision for future taxes would have to be approximated using a separate process.

First determine assumptions and policy components consistent with the expected (base) interest rate scenario (steps 1 to 3).

1. Make assumptions about the expected interest rate scenario without MfADs, including

   all elements of the interest rate scenario (reinvestment interest rate assumptions, rates of general inflation, reinvestment/disinvestment/borrowing strategies),

   rates of income and capital appreciation/depreciation on non-fixed income assets[8],

   mortality assumptions,

   expected benefit pattern,

   expense assumptions,

   policy lapse assumptions,

   probability of premium payment and level of premium persistency,

   partial withdrawal pattern,

   transfer of funds between investment fund options,

   premium deposit allocation between investment fund options, and

   tax assumptions, such as income tax rates, tax treatment of various asset classes, dividend withholding taxes.

2. Determine the expected policy components consistent with the expected assumptions, such as

   expected premium loading,

   expected expense charges,

   expected Cost of Insurance (COI) charges,

   expected investment rates credited to policy owner funds, and

[8] SOP provides guidance in subsection 2340.

investment or persistency bonus rates.

3. Apply MfADs to the expected assumptions[9] and to the expected policy components, where applicable, to determine the valuation assumptions. Sensitivity testing may be required to determine the direction in which the MfADs would be applied. The proper application of the margin may be different for different policies and for different durations. For example, margins on partial withdrawal rates might be positive for scenarios where reinvestment rates increase and negative for where reinvestment rates decrease. In addition, sensitivity testing may be required to determine the size of the margins in the presence of policy owner pass-through features.

   The effect of income tax would be considered in determining the appropriate direction of margins for expected assumptions, where this is material. For example, the Standards of Practice require that margins for non-fixed income assets include a prescribed drop in market value at the worst time, which might be materially different if determined on an after-tax basis.

Then, for each interest rate scenario[10], perform the following steps.

4. Determine the assumptions for the interest rate scenario. Revise the valuation assumptions to be consistent with these interest rate scenario assumptions. Policy owner behaviour may vary with the assumptions in each interest rate scenario.

5. Revise the expected policy components consistent with the interest rate scenario and review the proper application of the applicable margins. This process would take into account policy owner reasonable expectations and policy owner expected behaviour, including:

   the insurer's formal or informal policy for making changes to policy components,

   policy guarantees, contractual limits or market pressures that may limit the insurer's freedom to make changes,

   practical limitations (e.g., systems and administrative) that may impair the insurer's ability to make timely changes,

   the insurer's recent practice in adjusting policy components, and

   illustrations provided to policy owners.

6. Starting with the current policy owner fund balance, current assets, valuation policy components and assumptions, project future policy elements and future asset and liability cash flows. In cases where the credited rates (and/or other assumptions and policy components) are derived on a portfolio basis, this process may need to be performed duration by duration instead of policy by policy.[11] For some types of policies, policy owner behaviour, credited rates or other policy components may be

[9] Except the interest rate assumption and other scenario-tested assumptions.

[10] 'Scenario' refers equally to a scenario in a deterministic or a stochastic application.

[11] Consider a matrix, where the rows are each policy and the columns are each duration. The traditional way of valuing would be to calculate cash flows for each row, then add them up to obtain total cash flows by duration. The process described above would require a calculation of cash flows column by column instead of row by row. After each column is calculated, the aggregate liability cash flow can be combined with the aggregate asset cash flow to determine the fund credited rate for the next duration.

dependent on elements of the projections. In these cases, steps 4, 5 and 6 would be closely integrated and could involve an iterative approach.

7. Using these asset and liability cash flows, determine the scenario liability amount.
8. Determine the final liability amount based on the scenario testing of steps 4 through 8 as provided under paragraphs 2320.50 and 2320.51 of the Standards of Practice.