



---

***DRAFT EDUCATIONAL NOTE***

---

**MARGINS FOR ADVERSE DEVIATIONS**

**COMMITTEE ON LIFE INSURANCE FINANCIAL REPORTING**

**FEBRUARY 2005**

© 2005 Canadian Institute of Actuaries

*Document 205007*

*Ce document est disponible en français*



**Canadian Institute of Actuaries • Institut canadien des actuaires**

## **MEMORANDUM**

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

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

**DATE:** February 23, 2005

**SUBJECT:** **Draft Educational Note – Margins for Adverse Deviations**

---

The Committee on Life Insurance Financial Reporting (CLIFR) is currently proposing revisions to the current Standards of Practice – Practice-Specific Standards for Insurers, Section 2300 that had an effective date of January 1, 2003. The draft educational note intends to clarify the use of margins for adverse deviations (MfAD) in accordance with the proposed revisions to the standards. CLIFR intends to publish this document as a formal educational note subsequent to the adoption of the proposed changes to the standard.

This draft educational note provides guidance to the actuary in the selection of the level of the deterministic MfAD appropriate for the company's particular products or circumstances. It is intended to apply for the selection of the margin for guaranteed products. It covers the selection of margins for both economic and non-economic assumptions.

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

Once this educational note has been finalized, it would be subject to section 1220 of the Standards of Practice (hereafter referred to as "Standards"), which says that "the actuary should be familiar with the relevant educational notes and other designated educational material," and be aware that a "practice which the notes describe for a situation is not necessarily the only accepted practice for that situation and is not necessarily accepted actuarial practice for a different situation," and that "educational notes are intended to illustrate the application (but not necessarily the only application) of the standards, so there should be no conflict between them."

I would like to thank the members of CLIFR who were primarily responsible for the development of the proposed revisions to the standards of practice: Jacques Boudreau, Elizabeth Boulanger, Marie-Hélène Malenfant, Jacques Potvin and Barry Senensky.

MD

# TABLE OF CONTENTS

<b>1 – INTRODUCTION.....</b>	<b>5</b>
1.1 Purpose and Scope .....	5
1.2 Overview of the Approach.....	6
1.3 Definitions.....	7
<b>2 – ECONOMIC ASSUMPTIONS.....</b>	<b>7</b>
<b>2.1 – Fixed Income Assets: Asset Depreciation .....</b>	<b>8</b>
2.1.1 Introduction.....	8
2.1.2 Considerations leading to a margin of at least the average of the high and low margins.....	8
2.1.2.1 Bonds .....	8
2.1.2.2 Mortgages .....	9
2.1.2.3 Asset- and Mortgage-Backed Securities.....	11
<b>2.2 – Preferred Stocks: Asset Depreciation .....</b>	<b>12</b>
2.2.1 Introduction.....	12
2.2.2 Considerations leading to a margin of at least the average of the high and low margins.....	12
<b>2.3 – Derivatives: Investment Return.....</b>	<b>13</b>
2.3.1 Introduction.....	13
2.3.2 Considerations leading to a margin of at least the average of the high and low margins.....	13
<b>2.4 – Non-Fixed Income Assets: Investment Return.....</b>	<b>14</b>
2.4.1 Introduction.....	14
2.4.2 Considerations leading to a margin of at least the average of the high and low margins.....	14
2.4.2.1 Common Stocks.....	14
2.4.2.2 Real Estate .....	15
<b>3 – NON-ECONOMIC ASSUMPTIONS.....</b>	<b>16</b>
<b>3.1 – Insurance Mortality .....</b>	<b>17</b>
3.1.1 Introduction.....	17
3.1.2 Considerations leading to a margin of at least the average of the high and low margins.....	18

<b>3.2 – Annuity Mortality .....</b>	<b>19</b>
3.2.1 Introduction.....	19
3.2.2 Considerations leading to a margin of at least the average of the high and low margins.....	19
<b>3.3 – Morbidity .....</b>	<b>20</b>
3.3.1 Introduction.....	20
3.3.2 Considerations leading to a margin of at least the average of the high and low margins.....	20
<b>3.4 – Withdrawal and Partial Withdrawal .....</b>	<b>22</b>
3.4.1 Introduction.....	22
3.4.2 – General Considerations .....	22
3.4.3 Considerations leading to a margin of at least the average of the high and low margins.....	22
3.4.3.1 Situations where a decrease in lapse rates increase policy liabilities .....	22
3.4.3.2 Situations where an increase in lapse rates increase policy liabilities .....	24
<b>3.5 – Expenses.....</b>	<b>25</b>
3.5.1 Introduction.....	25
3.5.2 Special considerations.....	25
3.5.3 Considerations leading to a margin of at least the average of the high and low margins.....	25
<b>3.6 – Policyholder Options .....</b>	<b>26</b>
3.6.1 Introduction.....	26
3.6.2 General Considerations.....	27
3.6.3 Considerations leading to a margin of at least the average of the high and low margins.....	27

## MARGINS FOR ADVERSE DEVIATIONS

### 1 – INTRODUCTION

#### 1.1 Purpose and Scope

This educational note provides guidance to the actuary in the selection of the level of the deterministic margin for adverse deviations (MfAD) appropriate for the company's particular products or circumstances. It is intended to apply for the selection of the margin for guaranteed products.

For risk pass-through products, guidance is provided by section 2320.49 of the Standards of Practice (SOP):

“The policy liabilities need not make provision for adverse deviations to the extent that the insurer can offset its effect by adjustments to policyholder dividends, premium rates, and benefits. The insurer's contractual right of such offset may be constrained by policyholder reasonable expectations, competition, regulation, administrative delays, and the fear of adverse publicity or anti-selection.”

1740.12  
1740.24

Accordingly, for risk pass-through products, margins could be established first as if the product was guaranteed and the effectiveness of the pass-through features could then be modeled to arrive at a provision consistent with the level of pass-through. The model would take into account the actual past company actions and the constraints imposed by policyholder reasonable expectations, competition, regulation, administrative delays, and the fear of adverse publicity or anti-selection. Alternatively, the pass-through effect could be analyzed assumption by assumption and the level of margin adjusted accordingly. Tests performed assumption by assumption would take into consideration the interaction between the assumptions and their combined impact on overall pass-through limits.

Regarding the purpose of a margin for adverse deviations, SOP section 1740.04 specifies that:

“The amount of that provision should

take account of the effect of the uncertainty of the assumptions and data for the calculation on the financial security of those affected by the calculation,

not take account of the possibility of catastrophe or other major adverse deviation which is implausible in usual operations,...

Section 1740.43 notes that:

“A larger margin for adverse deviations (compared to the best estimate assumption) is appropriate if a) the actuary has less confidence in the best estimate assumption, or b) an approximation with less precision is being used, or c) the event assumed is farther in the future, or d) the potential consequence of the event assumed is more severe, or e) the occurrence of the event assumed is more subject to statistical fluctuation.”

And section 2320.082 further clarifies that:

“Notwithstanding sections 1740.04, 1740.14 and 1740.43, the margins for adverse deviations for life insurance financial reporting do not provide for uncertainty due to statistical fluctuations.”

In other words, the actuary would provide for adverse deviations which may result from error of estimation, deterioration or improvement of the expected experience as a result of influences which the actuary does not anticipate, commensurate with the degree of uncertainty of the expected experience scenario assumptions.

As a general principle, the process of setting a margin would take into account all relevant contingencies, including the relative volatility of losses, and would result in a higher margin where results can be expected to exhibit larger fluctuations, not to cover for the larger fluctuations per se but as an acknowledgement that the best estimate assumption is more difficult to determine when large fluctuations are observed.

Once the margin is determined, the difference each year between the assumed valuation experience (i.e., based on expected plus margin) and the actual experience flows through the income statement. It is not necessarily appropriate to revise margins in response to past fluctuations, unless there are grounds for concluding that underlying conditions have changed sufficiently. The determination of the margin would be based on a forward-looking review of the expected experience.

A high margin for error of estimation arises when there is considerable doubt about the reliability of the expected assumption due to inadequate or unreliable use of the experience data, recent changes in circumstances, or policies of the entity, etc. A high margin situation of possible deterioration arises when the available experience is too recent (not yet mature), when its relevance is uncertain due to a) differences in terms and conditions of the new instrument or product compared to the ones from which the experience was derived, b) concern that past behaviour of the economy or its sectors cannot be relied on as a good guide to the future, c) uncertainty as to the rate of cyclicity, d) anti-selection opportunities embedded in financial instruments, etc.

This educational note covers considerations for the selection of margins for adverse deviations for the following assumptions:

Economic assumptions:

- Fixed income assets: Asset depreciation
- Preferred stocks: Asset depreciation
- Derivatives: Investment return
- Non-fixed income assets: Investment return

Non-Economic assumptions:

- Insurance mortality
- Annuity mortality
- Morbidity
- Withdrawal and partial withdrawal
- Expenses
- Policyholder options

## **1.2 Overview of the Approach**

The SOP specifies in section 2320.083 that in the presence of significant considerations listed in sections 2340 (“Other Assumptions: Economic”) and 2350 (“Other Assumptions: Non-Economic”) or in the presence of other considerations that would be significant in the context

of the valuation, the margin would be determined to be at least the average of the high and the low margins.

Margins higher than average are appropriate when the presence of one or more of the significant considerations means misestimation or deterioration of the best estimate could be large. For example, relying on industry data to establish a specific assumption would be considered a significant consideration leading to an average margin but having to rely on industry data is generally accompanied with the presence of other significant considerations, which together would lead to a high margin.

For each risk discussed in the following sections, examples of significant considerations are provided and a list of other considerations that could be significant is identified separately for situations where the actuary may make an error in estimating the mean and situations where the mean may deteriorate. The lists are illustrative rather than exhaustive and include both important and less important items. The circumstances of the product and the company with regard to considerations mentioned in these situations will be the basis for the actuary's judgment as to the level of the margin required.

As Section 2320.081 states: "The actuary should ensure that the application of a margin for adverse deviations results in an increase to the value of the liability and that the resulting provision is appropriate in the aggregate."

### **1.3 Definitions**

#### *Margin for adverse deviations*

"The margin for adverse deviations is the difference between the assumption for a calculation and the corresponding best estimate assumption." (SOP section 1110.31)

#### *Provision for adverse deviation*

"The provision for adverse deviations is the difference between the actual result of a calculation and the corresponding result using best estimate assumptions." (SOP section 1110.39)

## **2 – ECONOMIC ASSUMPTIONS**

SOP section 2320.083 states: "The margin for adverse deviations would be at least the average of the applicable high and low margin whenever at least one "significant consideration" exists, or at least one other consideration is significant in the context of the valuation. "Significant considerations" vary by type of assumption and are described under sections 2340 and 2350."

SOP section 2340.001 states: "The following significant considerations indicate difficulties in properly estimating the mean:

- there is little relevant experience,
- future experience is difficult to estimate,
- operational risks adversely impact the likelihood of obtaining expected results,
- asset underwriting criteria are weak or poorly controlled,
- there are liquidity concerns,

there is uncertainty regarding the credit enhancement techniques used,  
the trust structure and legal responsibilities of the different parties for a securitized asset are not clearly understood in a practical and/or legal sense,  
the asset held is from a non-passthrough structure with a repackaging of the credit risk that is difficult to understand,  
the asset held is from a lower quality tranche of a non-passthrough structure that repackages credit risks,  
there is uncertainty about the counterparty credit, or  
there is no netting of the aggregate exposure with a counterparty.”

SOP section 2340.002 states: “Other significant considerations indicative of a potential deterioration of the mean include:

there is significant concentration of risks and/or lack of diversification, or  
operational risks are present such that the likelihood of continuing to obtain expected results is adversely impacted.”

Each of these significant considerations would be taken into account when determining the margin for adverse deviations for any of the economic assumptions. For each assumption, examples are provided of some of the significant considerations, along with other considerations that would be useful for the actuary to consider.

## **2.1 – Fixed Income Assets: Asset Depreciation**

### **2.1.1 Introduction**

The asset depreciation risk on fixed income assets is the risk of nonpayment, reduced payment, and/or delayed payment of contractually promised cash flows. It includes loss of interest, loss of principal, and extraordinary expenses associated with managing credit loss events.

The valuation assumption is the sum of a best estimate assumption plus a margin for adverse deviations that would be a percentage of the best estimate assumption.

SOP section 2340.06 states: “The low and the high margins for adverse deviations for a scenario are respectively 25% and 100% of the best estimate for that scenario, except that a higher range is appropriate where those percentages of an unusually low best estimate are not meaningful, and zero is usually appropriate for an Organisation for Economic Cooperation and Development (OECD) government’s debt denominated in its own currency.”

### **2.1.2 Considerations leading to a margin of at least the average of the high and low margins**

#### **2.1.2.1 Bonds**

Low margin situations would be characterized by the absence of the risk factors below. A larger margin may be required in low margin situations because of the low incidence and consequent high variability of default losses and because deterioration of the mean largely depends on factors beyond the company’s control.

It would generally be appropriate to use a zero margin in respect of a national OECD government’s debt denominated in its own currency. Other government or government

guaranteed debt does contain some level of C-1 risk and would, therefore, be subject to a C-1 risk margin.

The liquidity of highly rated fixed income assets may be an issue and may call for a higher margin for adverse deviations.

In a high margin situation, a margin greater than 100% of the expected loss of cash flows might be called for.

Examples of significant considerations for bonds as per SOP sections 2340.001 and 2340.002:

- *Error of estimation of the mean:*
  - Future experience difficult to estimate:
    - Relatively large proportion of non-investment grade issues,
    - Relatively high proportion of junior issues,
  - Operational risks: Investments in type of assets that the company lacks experience in acquiring and managing (e.g., investment in private-placement issues where the company does not possess the resources to perform sound internal credit analysis on a continuous basis, or where it lacks the work-out expertise),
  - Weak asset underwriting criteria: Past credit losses in excess of average for the market for a similar portfolio,
  - Liquidity concerns: Lack of liquidity on bonds available for trading.
- *Deterioration of the mean:*
  - Concentration or lack of diversification: Portfolio concentration by number of issue, issuer or industry,
  - Operational risks: Limited ability to track credit quality on an ongoing basis.

Other considerations for bonds:

- *Error of estimation of the mean:*
  - Lack of liquidity on bonds to be kept to maturity,
  - Non-rated instruments,
  - Option in favour of the issuer.
- *Deterioration of the mean:*
  - Event risk: a sudden external event fundamentally alters creditworthiness, such as product liability, accounting practices,
  - Loss of expertise in the investment area,
  - The company has been slow historically to react to deteriorating experience.

### **2.1.2.2 Mortgages**

Examples of significant considerations for mortgages as per SOP sections 2340.001 and 2340.002:

- *Error of estimation of the mean:*
  - Future experience difficult to estimate:
    - Uncertainty about the quality of the portfolio (e.g., acquisition),
    - Portfolio growth has been relatively rapid during an extended period of rising property values,
    - The loan to value ratio is unusually high for uninsured mortgages,
    - Higher volatility of the portfolio,
  - Operational risks:
    - Limited ability to track credit quality on an ongoing basis,
    - Underwriting and problem loan management are not adequate,
    - Weak asset underwriting criteria: Past company experience has been less favourable than industry experience when analyzed in aggregate and by location and type.
- *Deterioration of the mean:*
  - Concentration or lack of diversification: Significant relative portfolio concentrations exist with respect to location, mortgage type, the debtors, sectors, etc.

*Other considerations for mortgages:*

- *Deterioration of the mean:*
  - Economic conditions are deteriorating or have deteriorated,
  - Event risk: a sudden external event fundamentally alters creditworthiness, such as product liability,
  - Loss of expertise in the investment area,
  - The company has been slow, historically, to react to deteriorating experience,
  - Presence of options under residential mortgages,
  - Risks specific to the underlying properties:
    - Current leasing rates in excess of market rates,
    - Poor financial condition of major tenants,
    - Leases of major tenants coming up for renewal,
    - Accuracy of real estate appraisals (reliance on investment staff to do projections, degree of comfort with determination of expected cash flows, time since appraisals were done, presence of properties under development),
    - Environmental concerns,

- Significant amount of vacant space (within portfolio and within surrounding market).

### **2.1.2.3 Asset- and Mortgage-Backed Securities**

Examples of significant considerations for asset and mortgage-backed securities as per SOP sections 2340.001 and 2340.002:

○ *Error of estimation of the mean:*

- Operational risks:
  - Inexperience or lack of expertise of asset class within the organization,
  - The securitized asset is a new class of asset-backed security where the credit quality and dynamics of the class are not fully understood (i.e., lack of credible historical data for credit assessments to be made),
- Uncertainty regarding the credit enhancement techniques used for an asset (e.g., strength of letter of credit guarantee),
- The trust structure and legal responsibilities of the different parties for a securitized asset are not clearly understood in a practical and/or legal sense,
- The asset held is from a non-pass-through structure with a complicated repackaging of the credit risk that is difficult to fully understand,
- The asset held is from a lower quality tranche of a non-pass-through structure that repackages credit risk,
- Liquidity concerns.

○ *Deterioration of the mean:*

- Operational risks: Uncertainty regarding the credit quality of the underlying assets.

Other considerations for asset and mortgage-backed securities:

○ *Error of estimation of the mean:*

- There is no rating-agency rating of the security,
- The asset held is from a structure that is composed of a limited number of underlying assets (i.e., potential concentration risk),
- Inadequate monitoring capabilities,
- The underlying assets in a structure are new as opposed to being “seasoned”.

○ *Deterioration of the mean:*

- The rating for the asset being held is low,
- For mortgage-backed securities, there is no government or government agency guarantee on the payment of principal,
- Optionality that is difficult to predict and price.

## 2.2 – Preferred Stocks: Asset Depreciation

### 2.2.1 Introduction

The asset depreciation risk on preferred stocks is the risk of non-payment, reduced payment, and/or delayed payment of expected cash flows. It includes loss of dividends, loss of principal, and extraordinary expenses associated with managing credit loss events.

The valuation assumption is the sum of a best estimate assumption plus a margin for adverse deviations that would be a similar percentage of the best estimate assumption as applicable to fixed income assets.

### 2.2.2 Considerations leading to a margin of at least the average of the high and low margins

Example of significant considerations for preferred stocks as per SOP sections 2340.001 and 2340.002:

- *Error of estimation of the mean:*
  - Future experience difficult to estimate:
    - Relatively large proportion of non-investment grade issues,
    - Relatively high proportion of junior issues,
  - Operational risks: Investments in type of assets that the company lacks experience in acquiring and managing (e.g., investment in private-placement issues where the company does not possess the resources to perform sound internal credit analysis on a continuous basis, or where it lacks the work-out expertise),
  - Weak asset underwriting criteria: Past credit losses in excess of average for the market for a similar portfolio,
  - Liquidity concerns: Lack of liquidity on stocks available for trading.
- *Deterioration of the mean:*
  - Concentration or lack of diversification: Portfolio concentration by number of issue, issuer or industry,
  - Operational risks: Limited ability to track credit quality on an ongoing basis.

Other considerations:

- *Error of estimation of the mean:*
  - Lack of liquidity,
  - Non-rated instruments,
  - Option in favour of the issuer.

○ *Deterioration of the mean:*

- Event risk (e.g., a sudden external event fundamentally alters creditworthiness, such as product liability, accounting practices, taxation),
- Loss of expertise in the investment area,
- The company has been slow, historically, to react to deteriorating experience,
- Options in favour of the issuer.

## **2.3 – Derivatives: Investment Return**

### **2.3.1 Introduction**

The asset risks on derivatives are risk of default of the counterparty, uncertainty on the rate of return, timing issues, netting of aggregate exposure and liquidity risk.

In addition, the derivatives are subject to all the risk associated with the underlying assets, which risks are described in section 2. The level of margin would be established considering the addition of the risk factors of both the underlying asset and the derivative instrument per se.

### **2.3.2 Considerations leading to a margin of at least the average of the high and low margins**

Examples of significant considerations for derivatives as per SOP sections 2340.001 and 2340.002:

○ *Error of estimation of the mean:*

- Operational risks:
  - Lack of expertise with derivatives within the organization,
  - Inadequate monitoring capabilities,
  - Inability to measure potential derivative exposure accurately,
- Counterparty credit concerns (including lack of knowledge of counterparty credit exposure),
- Absence of netting of aggregate exposures with a counterparty.

○ *Deterioration of the mean:*

- Concentration or lack of diversification: Lack of diversity in derivative counterparties,
- Operational risks: Limited ability to track counterparty credit quality on an ongoing basis.

Other considerations for derivatives:

○ *Error of estimation of the mean:*

- Absence of credit enhancing features in derivative contracts (e.g., letter of credit, collateral, guarantees),
- Use of non-exchange-traded (i.e., over the counter) derivatives.

○ *Deterioration of the mean:*

- Event risk (e.g., a sudden external event fundamentally alters creditworthiness, such as product liability, accounting practices, taxation),
- Loss of expertise in the investment area,
- The company has been slow historically to react to deteriorating experience,
- Options in favour of the issuer.

## **2.4 – Non-Fixed Income Assets: Investment Return**

### **2.4.1 Introduction**

The non-fixed income assets are subject to the risk that the expected cash flows will not materialize. This may be caused by non-payment, reduced payment, and/or delayed payment of expected income amounts, or by reduced rates of capital appreciation. Provision for these risks would be considered to be part of the provision for adverse deviations.

A lot of exchange-traded instruments are like stocks and would be considered as such by the actuary. Exchange-traded mutual funds are to be treated in accordance with their underlying assets.

SOP section 2340.12 states: “The low and high margins for adverse deviations in the assumptions of common share dividends and real estate rental income are respectively 5% and 20%.”

SOP section 2340.13 states: “The margin for adverse deviations in the assumption of common share and real estate capital gains is 20% of the best estimate plus an assumption that those assets change in value at the time when the change is most adverse. That time would be determined by testing, but usually is the time when their book value is largest. The assumed change as a percentage of market value of a diversified portfolio of North American common shares is 30%, and of any other portfolio is in the range of 25% to 40% depending on the relative volatility of the two portfolios.”

### **2.4.2 Considerations leading to a margin of at least the average of the high and low margins**

As a general consideration, the margin would increase the shorter the expected holding period.

#### **2.4.2.1 Common Stocks**

*Example of significant considerations for common stocks as per SOP sections 2340.001 and 2340.002:*

○ *Error of estimation of the mean:*

- Future experience difficult to estimate: Higher volatility of the market value of the asset portfolio,
- Lack of liquidity: Relative illiquidity of assets in the portfolio,

○ *Deterioration of the mean:*

- Concentration or lack of diversification: Lack of risk diversification (number of holdings/average size) and sector diversification,

- Operational risks: Limited ability to track credit quality on an ongoing basis.

Other considerations:

- *Error of estimation of the mean:*
  - High turnover frequency of the stock portfolio,
  - Low or no dividend stocks in portfolio,
  - Regulatory and tax issues,
  - Political uncertainty.
- *Deterioration of the mean:*
  - Economic conditions are deteriorating,
  - Loss of expertise in the investment area.

#### **2.4.2.2 Real Estate**

Margins could be applied to the whole portfolio or vary by property depending on whether or not there is significant variation of risks within the portfolio.

Examples of significant considerations for real estate as per SOP sections 2340.001 and 2340.002:

- *Error of estimation of the mean:*
  - Future experience difficult to estimate:
    - Higher volatility of the asset portfolio,
    - Lack or loss of expertise in setting expected cash flows,
- *Deterioration of the mean:*
  - Concentration or lack of diversification: Lack of diversification in the real estate portfolio (number of holdings/average size, type of development, geographic distribution, maturity of lease agreements),
  - Operational risks: Limited ability to track credit quality on an ongoing basis.

Other considerations:

- *Error of estimation of the mean:*
  - Economic conditions are deteriorating,
  - Current leasing rates in excess of market rates,
  - Poor financial condition of major tenants,
  - Leases of major tenants coming up for renewal,
  - Accuracy of real estate appraisals (reliance on investment staff to do projections, degree of comfort with determination of expected cash flows, time since appraisals were done, presence of properties under development),
  - Environmental concerns,

- Significant amount of vacant space (within portfolio and within surrounding market),
  - Escape clauses,
  - Preferred rate extension clauses,
  - Expected redevelopment costs,
  - Real estate is leveraged without long-term leases that immunize the level of risk,
  - Relative illiquidity of assets in the portfolio,
  - Political instability.
- *Deterioration of the mean:*
- Economic conditions are deteriorating,
  - Loss of expertise in the investment area.

### 3 – NON-ECONOMIC ASSUMPTIONS

SOP section 2320.083 states: “The margin for adverse deviations would be at least the average of the applicable high and low margin whenever at least one ‘significant consideration’ exists, or at least one other consideration is significant in the context of the valuation. ‘Significant considerations’ vary by type of assumption and are described under sections 2340 and 2350.”

SOP section 2350.03 states: “The following significant considerations indicate difficulties in properly estimating the mean:

the credibility of the company’s experience is too low to be the primary source of data,  
future experience is difficult to estimate,  
the cohort of risks lacks homogeneity,  
operational risks adversely impact the likelihood of obtaining expected results, or  
the derivation of the best estimate assumption is unrefined.”

SOP section 2350.031 states: “Other significant considerations indicative of a potential deterioration of the mean include:

there is significant concentration of risks and/or lack of diversification,  
operational risks adversely impact the likelihood of continuing to obtain expected results, or  
past experience may not be representative of future experience and the experience may deteriorate.

Other significant considerations may exist, but are tied to specific assumptions. Where applicable, they are described below.”

Each of these significant considerations would be taken into account when determining the margin for adverse deviations for any of the non-economic assumptions. For each assumption,

examples are provided of some of the significant considerations, along with assumption-specific, significant considerations that are identified in SOP section 2350 and other considerations that would be useful for the actuary to consider.

### **3.1 – Insurance Mortality**

#### **3.1.1 Introduction**

SOP section 2350.07 states: “The low and high margins for adverse deviations for the mortality rate per 1,000 are respectively an addition of 3.75 and 15, each divided by the best estimate curtate expectation of life at the life insured’s projected attained age.”

SOP section 2350.06 states: “If the actuary’s best estimate assumption includes a secular trend toward lower mortality rates whose effect is to reduce the policy liabilities, then it is prescribed that the actuary negate that trend by an offsetting increase or decrease in what the actuary would otherwise select as a margin for adverse deviations.”

Accordingly, an expectation of future mortality improvement beyond the valuation date does not justify the use of a lower margin for adverse deviations that would be appropriate in the absence of such an expectation.

The best estimate curtate expectation of life ( $e_x$ ) would be calculated without the inclusion of a secular trend towards lower mortality rates. The total margin would include both the reversal of the secular trend and the selected constant divided by the life expectancy; as a result, the total margin may very well exceed the high margin in the absence of a secular trend.

#### *Situation where a decrease in mortality increases the policy liabilities*

With respect to death-supported policies (i.e., policies where a decrease in mortality rates increases the policy liabilities), a negative margin for adverse deviation (or mortality improvements) would increase the policy liabilities.

Death-supporting can occur when the amount ceded under a reinsurance treaty, currently or prospectively, exceeds the direct net amount at risk. This situation is not uncommon when high percentage quota share yearly renewable term (YRT) reinsurance arrangements ceding a level net amount at risk have been used for Term to 100 or Universal Life (UL) Level Cost of Insurance (COI) policies.

Other situations may create a similar dynamic and the same impact would result.

The actuary would ensure that the company’s mortality provisions for adverse deviation is appropriate in aggregate (SOP, section 2320.081). Section 2.3 (Aggregation to Take Into Account other than Interest Rate Risk Synergies) of the Educational Note titled, “Aggregation and Allocation of Policy Liabilities”, provides advice in this regard. Note that it would be appropriate for the actuary to assume a negative mortality margin for adverse deviation if this is necessary to produce a positive mortality provision for adverse deviation at the chosen level of aggregation. If this is the case and mortality improvement is anticipated, the actuary would not reverse the allowance for future mortality improvement. Furthermore, the actuary would ensure that sufficient mortality improvement has been factored in to reflect the anticipated improvement in mortality experience as the absence of reversal makes the mortality improvement assumption critical.

In order to ensure that the margin for adverse deviations increases policy liabilities, the choice between addition and subtraction may need to vary by scenario, age, policy duration, and other parameters.

To apply this methodology, a grouping of policies could be used. The grouping would apply to products with similar characteristics. Sensitivity testing may be required to determine the proper application of the margin for adverse deviation.

### **3.1.2 Considerations leading to a margin of at least the average of the high and low margins**

#### Examples of significant considerations as per SOP sections 2350.03 and 2350.031:

##### o *Error of estimation of the mean:*

- Low credibility: The credibility of the company's experience and studies is too low to be the main source of data,
- Future experience difficult to estimate:
  - Untested refinements in underwriting criteria have been recently introduced
  - There is a new type of benefit or a new way of distributing the products,
- Lack of homogeneity: The cohort of risks lacks homogeneity,
- Unrefined derivation of the best estimate assumption:
  - Approximations are made to establish joint ages under a joint life policy or benefit, using either an equivalent single age or a joint equivalent age.
  - Not all the necessary information is available to determine mortality rates.

#### Other considerations:

##### o *Error of estimation of the mean:*

- There have been recent changes in underwriting standards or methods of classification.

##### o *Deterioration of the mean:*

- Antiselection is present from explicit or implicit *reentry* options for healthy lives or from underwriting criteria,
- Unfavourable medical developments,
- The persistency rate of the product is low,
- The insurer has been slow, historically, to protect itself against changes which adversely affect it,
- Antiselection on certain options and benefits (paid-up addition, guaranteed insurability options, conversion privilege) affects the mortality of certain specific plans of an insurer,
- A policy of internal replacement is favourable to rotation of the old business and its impact is not supported by a credible body of experience,

- The premium structure does not recognize mortality differentials as precisely as the rest of the market so creates an incentive for antiselection either at issue or through lapse (e.g., premiums are not gender distinct, do not vary by smoking habit and/or do not recognize preferred underwriting),
- Antiselection by the sales force.

*Products underwritten on a preferred basis or offered in a preferred underwriting environment*

For products underwritten on a preferred basis, the margin would be at least the average of the low and the high margins for years where no credible experience exists, in accordance with SOP, sections 2350.03 and 2350.031. For durations without credible experience, the margins are normally higher than the margins for adverse deviations applied to standard regular underwriting mortality assumptions, at least until the time the effect of preferred underwriting is assumed to wear off.

Another consideration to keep in mind in setting the mortality margins for adverse deviations is that the recent market proliferation of preferred underwriting products may have impacted both mortality and persistency assumptions of products offered on a non-preferred basis, and both for those currently being offered and those that have been sold in the past.

### **3.2 – Annuity Mortality**

#### **3.2.1 Introduction**

SOP section 2350.12 states: “The low and high margins for adverse deviations are respectively a subtraction of 5% and 15% of the best estimate.”

#### **3.2.2 Considerations leading to a margin of at least the average of the high and low margins**

*Examples of significant considerations as per SOP sections 2350.03 and 2350.031:*

- *Error of estimation of the mean:*
  - Low credibility: The credibility of the company’s experience and studies is too low to be the main source of data,
  - Lack of homogeneity: The valuation information does not distinguish annuitants by sex,
  - Future experience difficult to estimate: The experience is subject to large fluctuations over time, making determination of the best estimate assumption more uncertain.

- *Deterioration of the mean:*
  - Operational risks: The company's payment controls and recovery practices do not prevent material erroneous overpayments,
  - Specific annuity mortality risk (SOP section 2350.13): Commutation of survival dependent benefits is permitted after periodic payments have started.

*Other considerations:*

- *Error of estimation of the mean:*
  - The product was issued on the basis of substandard mortality,
  - Exposure to back-to-back arrangements,
  - The class of risks reflects new terms and conditions.
- *Deterioration of the mean:*
  - The insurer has been slow historically to protect itself against changes which adversely affect it,
  - The presence of favourable medical developments.

### **3.3 – Morbidity**

#### **3.3.1 Introduction**

SOP section 2350.17 states: “The low and the high margins for adverse deviations are respectively an addition of 5% and 20% of the best estimate of morbidity incidence rates, and a subtraction of 5% to 20% of the best estimate morbidity termination rates. The actuary's selection would reflect any expected correlation between incidence and termination rates.”

*Various benefits provide protection against morbidity risks, the major risks covered are disability, medical expenses, dismemberment, accidental death, critical illness and long-term care.*

#### **3.3.2 Considerations leading to a margin of at least the average of the high and low margins**

*Examples of significant considerations as per SOP sections 2350.03 and 2350.031:*

- *Error of estimation of the mean:*
  - Low credibility: The credibility of the company's experience and studies is too low to be the main source of data,
  - Future experience difficult to estimate:
    - Underwriting and claims adjudication practices, including rehabilitation have changed recently,
    - The experience is subject to large fluctuations over time, making determination of the best estimate assumption more uncertain,
    - The company underwriting expertise or access to such expertise is limited,

- Untested refinements in underwriting criteria,
- Definition of insured events evolved with time and no or little experience has developed,
- Lack of homogeneity: Different definitions apply,
- Operational risks:
  - Underwriting and claims adjudication practices, including rehabilitation, are not well managed,
  - The experience is inadequately monitored,
- Unrefined derivation of the best estimate assumption: Experience studies of insurance claim costs do not separate incidence from termination rates,
- Specific morbidity risk (SOP section 2350.18):
  - Definitions of claim events are not precise and/or provide for potential antiselection,
  - Interpretation of claim event definitions by the court is uncertain.
- *Deterioration of the mean:*
  - Past not representative of the future:
    - Economic conditions are deteriorating or have deteriorated,
    - Moral hazard resulting from cultural shifts or changing legal environment,
  - Operational risks: Inadequate monitoring of company experience,
  - Specific morbidity risk (SOP section 2350.18):
    - The contract wording is not tight enough to provide protection against the impact of medical advances.

*Other considerations:*

- *Error of estimation of the mean:*
  - Exposure is concentrated by industry, occupation or geography,
  - Underwriters or claims personnel are trained primarily for other lines of business,
  - Anti-selection by the sales force.
- *Deterioration of the mean:*
  - The experience is likely to be affected by cyclical influences,
  - The insurer has been slow historically to protect itself against changes that adversely affect it,
  - Advances in diagnostic techniques,
  - Changes in the medical definition of the insured conditions.

### **3.4 – Withdrawal and Partial Withdrawal**

#### **3.4.1 Introduction**

SOP section 2350.25 states: “The low and high margins for adverse deviations are respectively an addition or subtraction, as appropriate, of 5% and 20% of the best estimate withdrawal rates. In order to ensure that the margin for adverse deviations increases policy liabilities, the choice between addition and subtraction may need to vary by interest scenario, age, policy duration, and other parameters. In the case of partial withdrawal, two assumptions are needed – the amount withdrawn and the partial withdrawal rate.”

In establishing the margin for the withdrawal risk, the actuary is to comply with the spirit and intent of the standard – i.e., that the valuation results appropriately take into account the potential for the direction of lapse sensitivity to change by interest scenario, age, policy duration, and other parameters. However:

- It is appropriate for the actuary to strike a reasonable balance between the theoretical ideal and the practical constraints on valuation, and use his or her judgment as to the appropriateness and materiality of approximations used, and in the resulting level of margins for adverse deviations selected.
- Sensitivity testing may be required to determine the proper application of the margin for adverse deviations. The actuary would do sufficient sensitivity testing to ensure that he or she understands the changes in exposure by parameters and can defend the appropriateness and materiality of the approximations used.

Reasonable grouping of policies with similar characteristics can be applied for this purpose, however, it would generally not be appropriate to group lapse-supported products with non-lapse-supported products. It would generally be appropriate to combine blocks of business, which exhibit similar characteristics within the context of sensitivity to withdrawals.

#### **3.4.2 – General Considerations**

Surrender benefits are paid by selling supporting assets at market rates and the sign of the lapse margin is determined by comparing the book value of the assets to be sold with the allocated book value of the corresponding liabilities.

#### **3.4.3 Considerations leading to a margin of at least the average of the high and low margins**

##### **3.4.3.1 Situations where a decrease in lapse rates increase policy liabilities**

Examples of significant considerations as per SOP sections 2350.03 and 2350.031:

- *Error of estimation of the mean:*
  - Low credibility:
    - The company has little internal experience,
    - The actuary uses pricing assumptions not supported by appropriate experience sources,
    - Exclusive reliance on inter-company data or other external sources.

- Future experience difficult to estimate:
  - New product or new type of coverage,
  - The experience is subject to large fluctuations over time.
- Lack of homogeneity: The cohort of risks lacks homogeneity.
- *Deterioration of the mean:*
  - Past experience not representative of future experience and likely to deteriorate:
    - Tax changes have occurred which make inforce policies significantly more valuable as a result of grandfathering;
    - Secondary markets have been created for the policies (e.g., viaticals),
  - Specific withdrawal risks (SOP section 2350.26):
    - The remuneration policy favours persistency,
    - The cancellation of a contract would be clearly detrimental to the policyholder.

*Other considerations:*

- *Error of estimation of the mean:*
  - The economic environment has been unstable in the recent past.
- *Deterioration of the mean:*
  - The experience is likely to be affected by cyclical influences (for example, under a decreasing interest rate environment, it may be expected that withdrawal rates would decrease unless the decrease in interest rates is passed on to existing policyholders),
  - The company set itself apart through product design rather than competitive premiums,
  - The company seldom changes product line,
  - The company has been quick to protect itself in the past against changes which adversely affect it such as:
    - Improvement of existing contracts
    - Modified remuneration
  - The company improves existing products rather than implementing an internal replacement policy
  - The policyholder may select against the company.

**3.4.3.2 Situations where an increase in lapse rates increase policy liabilities**Examples of significant considerations as per SOP sections 2350.03 and 2350.03:

- *Error of estimation of the mean:*
  - Low credibility:
    - The company has little internal experience,
    - Exclusive reliance on inter-company data or other external sources,
  - Future experience difficult to estimate:
    - New product or new type of coverage,
    - The experience is subject to large fluctuations over time,
  - Lack of homogeneity: The cohort of risks lacks homogeneity,
  - Specific withdrawal risk (SOP section 2350.26):
    - There is no market value adjustment on withdrawals for deposits and deferred annuities,
    - The company's contracts have provisions where rating decreases have the potential to trigger additional withdrawals.
- *Deterioration of the mean:*
  - Specific withdrawal risks (SOP section 2350.26):
    - The remuneration policy encourages terminations,
    - The policyholder stands to gain significantly from canceling the contract (e.g., decreasing term).

Other considerations:

- *Error of estimation of the mean:*
  - Economic conditions are deteriorating or have deteriorated.
- *Deterioration of the mean:*
  - The experience is likely to be affected by cyclical influences (for example, under an increasing interest rate environment, it may be expected that withdrawal rates would increase under products not passing the increased interest rates to its existing policyholders),
  - The insurer has been slow, historically, to adjust to changes affecting the persistency of its product,
  - The company competes on the basis of premium and does not set itself apart through product design,
  - The company frequently changes its product line,

- The company depends entirely on the sales force in its contacts with the insured and turnover among the sales force is high,
- Rather than improving the product in question, the company implements an internal replacement policy,
- The product depends on an environment that will be favourable in the short term only,
- The product was an innovative one that is now subject to competition,
- The policyholder may select against the company.

### **3.5 – Expenses**

#### **3.5.1 Introduction**

SOP section 2350.38 states: “The low and high margins for adverse deviations are respectively 2.5% and 10% of best estimate expense including inflation thereof. No margin for adverse deviations is needed for a tax, such as a premium tax, whose history has been stable.”

SOP section 2350.32 states: “The assumption would provide for future expense inflation consistent with that in the interest rate scenario.” No additional margin on inflation is anticipated or required.

#### **3.5.2 Special considerations**

Outsourcing the administration of claim payments, premium collection or investment management at known cost may allow the actuary to use a margin lower than the minimum. However, the actuary would consider the risk that the administrator does not honour the terms of the contract.

#### **3.5.3 Considerations leading to a margin of at least the average of the high and low margins**

Examples of significant considerations as per SOP section 2350.03 and 2350.031:

○ *Error of estimation of the mean:*

- Future experience difficult to estimate:
  - Acquisition or sale of a material block of business,
  - The expense experience has been volatile.
- Specific expense risk (SOP section 2350.39):
  - The distribution of general expenses by line of business, by product, by issue and administrative expenses is not based on a recent internal expense study,
  - The allocation is not an appropriate basis for the best estimate expense assumption,
  - The expense study does not adequately reflect the appropriate expense drivers,
  - Future reductions in unit expenses (before inflation) are assumed.

○ *Deterioration of the mean:*

- Past not representative of the future:
  - Expense rates vary among different distribution systems and the distribution of business among distribution systems is unstable and impacts unit costs,
  - The volume of new business and inforce amounts, as well as their respective growth or decline rate are very unstable,
- Operational risks: Cost controls are inadequate.

*Other considerations:*

○ *Error of estimation of the mean:*

- A change is likely in the distribution of the inforce among lines of business or products that can alter unit expense rates.

○ *Deterioration of the mean:*

- The renewal compensation paid is calculated as a function of lapse rates or other variables which can fluctuate and such fluctuation is not modeled,
- The experience is likely to be affected by cyclical influences,
- The insurer has been slow, historically, to protect itself against changes which adversely affect it,
- The regulatory environment is changing or has recently and its impact is not well known.

### **3.6 – Policyholder Options**

#### **3.6.1 Introduction**

Examples of policyholder options are options to purchase additional insurance, to convert term to permanent insurance, to select the extended term insurance non-forfeiture option, to make partial withdrawal from a universal life insurance policy, to select the amount of premium for a flexible premium policy and to purchase an annuity at a guaranteed rate.

The valuation assumption for each policyholder option is the sum of a best estimate assumption plus a margin for adverse deviations. The standards do not specifically discuss a standard range of margins for adverse deviations for policyholder options. It would be reasonable to assume a margin in the 5% to 20% range of the best estimate option utilization assumption. Sensitivity testing could be helpful when multiple assumptions interact to achieve a reasonable level of margin in aggregate. The margin would be a negative or a positive percentage of the best estimate assumption. In order to ensure that the margin for adverse deviations increases policy liabilities, the choice between addition and subtraction may need to vary by scenario, age, policy duration, and other parameters.

To apply this methodology, a reasonable grouping of policies could be done. The grouping would apply to products with similar characteristics. Considerations to take into account when grouping policies can be found in the educational note titled, “Aggregation and Allocation of

Policy Liabilities.” Sensitivity testing may be required to determine the proper application of the margin for adverse deviation.

### 3.6.2 General Considerations

For modeling simplicity purposes, the actuary may have combined various policyholder options into one net assumption. As an example, in a universal life product, rather than modeling partial withdrawals and premium (deposit) persistency separately, the actuary has chosen to model net deposits only. In setting an appropriate margin, the actuary would ensure that the level of margin is appropriate to the total risk exposure of the company and the determination of both best estimate assumptions. In the above example, the resultant margin would be larger than the stand-alone margins.

### 3.6.3 Considerations leading to a margin of at least the average of the high and low margins

Examples of significant considerations as per SOP sections 2350.03 and 2350.031:

○ *Error of estimation of the mean:*

- Low credibility: The company has little internal experience,
- Future experience difficult to estimate:
  - The class of risks reflects new terms and conditions,
  - Potential antiselection through partial withdrawals on Universal Life Level Cost of Insurance contracts with level amounts of insurance
- Lack of homogeneity: The cohort of risks lacks homogeneity.

Other considerations:

○ *Error of estimation of the mean:*

- The product depends on an environment that could be favourable in the short term only (e.g., current taxation policies).
- Possible antiselection by the policyholder in respect of minimum guarantees.

○ *Deterioration of the mean:*

- The experience is likely to be affected by cyclical influence,

The experience is likely to be affected by changing economic environment.