

# ILA LFVC Model Solutions

## Spring 2019

### 1. Learning Objectives:

3. The candidate will understand and apply emerging financial and valuation standards, principles and methodologies.

### Learning Outcomes:

- (3a) Describe emerging developments impacting Canadian valuation, capital, and International Financial Reporting frameworks, and assess their impact on the valuation of reserves, capital and financial statements

### Sources:

IFRS 17 Insurance Contracts – IFRS Standards Effects Analysis, May 2017, IASB

### Commentary on Question:

*This question tested the candidates' knowledge of IFRS 17 and its application to insurance contracts. Credit was given based on the justification and not on a simple identification of true vs. false statements.*

### Solution:

Critique the following statements regarding IFRS 17:

- A. *IFRS 17 affects the same population of contracts as IFRS 4: insurance contracts issued, reinsurance contracts held, and investment contracts with discretionary participation features issued.*

### Model solution to Part A:

Statement is false.

Under IFRS 17, the first two groups of policies are identical between IFRS 4 & 17. However, under IFRS 17 contracts with discretionary participation features must be issued by a company that also issues insurance contracts.

### Commentary on Part A:

*Many candidates indicated that IFRS 4 and IFRS 17 applied identically to the first two groups of policies and received partial credit. However, a complete answer noted the key fact that contracts with discretionary participation features must be issued by a company that issues insurance contracts.*

## 1. Continued

- B. *All assumptions used to calculate fulfillment cash flows and the contractual service margin (CSM) are current assumptions. The cash flows and assumptions are updated at each reporting date, using current estimates.*

### **Model solution to Part B:**

Statement is false.

Under IFRS 17, assumptions used to calculate the CSM and fulfilment cash flows (FCF) are current assumptions, except for the discount rate used for non-variable contracts. These are calculated as at initial recognition of the contracts (issue).

### **Commentary on Part B:**

*The key item to note is that the calculation of the CSM uses discount rates determined at issue. Stating this, in addition to the fact that assumptions used to calculate CSM and FCF are current assumptions, would receive full credit.*

- C. *There is no special treatment for contracts with a variable fee (compared to all other IFRS 17 applicable contracts) in recognizing fulfillment cash flows, changes due to discount rates and other financial variable changes.*

### **Model solution to Part C:**

Statement is false.

Variable fee contracts are treated differently under IFRS 17. For general contracts without variable fee, changes are reported in the statement of comprehensive income (profit or loss or other comprehensive income). For contracts with variable fee, the CSM is adjusted to reflect the changes in the variable fee, which included some changes in discount rates and other financial variables.

### **Commentary on Part C:**

*Successful candidates were able to not only identify that contracts with a variable fee are treated separately, but also have a comparison of the methods with and without a variable fee to show how they are different.*

- D. *In the event of non-economic assumption updates, changes that relate to current or past insurance coverage are recognized in profit or loss; changes that relate to future coverage are recognized by adjusting the CSM.*

### **Model solution to Part D:**

Statement is false.

For future changes, it can only be adjusted through CSM when there is an existing CSM and it's greater than 0. Also, the CSM cannot go negative. If CSM is zero or negative, the changes are recognized in profit or loss.

## 1. Continued

### **Commentary on Part D:**

*Future coverage changes can only be recognized through CSM if it is greater than zero. Candidates generally got credit for this statement. However, full credit would have been realized by noting that changes flow through profit or loss if CSM is negative or zero.*

*E. IFRS 17 helps to eliminate the economic mismatches between insurance contract liabilities and assets by using a discount rate based on the characteristics of the liability.*

### **Model solution to Part E:**

Statement is false.

The economic mismatch occurs regardless of whether the old or new accounting method is used. The use of a discount rate based on the liability makes the mismatch clearer, compared to an asset yield discount rate which can obscure the mismatch.

### **Commentary on Part E:**

*The key fact to note is that the economic mismatch occurs regardless of which accounting method is used.*

*F. Under IFRS 17, a company can group contracts within a portfolio into: 1) those contracts that are onerous at initial recognition and 2) those contracts that are not onerous at initial recognition. In addition, a group of contracts cannot include contracts issued more than one year apart.*

### **Model solution to Part F:**

Statement is false.

Under IFRS, company can group contracts into

- 1) Onerous at initial recognition (issue)
- 2) Not onerous at issue, and no significant possibility of becoming onerous in the future
- 3) Remaining contracts

Also, a group of contracts cannot include contracts issued more than 1 year apart, so this is true.

### **Commentary on Part F:**

*This section was generally answered well by candidates. To receive full credit candidates had to identify that contracts that are not onerous should be divided into two groups as above.*

*G. Under IFRS 17, a company can: 1) include an explicit, current risk adjustment in the measurement of insurance contracts; 2) use risk adjustment for some contract types but not for others; 3) use an implicit risk margin or allowance.*

## 1. Continued

### **Model solution to Part G:**

Statement is false.

These are all allowed approaches under existing insurance accounting practices, where companies can choose any method to set risk margins, whether explicit or implicit, all products or certain products only, etc.

However, under IFRS 17, a company is required to specify an explicit risk margin for all insurance contracts and to provide relevant exposures.

### **Commentary on Part G:**

*To receive full credit candidates had to identify that IFRS 17 requires an explicit risk margin for all type of insurance contracts.*

## 2. Learning Objectives:

1. The candidate will understand financial statements and reports of Canadian life insurance companies as well as the professional standards addressing financial reporting and valuation.

### Learning Outcomes:

- (1c) Describe, apply and evaluate regulatory documentation and disclosure requirements.
- (1e) Apply and recommend methods for performing reviews of financial statements including reserves.

### Sources:

LFV-102-09: Actuarial Review of Reserves and Other Annual Statement Liabilities

Actuarial Aspects of SOX 404, Financial Reporter #59, December 2004

Responsibilities of the Actuary for Communicating Sarbanes-Oxley control: Effectiveness in Accordance with Actuarial Standards of Practice, Financial Reporter #59, December 2004

### Commentary on Question:

*Commentary listed underneath question component.*

### Solution:

- (a) Describe the four key risk areas impacting the processes for determining actuarial amounts in the financial statements.

#### Commentary on Question:

*Candidates generally did well on this part of the question. To receive full credit candidates were expected not only to identify each of the four risks, but to elaborate with supporting details.*

4 key risk areas impacting the processes for determining actuarial amounts in the financial statement are as below:

#### (1) Data

- It's the process of gathering and interpreting data (might include policy inventories, paid claims, experience studies, etc.)
- For example, failing to update an extract program to include new plans can result in policy reserves to be understated.

#### (2) Actuarial valuation systems

- It's the programs, spreadsheets and other processes used to calculate reserves, DAC, etc.
- For example, incorrectly coding system modifications may result in errors in calculations and a misstatement of output.

## 2. Continued

### (3) Compilation process

- It is the process of compiling calculated reserves and other pieces of financial statement balances for input to the statement assembly.
- For example, the compilation process is too complex which includes manually inputting large numbers of separate calculations into a compilation spreadsheet, and therefore it is easy to lead to a misstatement of results.

### (4) Management review process

- It is the way in which management evaluates the processes involved in data gathering and interpreting actuarial valuations and the compiling the results.
- For example, there is excessive reliance on a key individual for a specific subprocess. Actuarial resources are thinly spread across the organization, with little cross-training.

(b) Critique the statements below from the Chief Financial Officer of ABC with regard to best practices for adherence to SOX 404:

- A. *Internal controls have no obvious benefit.*
- B. *Only processes that directly support the compilation of GAAP reserves and DAC should be included in the company's internal controls, and there is no reason to include other processes at all.*
- C. *Once the compilation task is peer reviewed, I will attest, and no further action will be necessary.*
- D. *Our actuary will respond to auditor queries only pertaining to the appropriateness of the method of compilation.*

### **Commentary on Question:**

*This part of the question tested required the candidate to defend the importance of SOX 404, to describe the shortcomings of ABC's policies, and to provide alternatives.*

A. Internal controls have no obvious benefit.

Critique: The primary benefit of an effective internal control structure is to provide the company, its management, its board and audit committee, and its owners and other stakeholders with a reasonable basis on which to rely on the company's financial statements.

## 2. Continued

- B. Only processes that directly support the compilation of GAAP reserves and DAC should be included in the company's internal controls, and there is no reason to include other processes at all.

Critique: The scope of the above statement is too narrow. Reasons are:

- 1) Since financial statements also depend on other processes, the scope of internal controls need be expanded. Examples of other processes are the pricing process (setting up pricing assumptions), the modeling process, the construction of experience studies, the underwriting process, and the statutory reserving process.
- 2) Risk identification must be expanded not just to compilation processes but data, actuarial valuation systems, and management review processes as well.

- C. Once the compilation task is peer reviewed, I will attest, and no further action will be necessary.

Critique: Peer review is not a sufficient control.

- 1) An example of controls is to reconcile the total inputs versus total outputs that are produced by a computer process. (Other accepted examples of controls include but not limit to:
  - formal review processes to assess calculations, methodologies and assumptions are accurate and appropriate;
  - reconciliation the results to the general ledger;
  - review by the chief actuary; have a regular review by the management regarding the changes in actuarial assumptions and methodologies;
  - periodic sample testing of the calculations;
  - trending and other analytical analysis of the actuarially determined balances;
  - password protection of the key spreadsheets and other programs;
  - cross-training of personnel to eliminate over-reliance on a single person.
- 2) Testing of controls  
After assessment of controls, testing of controls are needed. One need determine what actions are necessary to define the effectiveness of the control, add/change the test steps for each control, execute the test activities, document the test results, prepare a remediation plan for the control if it is determined as ineffective.

## 2. Continued

### 3) Documentation

A key component of SOX 404 is the documentation which is reviewed by both internal and external auditors. What to be included in the documentation are formal identification of processes and sub-processes in the actuarial area which impact the financial statement, identification of the risks involved with these processes and subprocesses, narrative descriptions of the process and subprocesses, process flow charts, a control matrix, and documentation of testing the controls.

- D. According to ASOP 21 the responding actuary should be prepared to discuss the data used and the sources of assumptions along with the methods used. The responding scope is too narrow for this statement. SOX44 requires an independent auditor to access the validation of the internal controls for financial reporting. The method of compilation is one the steps, but other steps, such as assumption, should be also reviewed.

- (c) Evaluate the reasonableness of ABC's reported change in statutory reserves for the two blocks. Justify your answer with an appropriate formula ratio test. Show all work.

#### **Commentary on Question:**

*Candidates generally did better on the term life calculation and struggled with life annuities calculation. Some candidates did not use the proper formula for the ratio test.*

Term Life:

$$M_0 + P + I - C - V_d - V_T = M_1$$

$$\text{Trend Ratio} : \frac{C - I}{M_0 + 0.5P} \text{ or } \frac{C}{\text{Average Amount at Risk}}$$

C - cost of mortality

I - Tabular Interest

P - Premium

V<sub>d</sub> - Reserve release by death

V<sub>t</sub> - Reserve release by other terminations

M<sub>0</sub> - Beginning Reserve

M<sub>1</sub> - Ending Reserve

For 2016:

$$C = M_0 + P + I - M_1 - V_d - V_T$$

$$C = 2407 + 1115 + 100 - 2478 - 93 - 62$$

$$C = 989$$

$$C - I = 989 - 100 = 889$$

$$\text{Trend Ratio} = \frac{889}{2407 + 0.5 \cdot 1115} = 29.99\%$$



## 2. Continued

| Term Life   | 2016   | 2017   | 2018   |
|-------------|--------|--------|--------|
| C           | 989    | 1,021  | 1,291  |
| C-I         | 889    | 918    | 1,183  |
| Trend Ratio | 29.99% | 30.08% | 37.16% |

The tabular mortality has increased significantly in 2018 from prior years. It seems something has changed in the mortality profile of the block, which should be questioned.

Life Annuities:

$$M_0 + P + I + \frac{(T - A) - \text{Payments}}{T} = \frac{M_1}{T}$$

$$\text{Trend Ratio} = \frac{\text{Beginning Reserve}}{\text{Ending Reserve}} \text{ or } \frac{\text{Beginning Reserve}}{\text{Ending Reserve}}$$

Payments – Payments to Annuitants

I - Tabular Interest

P – Premium

T – Tabular Reserve Release by death

A – Actual Reserve Release by death

M0 – Beginning Reserve

M1 – Ending Reserve

For 2016:

$$T = M_1 - P - I + A - M_0 + \text{Payments}$$

$$T = 479 - 0 - 24.75 + 13 - 512 + 58$$

$$T = 13.25$$

$$\text{Trend Ratio} = \frac{13.25}{512} = 2.59\%$$

| Life annuities                  | 2016  | 2017  | 2018  |
|---------------------------------|-------|-------|-------|
| T                               | 13.25 | 12.25 | 11.50 |
| Trend Ratio (Beginning Reserve) | 2.59% | 2.56% | 2.63% |
| Trend Ratio (Ending Reserve)    | 2.77% | 2.80% | 2.70% |

This is a stable trend, indicating the change in reserves is reasonable.

### 3. Learning Objectives:

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by Canadian life insurance companies.

#### Learning Outcomes:

- (2c) Recommend and justify appropriate valuation assumptions.

#### Sources:

CIA Educational Note: Expected Mortality: Fully Underwritten Canadian Individual Life Insurance Policies: July 2002 (excl. appendices)

LFV-634-18: CIA Standards of Practice: Insurance Sections 2100, 2300, 2500, April 2017

CIA Educational Note: Margins for Adverse Deviations (Mfad) – November 2006

Final Communication of a Promulgation of Prescribed Mortality Improvement Rates and Associated Margins for Adverse Deviations, ASB, July 2017

#### Commentary on Question:

*The question tested the candidates' ability to review available data, identify needed information for underwriting and set the appropriate margin for adverse deviations for business issued by Canadian life insurers. It also tests the candidates' knowledge of applying diversification between death sensitive and death supported blocks of business.*

#### Solution:

- (a)
- (i) Describe the additional data parameters traditionally used as inputs when developing a life insurance mortality table.
  - (ii) Recommend which of the inputs in (i) are appropriate to include when building the mortality table for OAP's funeral insurance product.
  - (iii) Describe the additional data parameters traditionally used as inputs when developing an annuity mortality table.
  - (iv) Recommend which of the inputs in (iii) are appropriate to include when building the mortality table for OAP's annuity product.
  - (v) List two other concerns or considerations regarding data used when creating these new tables.

### 3. Continued

**Commentary on Question:**

*Candidates generally did well on this part of the question. Most candidates were able to recommend smoking status when developing both life and annuity mortality tables. A common mistake was to include face amount for funeral insurance. Few candidates were able to recommend the size of premium for building annuity mortality table.*

- (i) A life mortality table might also depend on smoking status and duration. Other factors include face amount, health and life style.
- (ii) Smoking status should be added. Duration, health and lifestyle don't apply because this product is issued without underwriting. Given that the coverage is for basic funeral service, the face amount may not apply.
- (iii) An annuity mortality table might also depend on smoking status, registration/product type, size of premium and mortality improvement.
- (iv) Smoking status and mortality improvement should be added to annuity study as well. Size of premium could also be considered. The product/registration type may not apply.
- (v) The fact that this product was initially sold through service centers and seniors clubs could indicate a concentration of risk. This may lead to a potential deterioration of the best estimate assumption.

The product has been recently sold through the internet so past experience that may not be representative of future experience. This may also lead to a potential deterioration of the best estimate assumption

After splitting the study up, the data may no longer be credible and may need to combine it with an appropriate industry study. A company's own mortality experience for a particular block of business is usually the most relevant source of data.

Offshoring the data administration may lead to a potential deterioration of the best estimate assumption.

- (b) Determine an appropriate MfAD for both mortality tables. Justify your answer.

**Commentary on Question:**

*Candidates generally did well on this part of the question. Most candidates proposed a margin between the mid-point and high end for both insurance and annuity.*

### 3. Continued

For life mortality table: the low and high margins for adverse deviations for the mortality rates per 1,000 would be respectively an addition or subtraction, as appropriate, of 3.75 and 15, each divided by the curtate expectation of life at the life insured's projected attained age.

Given the recent change of distribution channel and data administration, the past experience might no longer be fully credible. The mortality MfAD should be at least the average of the high and low margins, that is,  $+9.375/e_x$  (positive for not death-supported).

For annuity mortality table: the low and high margins for adverse deviations for the mortality rates would be respectively a subtraction of 2% and 8% of the best estimate.

Given the recent change of distribution channel and data administration, the past experience might no longer be fully credible. The mortality MfAD should be at least the average of the high and low margins, that is, -5% (negative because it is a subtraction from the best estimate).

- (c)
- (i) Recommend if OAP should apply a diversification factor in its Future Mortality Improvement (FMI) Margin when determining its mortality tables. Justify your answer.
  - (ii) You are given the following table showing the impact of applying the FMI margin without diversification to the base mortality improvement rates. Each impact on actuarial liabilities is the highest increase under the two mortality improvement scenarios.

|                   | <b>Funeral Insurance</b> | <b>Annuities</b> |
|-------------------|--------------------------|------------------|
| <b>Ages 60-69</b> | 50                       | 5                |
| <b>Ages 70-79</b> | 100                      | 125              |
| <b>Ages 80+</b>   | 20                       | 75               |

Determine if a diversification factor of 0.30 is acceptable under the standards of practice for each age group. Show all work.

#### **Commentary on Question:**

*For part (i), most candidates correctly recommended a diversification factor between 0 and 0.5. To receive full credit, candidates needed to list considerations for diversifications.*

*For part (ii), candidates generally did not do well. Few candidates were able to answer the acceptance criteria of a diversification factor for each age group.*

### 3. Continued

- (i) When an insurer has both death-sensitive and death-supported blocks of business, the actuary could consider applying a diversification factor and using a lower margin for adverse deviations. Considerations for diversification would include:
- a) The blocks of business are of similar composition in terms of distribution by attained age, gender and country of issue and residence, similar access to emerging health care advances and of similar durations. All of these apply to OAP's business except the 'similar durations', as it's insurance sold since 1980 while Annuities since 2002.
  - b) The socioeconomic profiles of the underlying population of each block should be similar. Both the annuities and funeral insurance are being sold basically to the same group of people, that is, seniors without a lot of money but wise enough to prepare for the future.

The diversification factors would be between 0 and 50% of the margin for adverse deviations

- (ii) Total increase on insurance liability =  $50 + 100 + 20 = 170$   
Total increase on annuity Liability =  $5 + 125 + 75 = 205$   
Diversification Factor =  $(5+100+20) / (170+205) = 0.333$

The actuary should choose a diversification factor that satisfy the following:

For age group 60-69, the total increase in liabilities of applying diversification and MfAD, would be at least 50 (higher of 50 and 5)

For age group 70-79, the total increase in liabilities of applying diversification and MfAD, would be at least 125 (higher of 100 and 125)

For age group 80+, the total increase in liabilities of applying diversification and MfAD, would be at least 75 (higher of 200 and 75)

Applying a diversification factor of 0.333:

The total increase on insurance liability =  $170 \times (1-0.333) = 113 > 50$

The total increase on annuity liability =  $205 \times (1-0.333) = 137 > 125$

Therefore, a diversification factor of 0.30 is acceptable.

#### 4. Learning Objectives:

4. The candidate will be able to explain and apply the methods, approaches and tools of financial management and value creation in a life insurance company context.

#### Learning Outcomes:

- (4a) Assess financial performance, including analyzing and interpreting the financial performance of a product line or company.
- (4b) Apply methods and principles of embedded value.

#### Sources:

Embedded Value: Practice and Theory, SOA, Actuarial Practice Forum, March 2009

LFV-815-13: Understanding profitability in Life Insurance

#### Commentary on Question:

*This question tested the candidates' understanding of embedded value.*

#### Solution:

- (a) Calculate the EV that should be produced by the model. Show all work.

#### Commentary on Question:

*Candidates generally performed well on this part of the question. A common error was assuming the provided "Market Risk Premium over 10 Year Treasury" was the Market Risk Premium.*

EV = Adjusted Net Worth + Inforce Business Value

ANW = Required Capital + Free Surplus = 50 + 10 = 60

IBV = Present Value Book Profit - PV Cost of Capital discounted with risk discount rate (RDR)

RDR under CAPM = Risk Free + Beta \* (Market Risk Premium)

RDR = 2.9% + 1.3 \* 5% = 9.4%

PVBP =  $100/(1+9.4\%) + 90/(1+9.4\%)^2 + 95/(1+9.4\%)^3 + 103/(1+9.4\%)^4 = 311.07$

Cost of capital (t) =  $RC(t-1) * (RDR - \text{after tax investment rate of return})$

| Time | Book Profit | RC | COC   | Discount Factor |
|------|-------------|----|-------|-----------------|
| 0    |             | 50 |       | 1               |
| 1    | 100         | 48 | 2.95  | 0.914076782     |
| 2    | 90          | 46 | 2.832 | 0.835536364     |
| 3    | 95          | 44 | 2.714 | 0.763744391     |
| 4    | 103         | 42 | 2.596 | 0.698121016     |
| 5    |             |    | 2.478 | 0.638136212     |

## 4. Continued

PVBP = 311.06813  
PVCOC = 10.529191  
IBV = 300.53894  
EV = 360.54

- (b) Critique each of the following statements related to EV methodology:
- A. *Since assets backing reserves include debt securities, the company should consider factoring in the cost of debt into the risk discount rate.*
  - B. *Assumptions that are considered sensitive should have a Provision for Adverse Deviation (PAD) in EV calculations.*
  - C. *Market Consistent Embedded Value (MCEV) would be a significant improvement over EV since it is easier to track changes over time, and it is easier to compare across companies.*
  - D. *Policyholder behavior should not be modeled when calculating the Time Value of Financial Options and Guarantees (TVFOG) because it cannot be accurately forecasted.*

### **Commentary on Question:**

*Candidates who received full credit were able to state an effective critique of the false statements. Candidates generally correctly critiqued Statement B and D. Most candidates generally struggled with Statement A. If a candidate correctly identified a false statement but failed to provide the correct reason for why the statement was false, no credit was awarded for that statement.*

- A. The reasoning is wrong. The cost of debt may be included in calculating the risk discount rate; however, it would be included because the company has some debt financing contributing to surplus (can happen in Canada, not US as it just creates offsetting liability) and not because debt is backing reserves. In this situation, using cost of equity is most appropriate.
- B. False. Embedded value is designed to be a measure of the value of the business. Assumptions should reflect best estimate.

#### **4. Continued**

- C.* The first part is false. It is harder to analyze movement in MCEV since it involves tracking movement of both fair value of assets and fair value of liabilities over time. However, the second part is true. MCEV is easier to compare across companies since the model must be calibrated to observed market prices for similar options and guarantees, and the risk discount rate and pre-tax & investment expense returns on assets are assumed to be risk free rate. This eliminates some hard to estimate and subjective economic assumptions, thus providing more consistency across companies.
- D.* This is false. Policyholder behavior is hard to estimate; however, it is an important assumption in calculating TVFOG. For example, reduced lapse rates in scenarios where options are in the money should be included.



## 5. Learning Objectives:

4. The candidate will be able to explain and apply the methods, approaches and tools of financial management and value creation in a life insurance company context.

### Learning Outcomes:

- (4c) Explain and apply methods in determining regulatory capital and economic capital.
- (4d) Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital.
- (4e) Explain Canadian regulatory capital framework and principles.

### Sources:

LFV-XXX-18: OSFI Guideline – Life Insurance Capital Adequacy Test (LICAT), Chapters 1 – 3, 5 – 9, 11, November 2017

### Commentary on Question:

*This question tested the candidates' knowledge of Canadian capital requirements.*

### Solution:

- (a) Calculate the LICAT Mortality Level Risk component at issue for this product, including a numerical demonstration of if the product is death supported. Show all work.

### Commentary on Question:

*Candidates generally demonstrated knowledge that the product is death support. Some candidates calculated the Mortality Level component. However, only few candidates calculated the Final Mortality Level Risk component by removing the double counting.*

Step 1: Identify step to determine life or death supported

Apply a -15% mortality shock and + 75% future mortality improvement (FMI) shock

The test is combined mortality level & trend shock

$$Q_x = 20\% \times (1-15\%) = 17.00\%$$

$$\text{Mortality improvement or MI} = 1\% \times (1+75\%) = 1.75\%$$

## 5. Continued

|                   | 0         | 1                             | 2                             | Alive   |
|-------------------|-----------|-------------------------------|-------------------------------|---------|
| Cashflow          | (100,000) | 90,000                        | 90,000                        | 150,000 |
| Mortality Rate    |           | 16.70%                        | 16.41%                        |         |
|                   |           | $=17.0\% \times (1-1.75\%)^1$ | $=17.0\% \times (1-1.75\%)^2$ |         |
| Survival Rate     | 1.0000    | 0.8330                        | 0.6963                        | 0.6963  |
| Expected Cashflow | (100,000) | 15,032                        | 14,769                        | 104,442 |

Note: it is reasonable to assume mortality improvements starts at year two instead.

$$\text{Shocked Reserve} = -100,000 + 15,032 + 14,769 + 104,442 = 34,244$$

As the liability increases, this confirms the product is death supported.

Step 2 - Determine the mortality level component

Apply a -15% mortality shock for all years

$$Q_x = 20\% \times (1-15\%) = 17.00\%$$

$$\text{Mortality Improvement or MI} = 1.00\%$$

|                   | 0         | 1                             | 2                             | Alive   |
|-------------------|-----------|-------------------------------|-------------------------------|---------|
| Cashflow          | (100,000) | 90,000                        | 90,000                        | 150,000 |
| Mortality Rate    |           | 16.83%                        | 16.66%                        |         |
|                   |           | $=17.0\% \times (1-1.00\%)^1$ | $=17.0\% \times (1-1.00\%)^2$ |         |
| Survival Rate     | 1.0000    | 0.8317                        | 0.6931                        | 0.6931  |
| Expected Cashflow | (100,000) | 15,147                        | 14,996                        | 103,969 |

$$\text{Shocked Reserve} = -100,000 + 15,147 + 14,996 + 103,969 = 34,111$$

$$\text{Level Risk} = 34,111 - 33,000 = 1,111$$

Step 3 - Adjust mortality level component for double counting with mortality volatility

Apply a -15% mortality shock for first year only

$$Q_x (\text{year 1}) = 17.00\%$$

$$Q_x (\text{other}) = 20.00\%$$

$$\text{Mortality Improvement or MI} = 1.00\%$$

## 5. Continued

|                   | 0         | 1                            | 2                            | Alive   |
|-------------------|-----------|------------------------------|------------------------------|---------|
| Cashflow          | (100,000) | 90,000                       | 90,000                       | 150,000 |
| Mort Rate         |           | 16.83%<br>=17.0%*(1-1.00%)^1 | 19.60%<br>=20.0%*(1-1.00%)^2 |         |
| Survivors         | 1.0000    | 0.8317                       | 0.6687                       | 0.6687  |
| Expected Cashflow | (100,000) | 15,147                       | 17,642                       | 100,301 |

$$\text{Shocked Reserve} = -100,000 + 15,147 + 17,642 + 100,301 = 33,089$$

$$\text{Double Counting} = 33,089 - 33,000 = 89$$

$$\text{Final Mortality Level} = 1,111 - 89 = 1,022$$

- (b) Assess the impacts on both the Core and Total LICAT ratios for each of the following changes:
- (i) Due to higher perceived lapse risk, increase lapse PfADs from 10% to 15% of best estimate lapses
  - (ii) Strengthen mortality assumption which leads to a reserve increase (no change to mortality PfAD percentage)
  - (iii) Due to some errors in claims last year, the claims system will be fully updated in order to reduce operational risk

### Commentary on Question:

*Candidates generally were able to comment on the impacts to the BSB and Surplus Allowance from changes in (i) and (ii) and explain that LICAT operational risk charge is formula driven in (iii). However, candidates generally failed to explain the available capital/tier 1 capital impact due to change in GAAP liabilities.*

Total ratio = (Available Capital + Surplus Allowance + Eligible Deposits) / Base Solvency Buffer (BSB)

Core ratio = (Tier 1 Capital + 70% of Surplus Allowance + 70% of Eligible Deposits) / BSB

## 5. Continued

- (i) There is no effect on BSB because best estimate assumptions were not changed. No impact on denominator.

The increase in CGAAP liabilities will decrease retained earnings/available capital/tier 1 capital. This is offset by the increase in surplus allowance.

Potentially no/minimum impact on Total Ratio.

For core ratio, only 70% surplus allowance increase so it does not offset the Tier 1 capital decrease. It results in net decrease in numerator and reduction in Core Ratio.

Negative reserves may become less negative. Therefore, less capital moves from Tier 1 to Tier 2.

- (ii) Increase CGAAP liabilities and, therefore, decrease retained earnings/available capital/tier 1 capital.

Increase in surplus allowance as percentage of best estimate claims but does provide a full offset. Therefore, net decrease in nominator is expected.

BSB increases due to increase in mortality risk capital which increases denominator.

Both total and core ratios will decrease.

Negative reserves may become less negative. Therefore, less capital moves from Tier 1 to Tier 2.

- (iii) LICAT operation risk charge is formula driven and is a function of premiums

No change to operational Required Capital.

Costs of updating system will reduce earnings and cause a decrease in available capital. It results in small reduction in ratios. No change in BSB is expected.

## 6. Learning Objectives:

1. The candidate will understand financial statements and reports of Canada life insurance companies as well as the professional standards addressing financial reporting and valuation.

### Learning Outcomes:

- (1c) Describe, apply and evaluate regulatory documentation and disclosure requirements

### Sources:

LFV-635-13: Participating account management and disclosure to par policyholders

CIA Education Note: Guidance on Fairness Opinions Required under Bill C-57 (2005)

### Commentary on Question:

*Candidates generally did well on part (a) of the question. In part (b), candidates were not able to identify enough considerations for both expenses and taxes*

### Solution:

- (a) The following method has been proposed for determining dividends for a group of participating policyholders:

- Dividend classes are to be determined each year for the participating block.
- Policyholders with similar characteristics are treated consistently.
- There should be no material, planned or systemic cross subsidization of one cohort by another.
- Dividend experience factors should be consistent with the associated underlying experience of each participating account.
- Materiality in dividend determination should be judged from the point of view of the total participating account or the company.
- Smoothing of dividends is not permitted.

Critique the method in terms of fairness, accuracy and completeness.

- 1) Not true-

- Dividend classes should be set at issue
- There should be no post-issue changes in policy classifications, except as justified or required as a result of external circumstances, beyond the control of the company
- The method for determining dividends should be objective, unbiased, impartial and conform to rules established at issue

## 6. Continued

- 2) True
- 3) True
- 4) True
- 5) Not true-
  - Materiality in dividend determination should be judged from the point of view of the participating policyholder, not from the point of view of a total participating account or the company
  - This should be done even if it only applies to a relatively small block of policies.
  - However, ensuring strict fairness to small cohorts should not result in unreasonable implementation expenses.
- 6) Not true-
  - Smoothing of dividends should be allowed
  - But smoothing should not result in cross-subsidization of one cohort by another
  - Smoothing should only be used to avoid undue yearly fluctuations in the dividend scale and the method used should be reasonably justifiable and documented.
  - A policy on smoothing should be established in advance as part of the dividend and/or management policies required by the Regulations.

(b) Describe the considerations involved in forming a fairness opinion regarding allocations of expenses and taxes to the Participating Account.

- 1) For expenses, need to consider:
  - a. The allocation of expenses is supportable by expense analysis
  - b. There is an appropriate allocation of overhead
  - c. The allocation of expenses related to investment in new business is appropriate.
  - d. i.e. the amount to be absorbed by shareholders compared with that to be absorbed by different generations of participating policyholders, is appropriate
- 2) For tax, need to consider:
  - a. Where appropriate, taxes are allocated directly (e.g. premium tax, investment income tax)
  - b. Income taxes are based on the earnings of each account and where applicable, each sub-account
  - c. Future tax assets/liabilities are treated consistently between participating and non-participating accounts and where applicable, between sub-accounts and across accounts
  - d. Overall company tax planning has been considered, including the appropriate reflection of any benefits to the participating accounts
  - e. Except that allocation to the closed blocks would follow the tax allocation adopted on their formation

## 7. Learning Objectives:

1. The candidate will understand financial statements and reports of Canada life insurance companies as well as the professional standards addressing financial reporting and valuation.

### Learning Outcomes:

- (1b) Describe the structure of the Canada Annual Statement and explain the purpose of its statements, key exhibits and schedules.
- (1c) Describe, apply and evaluate regulatory documentation and disclosure requirements.

### Sources:

LFV-620-14: OSFI Guideline E15: Appointed Actuary – Legal Requirements, Qualifications and External Review (September 2012)

CIA Educational Note on IFRS: Embedded Derivatives and Derivatives under IFRS (IASP 10)

### Commentary on Question:

*Commentary listed underneath question component.*

### Solution:

- (a) Explain OSFI's objective in requiring a peer review of an Appointed Actuary's work.

### Commentary on Question:

*This part of the question was done moderately well, with most candidates able to recognize at least one of the intentions of a peer review of the Appointed Actuary, although few candidates recognized all items.*

The intention of a peer review on the Appointed Actuary is to:

- Assist OSFI in its assessment of the insurer's safety and soundness
- Provide the Appointed Actuary with a source of independent consultation advice as well as a source of professional education
- Maintain and strengthen confidence in the work of the Appointed Actuary by the public, company management and regulators

## 7. Continued

- (b) Identify considerations and assessments required in preparing a response as peer reviewer of an Appointed Actuary's work under the following circumstances:
  - (i) Changes to the life insurance valuation assumptions for mortality, lapses and expenses, such that the net impact on valuation liabilities is immaterial.
  - (ii) A conversion from an in-house valuation system to a third-party commercially available valuation system.
  - (iii) An external audit finding that investment income during the year has been over-reported.

### **Commentary on Question:**

*Many candidates recognized for circumstance (i) that an immaterial total impact could contain material changes but didn't go into further detail on what review was necessary for those changes. Circumstances (ii) and (iii) were not well understood by candidates and many discussed general details of the situation itself rather than the role of the peer reviewer.*

- (i) An immaterial overall impact could be the result of offsetting changes. The peer reviewer should review each material change on its own. For material changes, the reviewer should look at underlying data supporting each change and determine if the change is warranted.
- (ii) Conversion to a new valuation system is considered a material change. Reviewer would not be expected to perform detailed recalculations as long as they determine that the controls and procedures used by the Appointed Actuary are adequate to identify potential errors in valuation results.
- (iii) The peer reviewer should assess the change at a more granular level than the auditor. The peer reviewer should understand if the situation has an impact on reported reserves and look at any controls used by the Appointed Actuary to monitor results, such as Source of Earnings. As well, the peer reviewer should assess if the actuary has made an appropriate adjustment in the reserves to account for the over-reporting.



## 7. Continued

- (c) The Appointed Actuary has determined that fair value reporting should be used for each of the following Universal Life features under IFRS (as per IASP 10):
- Adding a minimum credited rate of 0.5% per year to all fixed rate deposit accounts
  - Offering a “leveraged” credited rate of 2.5x market rate with a cap of 15%
  - A self-directed investment option for a fixed annual fee

Assume the current market interest rate is 1%.

Critique the appropriateness of the Appointed Actuary’s determination for each feature from a peer reviewer’s perspective.

### **Commentary on Question:**

*This part of the question was generally poorly answered. While some candidates recognized they should identify whether the feature should be unbundled from the contract, they did not explain the conditions that would result in this or the reasoning behind their choice. Other candidates did not recognize that unbundling was an option.*

If the embedded derivative is an interest rate, it is considered closely related to the host contract unless

- the contract holder would not recover substantially the initial investment, or
- the contract holder could at least double the initial rate of return on the host contract and could double the market rate of return.

If the duration is longer than that of usual investments under IAS 39 the risks may not be closely related.

If the minimum guarantee rate is below market rates at contract outset it is closely related.

The cap is closely related if it is above market rates at contract outset and is not leveraged.

Leverage refers to the link of the host contract to market interest rates, not to returns on specified investments.

For the floor of 0.5% this is below the current market rate of 1% and so it is closely related to the contract and should not be unbundled.

## 7. Continued

For the 2.5X leveraged floater with a 15% cap, there are 3 considerations that result in it not being closely related to the host contract and therefore requiring it to be unbundled

- The fact that it is leveraged
- The 2.5 factor is more than double the rate of return
- The cap is above the current market rate

The self-directed option is a service contract, meaning there is no need to consider it as an embedded derivative. It should not be unbundled from the contract.

## 8. Learning Objectives:

4. The candidate will be able to explain and apply the methods, approaches and tools of financial management and value creation in a life insurance company context.

### Learning Outcomes:

- (4b) Apply methods and principles of embedded value.

### Sources:

LFV-106-07: Ch. 4 of Insurance Industry Mergers & Acquisitions (Sections 4.1-4.6)

### Commentary on Question:

*This question tested the candidates' knowledge of financial management and value creation in a life insurance company context. It required candidates to explain and apply the methods and principles of Embedded Value.*

### Solution:

- (a) Critique the following statements regarding Actuarial Appraisals:
  - A. *An Actuarial Appraisal should be performed on a Statutory Accounting basis, because valuations should be performed on a conservative basis.*
  - B. *The main challenge in using Comparable Company Analysis is that recent transactions of comparable size and lines of business may not exist.*
  - C. *An Actuarial Appraisal is typically prepared when a buyer is interested in valuing a targeted company or block of business.*
  - D. *An Actuarial Appraisal is not a good valuation method for segregated funds since a single scenario will not capture the cost of the guarantees.*

### Commentary on Question:

*To receive full credit on this part of the question, candidates had to justify their response.*

- A. False, it should be performed on Statutory Accounting basis because it represents cash flows
- B. False, this statement is confusing Comparable Company and Comparable Transactions
- C. False, a seller would usually hire a consultant to prepare an appraisal and go to market
- D. False, you just need to supplement your appraisal with some stochastic analysis that quantifies the options cost. Sensitivity tests could work too

## 8. Continued

- (b) Calculate the following:
- (i) Net Income in Year 1
  - (ii) Value of New Business of the block

Show all work.

**Commentary on Question:**

*Most of the candidates were not able to calculate the correct VIF because of missing components when calculating VIF. Most candidates were able to determine the Net Income in Year 1 properly. Few candidates got the correct VNB and did not realize that the business was a runoff block of business.*

$$\begin{aligned}\text{Distributable Earnings} &= \text{ABV} + \text{VIF} - \text{Cost of Capital} \\ \text{VIF} &= \text{Distributable Earnings} - \text{Excess Capital} - \text{Required Capital} + \text{Cost of Capital} \\ &= 240 - 20 - 150 + 30 \\ &= 100\end{aligned}$$

Since it's a 5 Year projection at 0% discount, the sum over 5 years is thus 100; The earnings are level, annual income in YR 1 is just  $100 / 5 = 20$

This is a run off block, VNB = 0

- (c) State three reasons that could justify why the buyer could be using a discount rate of 7%, relative to the baseline discount rate from the CAPM framework. Show all work.

**Commentary on Question:**

*To receive full credit candidates had to correctly calculate the WACC and provide 3 reasons to justify why the buyer could be using a discount rate of 7% which is lower than WACC.*

*Candidates generally calculated WACC correctly. Most candidates could provide at least one reason to justify the lower rate used.*

$$\begin{aligned}\text{WACC} &= \text{debt cost} \times (\text{D} / \text{D} + \text{E}) + (\text{E} / \text{E} + \text{D}) \times (\text{risk free} + \text{beta} \times (\text{market return} - \text{risk free})) \\ &= 6\% \times (100 / 400) + (300 / 400) \times (4\% + 0.8 \times (9\% - 4\%)) \\ &= 7.5\%\end{aligned}$$

## **8. Continued**

Discount rate is 7% and lower than the WACC. We could speculate the following:

- (i) Company's internal hurdle rate for the business could be lower
- (ii) Funding structure may be cheaper form of debt, thus bringing down financing
- (iii) It could be a competitive market with lower rate

## 9. Learning Objectives:

5. The candidate will understand the nature and uses of basic reinsurance arrangements used by life insurance companies.

### Learning Outcomes:

- (5a) The candidate will understand the various forms of reinsurance, and be able to, with respect to both the ceding and assuming parties, analyze and evaluate:
- (i) Risk transfer considerations
  - (ii) Cash flow mechanics
  - (iii) Accounting and financial statement impacts
  - (iv) Reserve credit considerations

### Sources:

Accounting for Reinsurance Contracts under International Financial Reporting Standards (IASP 9), (exclude Appendices C and D)

### Commentary on Question:

*This question tested the candidate's understanding of how IFRS 4 affects reporting of reinsurance. Candidates are expected to create a revised balance sheet and identify shortcomings in the balance sheet and reinsurance treaty excerpts in the question.*

### Solution:

- (a) Explain why the balance sheet is not consistent with IFRS 4.

#### Commentary on Question:

*Candidates were generally able to identify at least one reason for why the balance sheet is not consistent with IFRS 4.*

The balance sheet shows the policy liability net of reinsurance basis only, which is not allowed under IFRS.

IFRS 4.14(d) specifies that insurance liabilities must be reported without any reduction for reinsurance purchased (i.e. reported on a gross of reinsurance basis).

Reinsured liability should be shown on the Asset side of the Balance Sheet as "Ceded reinsurance asset". It should not appear on the Liability side of the Balance Sheet as a subtraction from the gross liability.

## 9. Continued

- (b)
- (i) Describe the two approaches to revise PZA Life's balance sheet so it is appropriate and consistent with IFRS 4.
  - (ii) List the pros and cons of each approach in (i).
  - (iii) Revise the balance sheet under one of the approaches. Assume PZA Life uses the same percentage margin for prudence in the calculation of its actuarial liabilities

### **Commentary on Question:**

*Candidates generally did not do well on this part of the question. Few candidates were able to describe the two approaches and prepare balance sheet accordingly. A common mistake was to report ceded reinsurance assets as insurance liabilities.*

Approach 1: Ceded reinsurance assets reported with prudence, using the same prudence (MfAD) assumption as gross insurance liabilities (which is also reported with prudence).

Pro: Consistent prudence assumption between reinsurance asset and liability.

Con: Reinsurance asset value after prudence is higher than under best estimate, which is contrary to the general concept of prudence in financial reporting.

Approach 2: Ceded reinsurance assets reported without prudence. Gross insurance liabilities includes only prudence that is reflective of the net insurance liabilities.

Pro: Consistent with the application of prudence in general financial reporting, by avoiding a post margin asset value being higher than best estimate value.

Con: Technically conflicts with spirit of IFRS 4, which specifies that accounting policies measuring net liabilities are not relevant, because accounting policy should be consistently applied and not affected by whether reinsurance has been purchased.

- (c) The following excerpts are taken from the reinsurance contract between PZA Life and BDC Re.

## 9. Continued

### ***Insolvency***

*In the event of insolvency of PZA Life, BDC Re retains the right to be notified of and investigate pending claims and pursue any defense available. BDC Re is required to continue paying claims, but claim amounts may be reduced in proportion to the amount the liquidator has paid directly to claimants. BDC Re may offset claim payments by premium monies owed.*

*In the event of insolvency of BDC Re, PZA Life may terminate the agreement for new business and recapture all inforce subject to a mutually agreed upon fee. Recapture will be done retroactively to the prior contract anniversary date.*

### ***Errors and Omissions***

*Both parties are expected to identify and correct errors at the earliest possible date. The party discovering the error must notify the other party in writing as soon as discovered.*

### ***Reporting Requirements***

*PZA Life may change the reporting format and data used in reports provided to BDC Re as a result of changes to PZA Life's systems. PZA Life must notify BDC Re of the changes at least 15 days in advance*

### ***Offset***

*Mutual debits and credits may be offset against each other, including business from outside of Canada. Offsets will continue in the event of the insolvency of one of the parties.*

Critique the above excerpts from the treaty.

### **Commentary on Question:**

*In general, candidates did well this part of the question.*

### ***Insolvency***

*"ABC Re is required to continue paying claims, but claim amounts may be reduced in proportion to the amount the liquidator has paid directly to claimants." Incorrect. When insolvency occurs, the liquidator may be able to pay only a portion of each claim, but the reinsurer should not benefit from a windfall. If the reinsurer has received full payment of premiums, it should pay full benefits.*



## 9. Continued

*"Recapture will be done retroactively to the prior contract anniversary date."*  
Incorrect. Recapture cannot be retroactive.

All other statements are fine.

### ***Errors and Omissions***

*"Both parties are expected to identify and correct errors at the earliest possible date."* Correct.

*"The party discovering the error must notify the other party in writing as soon as discovered."* Correct.

### ***Reporting Requirements***

*"PZA Life may change the reporting format and data used in reports provided to BDC Re as a result of changes to PZA Life's systems."* Incorrect. Both parties must agree to changes.

*"PZA Life must notify BDC Re of the changes at least 15 days in advance."*  
Incorrect. The ceding company is required to notify the reinsurer at least one reporting period in advance of any changes in reporting format or data used in reports.

### ***Offset***

*"Mutual debits and credits may be offset against each other, including business from outside of Canada".* Incorrect. Offsets must only be for business in Canada.

*Offsets will continue in the event of the insolvency of one of the parties.* Correct.

## 10. Learning Objectives:

2. The candidate will be able to understand and apply valuation principles of individual life insurance and annuity products issued by Canadian life insurance companies.

### Learning Outcomes:

- (2a) Compare and apply methods for life and annuity product liabilities.
- (2c) Recommend and justify appropriate valuation assumptions.

### Sources:

CIA Educational Note: Valuation of Universal Life Policy Liabilities, (Feb 2012)

### Commentary on Question:

*This question tested the candidates' knowledge of setting valuation assumptions for Universal Life contracts and the specific elements unique to this type of flexible premium product with adjustable cost of insurance charges.*

### Solution:

- (a) Describe considerations in determining the following assumptions for the valuation of LowPay UL policy liabilities under CALM:
  - (i) Projected credited interest rates on policy owner funds
  - (ii) Projected future deposits
  - (iii) Cost of insurance charges

### Commentary on Question:

*Most candidates showed an understanding of the basics of setting valuation assumptions in this context, but most candidates did not recognize that policyholder reasonable expectations are an important consideration in projecting adjustable cost of insurance charges. Many candidates instead focused on providing details on factors influencing mortality table construction, which did not receive credit.*

- (i) The projected credited interest rates on policy owner funds would be based on an assumed investment rate less a spread. The assumed investment rate would be related to the assumed investment yield on the assets supporting the funds.

The expected spreads could be determined by projecting the current spread to an ultimate level. It may be appropriate to reduce the projected spread due to competitive pressures, a mismatch between assets and liabilities, or due to minimum interest rate guarantees that may be applicable when projected rates decrease.

## 10. Continued

- (ii) The projected future deposits would be based on the current level of premium being received. As this product is marketed as a flexible premium product with a small savings component, we should expect minimal funding and low premium persistency.

The projected deposits should be sufficient to ensure policies are funded to the minimum level required to keep the policy in force.

In scenarios where interest rates are decreasing, we should assume higher deposits when the minimum interest rate guarantees would be applicable.

- (iii) As the cost of insurance (COI) charges in this situation are adjustable, the projected future charges should take into account the policyholder's reasonable expectations.

If company management has changed COI rates in the past, and illustrations provided to the policyholder show different levels of COI charges depending on the interest rate environment, then it would be acceptable to project future changes in COI charges linked to the scenario.

However, if illustrations only show current COI charges, and charges have been stable for some period of time, then COI charges should be projected at current levels with no change.

- (b) Assume that equity investments are used to back a portion of LowPay UL insurance component cash flows.
  - (i) List considerations related to setting the reinvestment strategy to calculate CALM reserves.
  - (ii) Determine the risks associated with the above investment strategy.

### **Commentary on Question:**

*The intent of part (i) was to focus on assumptions related to reinvestment in equities which include the projection of the investment strategy and asset mix, not the specific equity growth/dividend assumptions. Common mistakes include (1) assuming that the equity investment was designed to back the guaranteed interest accounts instead of the underlying insurance cash flows/liability, and (2) simply list standards of practice assumptions related to equity investments.*

*Part (ii) was generally well done with most candidates able to identify and explain at least some of the applicable risks.*

## 10. Continued

- (i) Considerations related to setting the reinvestment strategy that includes equity investments to calculate CALM reserves for LowPay UL include:
  - 1. The assumed reinvestment mix in equities should not exceed the proportion of the asset mix at the balance sheet date.
  - 2. The assumption of reinvestment in equities should be consistent with the company's investment policy.
  - 3. The review of reinvestment mix should not include the effect of new business.
  - 4. Reinvestment strategy should consider potential situations where divestment of equity would be required.
  - 5. The CIA Standards of Practice require that the actuary includes a provision for adverse deviation (PfAD) on the reinvestment mix assumption if the amount of non-fixed income assets supporting the liability exceeds the amount required to support 20% of the cash outflows for the first 20 years and 75% thereafter.
  
- (ii) Equity investments within the investment strategy are subject to a number of risks, including the following:
  - 1. Market Risk – The risk that equity values fall and are insufficient to fund insurance cash flows.
  - 2. Basis Risk/Mismatch Risk – The risk that equity cash flows will have different characteristics and timing versus the insurance component cash flows.
  - 3. Counterparty Risk – Should be negligible if investment is in direct equity holdings. All contractual obligations by the seller of equity end once the equity transaction is complete. There are possible counterparty risks if the equity position is held through an alternative structure such as equity derivatives.
  - 4. Liquidity Risk – The inability to buy or sell equities quickly at a fair price when required.
  - 5. Volatility Risk – Equities typically have higher volatilities as compared to fixed income investments. There could be higher volatility in the insurer's liabilities as a result.
  - 6. Currency Risk – Applies only to the extent that investments are in different currencies than the liabilities.
  - 7. Taxation Risk - Equities have lower rates and more favourable treatment than fixed income, which may not last indefinitely.

## 10. Continued

- (c) Determine any changes needed to the following CALM valuation assumptions for PlatinumPay compared to LowPay:
- (i) Credited rate
  - (ii) Policyholder behaviour with respect to fund allocation
  - (iii) Policyholder behaviour with respect to premium persistency

**Commentary on Question:**

*The intent of this part of the question was to test candidates' understanding of setting assumptions for a product where there are multiple fund options and that may be used by policyholders in different ways depending on how the policyholders fund it. Candidates generally demonstrated some understanding how valuation assumptions would need to change for this new product. Some candidates did not understand that the new product would have 2 fund options and instead assumed that only the equity indexed fund would be offered. As a result, some candidates did not provide considerations related to setting assumptions where policyholders have the ability to move between funds and that the premium persistency & spread assumptions may differ by fund within the same product.*

Changes are needed to the CALM valuation assumptions for the PlatinumPay product compared to the LowPay product to reflect the new equity fund offered in addition to the guaranteed interest fund, as well as the different marketing of the product's purpose.

- (i) The credited rate assumption for the equity index fund should reflect the earned rate expected on the equity assets backing this new fund option. The credited rate will be the projected earned rate less the assumed spread for this fund. It would not be assumed that the spread would increase in the future due to competitive pressures.
- (ii) An assumption should be developed to allocate projected premiums between the equity index fund and the guaranteed interest fund. The assumed allocation should be based on expected policyholder behavior. The CALM valuation will also need to make an assumption about policyholder fund transfers to achieve a target mix in future years. It should be assumed that anti-selection will occur when policyholders make fund transfers that will minimize the insurer's achieved spreads. The CALM reinvestment assumption for equity investment should match the expected policyholder fund selection.

## 10. Continued

- (iii) The inforce policies will need to be split into higher and lower premium persistency groups, with separate premium persistency assumptions for each group. The lapse assumption should vary based on the marketing material for each product and how the product was emphasized to policyholders.

## 11. Learning Objectives:

3. The candidate will be able to understand and apply emerging financial and valuation standards, principles and methodologies.

### Learning Outcomes:

- (3a) Describe emerging developments impacting Canadian valuation and International Financial Reporting frameworks, and assess their impact on the valuation of reserves and financial statements.

### Sources:

Draft Educational Note Comparison of IFRS 17 to Current CIA Standards of Practice

LFV-XXX-18: IFRS 17 Insurance Contracts – IFRS Standards Effects Analysis, May 2017, IASB (section 1, 2, 4, 6, 9 and Appendix A&B)

### Commentary on Question:

*This question tested the candidates' knowledge of IFRS 17.*

### Solution:

- (a) Describe the provisions for non-financial risk.

#### Commentary on Question:

*Candidates generally identified that the provisions for non-financial risks under IFRS17 are included explicitly in Risk Adjustment. However, candidates generally did not illustrate their understanding by contrasting the concept with the provision for adverse deviation (PfAD) under CALM.*

Under IFRS17, an explicit risk adjustment is required to reflect the company's provisions for non-financial risks. This is in contrary to the provisions for adverse deviation (PfAD) under CALM where both the economic and non-economic risks are included. As for provisions for financial risks, they are included in the present value of future cash flows either by adjusting cashflows or adjusting the discount rate. Hence, reinvestment or disinvestment assumptions are no longer required. Cashflows that vary with assumptions related to financial risks such as UL credited rates and expense inflation are not modelled under a best estimate assumption. Instead, they need to be modelled stochastically using risk-neutral construct.

- (b) Compare and contrast the treatment between IFRS 17 and CALM with respect to the guaranteed minimum crediting interest rate.

#### Commentary on Question:

*Candidates generally did not do well on this part of the question.*

## 11. Continued

Under IFRS 17, non-distinct derivatives are considered. Stochastic modelling techniques using risk-neutral scenarios would be used to value the embedded derivatives. Due to the risk-neutral construct, IFRS 17 provisions would not make a distinction between hedged versus unhedged risks. IFRS 17 reflects the guarantee in a way that is consistent with the observable market prices for such options and guarantees. As such, it provides more relevant information about the company's insurance obligations.

Under CALM, the treatment differs between hedged and unhedged risks. If the risk is not fully hedged, CIA Standard of Practice (SOP) requires that models to be run using best estimate assumptions. CALM will run further valuations using a set of prescribed scenarios using real-world scenarios. In contrast, if the risk is fully hedged, CIA SOP would include the cost of hedging, which is the same as IFRS 17.

- (c) Explain the approach used to determine the discounting rates.

### **Commentary on Question:**

*Candidates generally did well on demonstrating their knowledge of the bottom-up or top-down approach of developing the curve. However, most candidates did not discuss where cashflows need to be treated differently based on their variability.*

To determine the discounting rates, cashflows need to be split into those that vary versus do not vary with returns with the underlying items.

For cashflows that are fixed and do not vary with returns on the underlying items, the approach should be based on liquidity-adjusted risk-free discount rate curve. The discount rates should not depend on the assets used to support the liabilities, hence no provisions for investment expense risk or reinvestment risk should be included. The curve may be developed using bottom-up or top-down approach.

- Under the Bottom-Up approach, risk free discount curve is adjusted by adding an illiquidity premium to reflect characteristics of the insurance liabilities. The liquidity premium in IFRS 17 reflects the illiquidity of the liabilities, not the assets. Risk free curve may have a different approach after the longest duration / 20 years.
- Under the Top-Down approach, a reference portfolio of assets is selected with characteristics that are similar to those of the insurance contract liability. Note that CALM is similar to the replicating portfolio approach in that it starts with the account value and then adds the other portions of the liability.

For cashflows that do vary with returns on the underlying items, the discount rates should reflect that variability



## 11. Continued

- (d) Describe the accounting treatment of the Side Fund.

**Commentary on Question:**

*Candidates generally did well on demonstrating the treatment of the contract if it is considered a distinct investment component. However, most candidates did not elaborate on the situation under which the contract would not be considered non-distinct.*

The treatment of the Side Fund differs depending on whether it should be considered a distinct investment component. If a contract similar to the Side Fund could be sold separately, it should be considered a distinct investment component.

If distinct, it should be separated from the main contract as a distinct investment component and valued under IFRS 9. If lapse or maturity of the base policy would cause a lapse or maturity of Side Fund, it should be considered as a non-distinct investment component. If non-distinct, IFRS 17 would apply and it would be included with the insurance contract liabilities. Investment component should be excluded from insurance revenue and insurance service expense. References to embedded derivatives or service components are mentioned, should not be part of side fund consideration