

ILA LFMC Model Solutions

Fall 2021

1. Learning Objectives:

6. The candidate will understand important insurance company issues, concerns and financial management tools.

Learning Outcomes:

- (6a) The candidate will be able to describe, apply and evaluate considerations and matters related to:
- Insurance company mergers and acquisitions
 - Sources of earnings
 - Embedded Value determinations
 - Rating agency considerations

Sources:

LFM-147-20 Compendium of A.M. Best's Publications

LFM-106-07 Insurance Industry Mergers and Acquisitions, Chapter 4 (Sections 4.1-4.6)

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Describe the three A.M. Best Opinion Outlooks.

Commentary on Question:

This part of the question tested candidates' knowledge on rating agency outlooks and their corresponding results. Candidates generally provided the definitions of the three outlooks without stating the possible outcome. Full credit was received for providing both the definitions and outcomes.

Positive Outlook

- Indicates entity/Issuer/security is experiencing favorable financial/market trends relative to its current BCR
- If trends continue, entity/issuer/security has a good possibility of having its BCR upgraded

1. Continued

Negative Outlook

- Indicates entity/Issuer/security is experiencing unfavorable financial/market trends relative to its current BCR
- If trends continue, entity/issuer/security has a good possibility of having its BCR downgraded

Stable Outlook

- Indicates entity/Issuer/security is experiencing stable financial/market trends relative to its current BCR
- Entity/issuer/security has a low likelihood of having its BCR changed over an intermediate period

- (b) Critique each of the following statements regarding AM Best's Credit Rating process for an insurance company:
- A. *A recommended rating is developed by a Rating Analyst whose interactions with the insurance company's management are restricted to ensure an independent and unbiased rating.*
 - B. *The Rating Analyst's recommendation is reviewed and modified, as appropriate, by a rating review committee before it is voted on and approved by the committee.*
 - C. *The process relies almost entirely on quantitative measures including analysis of accounting ratios, balance sheet strength and key management performance indicators.*
 - D. *The process only considers information available from public sources. AM Best assumes the information is reliable and does not audit it.*
 - E. *Upon reaching a rating decision, if the insurance company does not agree with the rating, AM Best will give the company 30 days to provide additional information that could reasonably be expected to influence the decision. If the company is able to provide such information, AM Best will reevaluate its decision; otherwise, the rating will be released to the public at the end of the 30 days.*

Commentary on Question:

This part of the question tested the candidates' knowledge of the credit rating process for an insurance company. Full credit was received for correctly stating if the statement was correct as well as providing explanations on why the statement is incorrect. Candidates generally did well on this part of the question.

1. Continued

- A. False. Rating Analyst will be in discussion with management throughout the development process
 - B. True
 - C. False. The process incorporates both quantitative and qualitative measures
 - D. False. The process considers private information in addition to public information. However, it is true that AM Best assumes all public information is reliable and does not audit it.
 - E. False. AM Best may grant an appeal if company provides additional information that could reasonably be expected to influence the decision. Once AM Best grants an appeal, the terms are totally at their discretion. Company can also withdraw the rating analysis if they do not agree with the result.
- (c) Insurance company stakeholders include the following:
- Bondholders
 - Stockholders
 - Regulators
 - Policyholders

Describe the relevance of the following ratings to each of the four stakeholders:

- (i) AM Best's Issuer Credit Rating
- (ii) AM Best's Financial Strength Rating

Commentary on Question:

This part of the question tested the candidates' knowledge of the Credit Rating and the Financial Strength Rating. Candidates generally did well on this part of the question. Full credit was received if candidates indicated the order of relevance for the stakeholders.

- (i) AM Best's Issuer Credit Rating
 - Most relevant to Bondholders because the rating focuses on the company's credit risk
 - Relevant to Stockholders since the rating is one indication of how safe the company is to invest in
 - Relevant to Policyholders since the rating is one indication of how safe the company is to provide insurance coverage
 - One of many indicators used by Regulators to monitor the company's solvency

1. Continued

- (ii) AM Best's Financial Strength Rating
 - Most relevant to Policyholders because the rating focuses on the company's ability to meet its ongoing obligation
 - Also relevant to Bondholders and Stockholders since the rating is one indication of how safe the company is to invest in
 - One of many indicators used by Regulators to monitor the company's solvency

- (d) Identify four differences between the inputs to an actuarial appraisal and the inputs to an AM Best Issuer Credit Rating.

Commentary on Question:

There are many differences between the inputs to an Actuarial Appraisal and the inputs to an AM Best Issuer Credit Rating. Full credit was received if any four differences were provided with an explanation. A sample of acceptable solutions are provided below.

Items in an actuarial appraisal but not in an AM Best ICR

- Assumptions: an appraisal is heavily dependent upon assumptions, but they do not play a large role in the development of an ICR
- Discounted cash flows: an appraisal is heavily dependent upon discounted cash flows, but they do not impact the development of an ICR

Items in an AM Best ICR but not in an actuarial appraisal

- Internal capital models: in an appraisal, the buyer may impose their own calculations for capital
- Interim management reports: in an appraisal, these reports may influence how major changes or management views are reflected, but they don't have a large impact on the appraisal value

- (e) Describe possible reasons why DEF's appraisal value is higher than ABC's, considering each of the three main components of an actuarial appraisal.

Commentary on Question:

Candidates generally understood the three components that affect the appraisal value. Full credit was received by describing whether the components are different between the two appraisals and why they are different or similar.

Adjusted book value (ABV)

- Should be very similar between the two companies
- ABV is calculated on a statutory basis with minimal room for deviation

1. Continued

Value of in-force business

- Should not be too different
- Assumptions should largely be the same, though life insurer's valuation is likely to be somewhat higher due to administrative synergies resulting in lower expenses

Value of future business capacity

- Could be very different
- Life insurer's valuation could be considerably higher due to more synergies, especially in the areas of distribution channels, underwriting and administration

2. Learning Objectives:

5. The candidate will understand how to explain and apply the methods, approaches and tools of financial management in a life insurance company context.

Learning Outcomes:

- (5a) The Candidate will be able to:
- Explain and apply methods in determining regulatory capital and economic capital
 - Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital
 - Explain Canadian regulatory capital framework and principles
 - Explain and apply methods in capital management

Sources:

A Multi-Stakeholder Approach to Capital Adequacy, Conning Research

Economic Capital for life Insurance Companies, SOA Research paper, Oct 2016 (exclude sections 5 and 7)

Commentary on Question:

This question tested the candidates' understanding of economic capital and applying the multi-stakeholder, multi-objective approach.

Solution:

- (a) Calculate the amount of RBC and S&P capital available for release for year 1. Show all work.

Commentary on question:

Candidates were generally able to demonstrate knowledge of all the key steps to perform the required calculations. Common errors included using the probability of downgrade or default over 1 year; not apply discounting; and using the ratio of available capital / risk threshold instead of taking the difference.

Please refer to the excel for the model solution

2. Continued

(b) You are given the following additional capital information:

- Capital available for release based on the current economic capital model with VaR 99.5 over 1 year: 400,000
- Capital available for release in year 2

| Financial Variable | Year 2 |
|---------------------------|---------------|
| RBC (Default) | -50,000 |
| S&P CAR (Downgrade) | 500,000 |

Contrast the difference between PCLC's results when using the economic capital method versus the multi-objective approach.

Commentary on question:

Candidates who described the capital excess / deficiencies at each time period and how it links to multi-stakeholder generally did well on this question. Full credit was received when discussing the need to balance the objectives of the different capital metrics. Candidates generally identified the capital available for release or shortfall under EC and RBC. Few candidates noted the S&P amount for both year 1 and year 2. Candidates that did well identified that the company would require additional capital of 50K in year 2 under RBC and used that to explain the value of a multi-objective view.

Economic capital model indicates there is an excess capital of 400,000 that can be released. Capital of 379,000 can be released under the RBC model in year 1, but there is a deficit in year 2.

Under S&P, there is excess capital in both year 1 and 2 (284k and 500k).

The different capital models indicate that there is enough capital to be released in year 1 from the different stakeholder viewpoints, but not in year 2 where the challenge is on RBC where capital cannot be released. The company needs to assess their objectives, as well as meeting RBC and S&P requirements by finding the right weightings on each capital requirement and optimize what is best for the company.

2. Continued

- (c) Critique the following statements:

Commentary on question:

Candidates generally did well on statements A and D. For statements B and C, candidates generally only critiqued part of the statement. Candidates need to comment on the full statement to receive full credit.

For statement A, candidates who discussed the policyholder or shareholder perspective received full credit. Candidates had to discuss other uses of economic capital to receive full credit.

For statement B, candidates need to critique both sentences to receive full credit. Candidates generally did well critiquing the second sentence, but only received partial credit on the first sentence if they only mentioned that the statement is false without any reasoning related to multi-stakeholder considerations.

For statement C, full credit was received if the candidate critiqued all three parts of the statements. Partial credit was received if a candidate only mentioned both capital metrics have real consequences without substantiating those consequences. Some candidates had difficulty articulating that the RBC and S&P factors are based on industry information applied to company data. There was some confusion that the factors were based on company specific data.

For statement D, candidates generally received full credit. Some candidates gave alternative advantages instead, which received partial credit. Some candidates noted that VAR is not coherent and leads to inconsistent results when aggregating capital. Many candidates responded from the perspective of what CTE is rather than what VAR is not, which received partial credit.

- A. *Economic capital is a key measure of risk from a regulatory perspective and used only for capital adequacy.*

False. Economic capital is a key measure of risk from a company perspective. It is not only used for capital adequacy, but is also used for performance measurement and management, risk-based decision making, business strategic decision making, M&A etc.

2. Continued

- B. In consideration of all stakeholders' risk and capital adequacy objectives, the economic capital method is an appropriate measure. All current capital approaches apply only to the insurance industry.*

Both sentences in the statement are false. The economic capital method is not an appropriate measure as it only considers one view from a company perspective. It does not consider multiple stakeholder view. Instead, a multi-stakeholder approach should be used since it produces capital indications across various key financial measures, time horizons, and risk tolerances.

Economic capital, as well as multi-stakeholder approach can be applied beyond the insurance industry to any industry where there are multiple stakeholders e.g Banking sector.

- C. A similarity in the RBC ratio and S&P CAR is that both have a real consequence if you fall below a certain threshold and both have a solvency focus. Risks in RBC ratio are modeled and calibrated based on industry experience, but S&P CAR is based on company experience.*

Partially correct. Both RBC and S&P CAR have real consequences under certain threshold. For RBC, this is a solvency requirement where regulatory intervention such as submission of action plans to a regulatory takeover of the management of the company can happen.

S&P CAR impacts the rating of the company. Having a lower level of capital under the threshold can lead to a rating downgrade, which has implications for the company such as the cost of attracting new capital, perception from policyholders' and agents' on the ability of the company to fulfill its obligations.

Both RBC and S&P CAR are based on industry experience rather than company experience. They are based on formula-based, fairly objective and consistently applied across the industry, making the resulting ratios more straightforward to calculate, decompose and compare. Most of the information to calculate these formulas are publicly available.

- D. One of the advantages of VaR, relative to CTE, is that it can lead to consistent results when aggregating capital.*

False. VaR does not lead to consistent results when aggregating capital because it not a coherent measure.

3. Learning Objectives:

1. The candidate will understand and apply pre-IFRS 17 valuation principles to individual life insurance and annuity products issued by Canadian life insurance companies.

Learning Outcomes:

- (1a) The Candidate will be able to:
- Compare and apply methods for life and annuity product reserves
 - Evaluate, calculate, and interpret liabilities
 - Recommend and justify appropriate valuation assumptions

Sources:

CIA Educational Note: Best Estimates Assumptions for Expenses – November 2006

Commentary on Question:

This question tested the candidates' knowledge of standards of practice with respect to expense assumptions.

Solution:

- (a) Below are various expense categories
- A. Acquisition expenses
 - B. Maintenance expenses
 - C. Claims related expenses
 - D. Investment expenses
- (i) Describe to what extent the expense categories above should be included or excluded from the valuation best estimate projections under the CALM methodology.
- (ii) Identify an appropriate measurement base for setting the unit of expense for those included expense categories.

Commentary on Question:

Candidates generally did well on this part of the question. Few candidates mentioned that investment expenses related to capital should be excluded.

- A. Acquisition expenses
- Acquisition expenses are generally not included in the valuation as these occur before the valuation date.
 - However, the actuary can extend the term of the liability to recognize deferred acquisition costs. This action must be consistent with the pricing of the product.
 - Unit expenses could be expressed as a percent of premium.

3. Continued

B. Maintenance expenses

- Maintenance expenses are generally included in the valuation as these occur after the valuation date.
- Unit expenses could be expressed as an amount per policy or a percent of premium.

C. Claims related expenses

- Claims related expenses include all processing expenses related to any policy benefit for the related policies.
- Excludes interest paid on late/delayed claims payments.
- Unit expenses would be an amount per claim paid or an amount per \$1,000 of claim.

D. Investment expenses

- Includes investment expenses relate to assets used to support policy liabilities.
- Excludes investment expenses related to capital.
- Unit expenses would be a percent of asset market value expressed in bps.

- (b) You have been provided with the results of an expense experience study, and are determining approaches for setting best-estimate expense assumptions. Critique each of the following approaches:
- (i) Set a bulk provision equal to the total actual expenses during the year. Project these forward using a 2% inflation rate.
 - (ii) Set an expense factor equal to the sum of all expenses divided by the number of policies which are in-force at the valuation
 - (iii) Vary the unit expense by province of issue to reflect the differences in operating costs

Commentary on Question:

Candidates generally did not do well on this part of the question. Partial credit was received for valid considerations such as the inflation rate should be consistent with scenarios.

- (i)
 - Does not reflect any significant growth or decline in business
 - Total expenses include acquisition costs which should be excluded from valuation
 - Would not allow for a consistent approach

3. Continued

(ii)

- Should exclude any one-time costs not expected to continue
- May want a separate factor for claims related costs
- Should check on consistency of result with previous valuation

(iii)

- Province of issue not easily tracked in a valuation system
- Would create too many factors to adequately manage

(c) You are given the following situations:

- A. The results of the annual expense study have shown that unit costs have dropped by 20% as compared to the previous year's best estimate assumption. This assumption has not changed in the previous 5 years.
- B. The Company introduced a new line of business during the year. The costs for the new line were double for those of the existing lines of business. Management projections show that this difference is expected to reach zero within three years from the valuation date.
- C. During the year, the Company has outsourced the premium and claims administration to a small, but efficient, local company. The change is expected to save costs over time.

Recommend an appropriate action to update the current reserve assumption consistent with the CIA Standards of Practice for each of the above situations. Justify your answer.

Commentary on Question:

Candidates generally did well on situation A, but generally did not do well on situations B or C. Few candidates demonstrated understanding of the expense overrun on situation B.

A

- Actuary should only reflect gains when there is supporting evidence to do so.
- Actuary should review expense study to understand source of reductions.
- Actuary can reflect emerging trends but should not reflect one-time events.
- Future gains should only be included to the extent that these are expected to continue.
- If gain is expected to continue, actuary can reflect some of the reduction, but should not fully reflect the drop in expenses.

3. Continued

B

- Actuary can consider business plan when setting unit expenses.
- Additional expenses for new line would be considered a temporary expense overrun.
- Actuary can use a long-term best estimate with a separate provision to account for the overrun.
- Alternatively, actuary can use varying unit expenses to reflect total expenses and expected volumes.

C

- Fees charged by the outsourcing company should be included in the expenses. Internal expenses of the company related to the administration of the outsourcing arrangement should also be included.
- Fees should be projected with inflation, consistent with the terms of the contract.
- The actuary should use caution in projecting productivity gains until there is supporting experience.
- It may be appropriate to increase the MfAD to reflect additional risks associated with the outsourcing agreement.

4. Learning Objectives:

1. The candidate will understand and apply pre-IFRS 17 valuation principles to individual life insurance and annuity products issued by Canadian life insurance companies.

Learning Outcomes:

- (1a) The Candidate will be able to:
- Compare and apply methods for life and annuity product reserves
 - Evaluate, calculate, and interpret liabilities
 - Recommend and justify appropriate valuation assumptions

Sources:

CIA Educational Note: Investment Assumptions Used in the Valuation of Life and Health Insurance Contract Liabilities, Sep 2015

CIA Education Note: Investment Returns for non-fixed income returns for Assets, March 2011

Commentary on Question:

This question tested the candidates' knowledge of investment assumptions used in CALM.

Solution:

- (a)
- (i) Describe the construction of the CALM base scenario.
 - (ii) You have been asked to construct CALM Prescribed Scenario 2 for the 1-year and 20-year durations. Determine the values for these specific durations:

| Year | 1-year | 20-year |
|------|--------|---------|
| 0 | | |
| 1 | | |
| 10 | | |
| 20 | | |
| 30 | | |
| 40 | | |
| 50 | | |

Commentary on Question:

For part (i), candidates were generally able to describe the construction of the CALM base scenario.

4. Continued

For part (ii), candidates were generally able to calculate (1) time 0 rate and time 40+, and (2) time 10 and time 30 are uniformly graded. Common errors include using 90% of the valuation date amounts at time 1 rather than 110% of the valuation date; and using 10% of time 1 rate at time 20 rather than using 10% balance sheet rate.

(i)

Rates up to duration 20 – Forward interest rates effective at the balance sheet date

Rates from duration 21-39 – Uniform transition from 20th to 40th year rates

Duration 40 – 30% of the 20th anniversary + 70% of the 60th anniversary

From 41-59 – Uniform transition from 40th to 60th year rates

Duration 60+: URR median

(ii)

Time 0 – Valuation date amount

Time 1 – 110% of valuation date amounts

Time 10 – Uniformly grade between 1-20

Time 20 – 10% balance sheet + 90% year 40

Time 30 – Uniformly grade between time 20 and time 40

Time 40+ - 1 year – URR high short term, 20 year – URR high long term

| | 1-year | 20-year |
|----|---------------|----------------|
| 0 | 0.100% | 3.250% |
| 1 | 0.110% | 3.575% |
| 10 | 4.155% | 6.299% |
| 20 | 8.650% | 9.325% |
| 30 | 9.125% | 9.663% |
| 40 | 9.600% | 10.000% |
| 50 | 9.600% | 10.000% |

- (b) The CFO would like to invest in an aggressive fund of non-fixed income (NFI) assets in order to improve the returns. You are given the following statements with respect to the CALM valuation of liabilities. Critique each of the following statements:

A. *The best estimate valuation assumption should be determined using the previous 10 best years of experience of the past 30 years.*

B. *The historical returns used to determine the best estimate valuation assumption should be based on the experience of the Toronto Stock Exchange (TSX).*

C. *Dividend income and rental income assets should not be considered for the portfolio as these investments will reduce the expected return.*

4. Continued

D. *The best estimate valuation return should be determined as the average of the historical returns.*

Commentary on Question:

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

For statement A, candidates generally did well. Candidates were generally able to identify that it should be determined using the longest period possible.

For statement B, candidates generally identified it incorrectly as true. Few candidates were able to link the statement with the fact the CFO would like to invest in an aggressive fund of NFI assets. Partial credit was received if candidates identified that (1) 'aggressive' means highly volatile, and (2) TSX would include all classes of stock.

For statement C, candidates generally identified it incorrectly as false, and dividend income and rental income assets will increase the expected return. Partial credit was received if candidates identified that (1) dividend income and rental income assets will reduce the expected return, or (2) dividend income and rental income assets will reduce volatility.

For statement D, candidates generally identified it incorrectly as false. Few candidates clarified that the average of the historical returns needs to be based the return on geometric mean and not the arithmetic mean.

A. False

Historical period should be based on the longest period possible
Need to include both positive returns and negative returns

B. False

The stocks are 'aggressive' meaning these would be highly volatile.
The TSX would include all classes of stocks, meaning this would not be an appropriate benchmark.

C. True

These stocks will also reduce volatility. Achieving a balance will produce more stable results over a period of time.

D. True, but needs to be clarified.

Need to base the return on the geometric mean and not the arithmetic mean.

4. Continued

(c) The valuation cash flows for a block of business are as follows:

| | |
|--------------|-------|
| Years 1-10: | 1,000 |
| Years 11-20: | 900 |
| Years 21-25: | -500 |
| Years 26-30: | 300 |
| Years 31+: | 0 |

The block is being matched by NFI assets. You are given the following information:

- These investments are well-diversified and held entirely in Canada.
- The NFI holdings are greatest at time 5.
- The valuation returns are to be determined using the following assumptions:

| | Best estimate | Margin (as a % of best estimate) |
|----------------------|---------------|----------------------------------|
| Growth rate: | 6.0% | 20% |
| Income assumptions: | 2.0% | 10% |
| Investment expenses: | 0.5% | 10% |

Calculate the maximum NFI holdings allowed in the valuation at time 5.

Commentary on Question:

Candidates were generally able to calculate the valuation discount rate, including (1) how to apply margin, and (2) how to aggregate growth rate, income assumption and investment expenses. Partial credit was received if margins were calculated correctly on only one or two assumptions.

Candidates generally identified that the maximum NFI follows the 20-20-75 rule. However, not all candidates applied the rule correctly to all years of cashflows (from year 5 to year 30).

Few candidates applied the flooring at yearly results.

Some candidates were aware that a 30% market correction was. However, most candidates did not apply it correctly.

4. Continued

Valuation discount rate

= 6.05%

= Net Growth + Net Income – Net Investment Expense, excludes on time drop

Net growth = 4.8% = 6% x (1 – 20%)

Net income = 1.8% = 2% x (1 – 10%)

Net investment expense = 0.55% = 0.5% x (1 + 10%)

Applying 20% to first 20 years

Applying 75% to remaining period

Floor yearly results at 0

Present value of NFI cashflows at time 5 = \$2,186.70

| Time | Valuation Cash Flows | % Apply | NFI Cashflow |
|------|----------------------|---------|--------------|
| 1 | 1,000 | | |
| 2 | 1,000 | | |
| 3 | 1,000 | | |
| 4 | 1,000 | | |
| 5 | 1,000 | 20.00% | 200 |
| 6 | 1,000 | 20.00% | 200 |
| 7 | 1,000 | 20.00% | 200 |
| 8 | 1,000 | 20.00% | 200 |
| 9 | 1,000 | 20.00% | 200 |
| 10 | 1,000 | 20.00% | 200 |
| 11 | 900 | 20.00% | 180 |
| 12 | 900 | 20.00% | 180 |
| 13 | 900 | 20.00% | 180 |
| 14 | 900 | 20.00% | 180 |
| 15 | 900 | 20.00% | 180 |
| 16 | 900 | 20.00% | 180 |
| 17 | 900 | 20.00% | 180 |
| 18 | 900 | 20.00% | 180 |
| 19 | 900 | 20.00% | 180 |
| 20 | 900 | 20.00% | 180 |
| 21 | (500) | 20.00% | 0 |
| 22 | (500) | 20.00% | 0 |
| 23 | (500) | 20.00% | 0 |
| 24 | (500) | 20.00% | 0 |
| 25 | (500) | 20.00% | 0 |
| 26 | 300 | 75.00% | 225 |
| 27 | 300 | 75.00% | 225 |
| 28 | 300 | 75.00% | 225 |
| 29 | 300 | 75.00% | 225 |
| 30 | 300 | 75.00% | 225 |

4. Continued

Well diversified NA portfolio = 30%

$$\begin{aligned}\text{Max NFI} &= \text{Present value of NFI cashflows at time 5} / (1 - 30\%) \\ &= \$2,186.70 / (1 - 30\%) = \$3,123.85\end{aligned}$$

5. Learning Objectives:

3. The candidate will understand Canadian taxation applicable to life insurance companies and products.

Learning Outcomes:

- (3a) The Candidate will be able to describe and apply the taxation regulations applicable to Canadian life insurance companies and life insurance products.

Sources:

Canadian Insurance Taxation, Chap. 4, Chap. 24, Chap. 9, Chap. 10, Chap. 6

Commentary on Question:

This question tested the candidates' knowledge of Canadian policyholder taxation considerations.

Solution:

Calculate the following:

- (i) Premium tax payable.
- (ii) Investment income tax (IIT) payable.
- (iii) Net after-tax statutory income.

Commentary on Question:

For part (i), candidates generally understood to apply the Premium Tax Rate to the Net Premium for Premium Tax Payable; some candidates did not calculate the Net Premium correctly.

For part (ii), candidates generally did not use the correct Investment Income Tax (IIT) rate, using the IIT Interest Rate instead. Candidates generally struggled with the calculation of the Base to apply IIT rate.

For part (iii), candidates generally understood what components of the taxable income calculation to use and applied the correct corporate tax rate. Most candidates failed to include the correct investment income in the taxable income and adjusted the difference in change in tax reserves versus statutory reserves for the Gross Statutory Income calculation.

- (i) Net Premium = Direct Written premium - Refunded Premiums - Dividend Cash - Dividends Paid-up Additions
Net Premium = 400 - 15 - 30 - 45 = 310

Premium Tax Payable = Net Premium × Premium Tax Rate
Premium Tax Payable = 310 × 4% = 12.40

5. Continued

- (ii) Total Mean Reserves = Mean Reserves Direct + Mean Reserves Assumed
(Ignoring Mean Reserves Ceded)

$$\text{Total Mean Reserves} = 160 + 10 = 170$$

$$\text{Life Investment Income} = \text{Total Mean Reserves} \times \text{IIT Interest Rate}$$

$$\text{Life Investment Income} = 170 \times 2.5\% = 4.25$$

Include amounts reported to policyholders in income to calculate the Base

$$\text{Base to apply IIT Rate} = 4.25 - 2.00 = 2.25$$

$$\text{IIT payable} = \text{IIT rate} \times \text{Base}$$

$$\text{IIT payable} = 0.15\% \times 2.25 = 0.3375$$

- (iii) Taxable Income includes:

$$\text{Direct Written Premium} = 400$$

$$\text{Assumed Premium} = 40$$

$$\text{Ceded Premium} = -50$$

$$\text{Repayment of policy loans} = 20$$

$$\text{Repayment interest on policy loans} = 5$$

(Ignoring foreign insurance premiums)

$$\text{Change in tax reserves} = -40$$

$$\text{Investment income} = 3\% \text{ rate} \times \text{average stat reserves} = 3\% \text{ rate} \times (100 + 130) / 2 = 3.45$$

$$\text{Premium tax} = -12.4 \text{ (from i)}$$

$$\text{IIT payable} = -0.3375 \text{ (from ii)}$$

$$\text{Sum the above components to calculate Taxable Income} = 365.7125$$

$$\text{Corporate Tax Payable} = \text{Corporate Tax Rate} \times \text{Taxable Income}$$

$$\text{Corporate Tax Payable} = 20\% \times 365.71 = 73.14$$

Adjust for difference in change in tax reserves compared to change in statutory reserves

$$\text{Adjustment} = (100 - 130) - (140 - 180) = 10$$

Gross Statutory Income = Taxable Income + Adjustment for difference in change in tax reserves vs statutory reserves

$$\text{Gross Statutory Income} = 365.71 + 10 = 375.71$$

Net Statutory Income = Gross Statutory Income - Corporate Tax Payable

$$\text{Net Statutory Income} = 375.71 - 73.14 = 302.57$$

6. Learning Objectives:

2. The candidate will understand the professional standards addressing IFRS 17 financial reporting and valuation.

Learning Outcomes:

- (2a) The Candidate will be able to describe, apply and evaluate the appropriate IFRS 17 accounting and valuation standards for life insurance products.

Sources:

LFM-649-20: International Actuarial Note 100: Application of IFRS 17 (excluding section C chapter 11 and section D)

Commentary on Question:

This question tested the candidates' knowledge of IFRS 17. Candidates generally had some level of knowledge on IFRS 17, including the concept of Contractual Service Margin (CSM), IFRS 17 Groups, and Definition of Coverage Units. However, few candidates demonstrated sufficient knowledge to receive full credit.

Solution:

- (a) Contrast the calculations between initial recognition and subsequent measurement for the Contractual Service Margin (CSM) under IFRS17 general measurement model.

Commentary on Question:

This part of question required the candidate to compare the difference between CSM at initial recognition and CSM in subsequent measurements. Most candidates received partial credit on this question. Candidates generally knew that CSM is a prospective calculation at initial recognition and a roll-forward calculation in subsequent measurements. Few candidates mentioned the interpretation of CSM. Most candidates failed to recognize that initial recognition considers past cashflows.

- Timing: Initial recognition is a point in time calculation only done at issue; Subsequent measurement is done in all future reporting periods.
- Calculation: Initial recognition is a prospective (present value) calculation. Subsequent measurement is a retrospective (rollforward) calculation.
- Actuarial interpretation: At initial recognition, CSM is established to offset initial profits, removing front-ending of profit. In subsequent measurements, CSM is released into profits based on coverage provided.
- Scope: Initial recognition considers all contractual cashflows (future and past) within the contract boundary. Subsequent measurement considers future contractual cashflows within the contract boundary.

6. Continued

(b) Critique the following IFRS17 statements.

- A. *We will calculate a CSM for individual policies at contract issue to support capital requirements for the fulfilment cashflows. Fulfilment cash flows will include expected future cash outflows and inflows. At contract issue, the CSM will consider all contractual cash flows, both future and past, within the contract boundary.*
- B. *For efficiencies on our closed block of Term to 100 business, we will amortize the CSM linearly over the contract boundary. If the block becomes onerous, we will continue to amortize the CSM linearly over the remaining contract boundary.*
- C. *Due to a system conversion a few years ago, we were unable to retain certain historical data and, thus, at transition our universal life business will be grouped using the fair value approach. New universal life policies issued after transition will be added to the group until May 31. On June 1, our newly priced universal life product will be launched. From June 1 onwards, each reprice will be grouped separately, with a reprice every 10 to 14 months.*

Commentary on Question:

For statement A, candidates generally understood that CSM is calculated at the group level. Some candidates failed to recognize CSM is calculated at initial recognition instead of issue. For statement B, candidates generally pointed out that there will be no CSM to amortize if the block becomes onerous. Some candidates failed to explain clearly whether the linear amortization is appropriate. Candidates generally did well critiquing statement C.

A.

- First sentence:
 - CSM is for a group of contracts. One contract cannot be measured without considering others like it.
 - CSM not established at contract issue but at initial recognition.
 - CSM offsets initial profit, not capital requirements.
- Second sentence: fulfilment CFs also include risk adjustment for non-financial risk and pre-coverage cash flows.
- Third sentence: at initial recognition, not contract issue; otherwise, rest of sentence is true.

6. Continued

B.

- First sentence:
 - although a straight-line release is a reasonable proxy, given the long duration of a T100 contract boundary it would indicate discounting and size of blocks would impact CSM release materially.
 - CSM meant to be relative to services rendered, and liner release over that length of time would under release in early years and over release in later years.
- Second sentence:
 - An onerous contract results in a LC and is recognized as loss immediately.
 - The LC is tracked, but not amortized.
 - Only if LC goes back to CSM would you continue to amortize.

C.

- First sentence: can use FV approach as it is impractical to use full retrospective approach.
- Second sentence: new contracts cannot be added to groups measured at transition using the fair value approach.
- Third and Fourth sentences: new contracts can be added to the group after the end of the reporting period but cannot be more than one year apart.

(c) During 2024, the following events occur that were not forecasted or differed from forecast.

- (i) An increase of 220 in the payout annuity risk adjustment due to increased uncertainty of mortality experience
- (ii) An additional 60 of universal life death benefits paid due to higher than expected mortality
- (iii) An experience study lowers disability termination rates and increased the liability of incurred claims by 170.
- (iv) The universal life contracts issued end up being onerous by 30.
- (v) Interest rates increased more than expected and reduced the disability income, payout annuity and universal life liabilities by 100, 130 and 145, respectively.

Explain how each of these events would impact the CSM roll forward in 2024.

6. Continued

Commentary on Question:

This part of the question required an understanding of the CSM rollforward. Candidates generally knew that unfavorable changes to onerous blocks could not affect CSM. Some candidates understood that actual experience does not directly impact CSM. Few candidates received credit for parts (iii) – (iv).

- (i) Since POA is onerous and in a loss component, the increase would not impact the CSM.
- (ii) The additional death benefits would not have a direct impact on the CSM. However, indirectly, additional deaths could change the coverage units and result in a release of CSM.
- (iii) LIC does not impact the CSM.
- (iv) The new contracts issued CSM of 50 would change to nil since onerous contracts go through P&L. Since the new business would have its own grouping, it would not reduce the existing CSM by 30. There might be secondary impacts on CSM amortization (as some of the NB CSM would have been expected to be released in 2024) and interest accretion as a result.
- (v) Time value of money impacts do not go through CSM for contracts without direct participating features (or using the General Measurement Model approach). Time value of money impacts are recognized in CSM for contracts with direct participating features (or contracts using the Variable Fee Approach).

7. Learning Objectives:

4. The candidate will understand U.S. financial and valuation standards, principles and methodologies applicable to life insurance and annuity products.

Learning Outcomes:

- (4a) The Candidate will be able to describe U.S. valuation and capital frameworks, and explain their impact on the valuation of reserves, capital and financial statements.

Sources:

LFM-143-20 Fundamentals of the Principle Based Approach to Statutory Reserves for Life Insurance, Rudolph

LFM-145-20 Global Insurance Regulatory Issues: Implications for U.S. Policy and Regulation, Nov. 2015

Commentary on Question:

This question tested the candidates' knowledge of U.S. financial and valuation standards, principles and methodologies.

Solution:

- (a) List the recommendations made by the Bipartisan Policy Centre's (BPC) Insurance Task Force to improve global insurance regulation.

Commentary on Question:

Candidate received credit for each recommendation identified. Candidates generally did not identify all the recommendations.

Recommendations:

- 1) Policyholder protection should remain the primary goal of the U.S. solvency system;
- 2) FSOC's independent members with insurance expertise should be part of "Team USA" and participate where possible on global insurance forums.
- 3) Team USA should be clarified and codified for international regulation liaison.
- 4) The FDIC, the Federal Reserves, and the U.S. Treasury Department should make it a priority to develop an approach tailored to the business of insurance for resolving IAIGs and G-SIIs if and when they fail.

7. Continued

- (b) The United States has various government and other organizations involved in global insurance forums. Below are various scenarios regarding insurance regulation.

For each scenario A through D below:

- (i) Determine the US-based organizations participating in the scenario
- (ii) Explain how each organization contributes to the scenario
- A. A large global insurer based in Canada is under review to see if it should be deemed a Globally Significant International Insurer (G-SII).
- B. A US insurer has just been deemed a Systematically Important Financial Institution (SIFI), but is demanding this designation be reviewed and overturned.
- C. An amendment to the global reserve standard has been proposed and all countries in the world have been asked to adopt the standard.
- D. The European Union has decided to change reinsurance collateral requirements for companies that operate in Europe. A medium-sized US company wishes to extend their operations into Europe.

Commentary on Question:

This part of the question tested the candidates' knowledge of US-based organizations and their involvement in various global and domestic scenarios. Candidate received partial credit if they could correctly identify the key relevant organization in each scenario. For scenario A, full credit was received if two organizations were identified, and involvements of those organizations were correctly described.

A.

NAIC:

- Primary US participant in IAIS which develops methodology to assess and designate G-SIIs.

Federal Reserve Board:

- Sits on IAIS which develops methodology to assess G-SIIs.
- Sits on Financial Stability Board (FSB) which designates G-SIIs.

7. Continued

Federal Insurance Office:

- Sits on IAIS which develops methodology to assess G-SIIs.
- Represents on IAIS executive committee which develops methodology to assess G-SIIs

US Treasury Department:

- Member of the FSB which designates G-SIIs.

B.

Federal Reserve Board:

- Has regulatory authority over largest most complex US-based insurers. Oversees SIFIs and SLHCs.

FSOC Independent Member with Insurance Expertise:

- Has vote to designate US-based insurer as SIFI.

C.

NAIC:

- Primarily focused on standard setting and providing support to members but does not have regulatory authority or the power to enforce its standards on its members.

State regulators:

- Conduct most of the insurance oversight.
- Does not need to comply with NAIC policies or model legislation.
- Under the International Insurance Capital Standards Accountability Act, along with Treasury / FIO must achieve consensus with state insurance regulators through the NAIC to take a position on insurance proposal in an international forum.

D.

Federal Insurance Office:

- Given authority by Dodd-Frank to represent the US internationally, no domestic regulatory authority.
- Negotiates covered agreements with foreign jurisdictions.

7. Continued

- (c) A US-based company is implementing VM-20 for a block of newly issued Universal Life insurance policies.
- (i) Compare the historical Commissioner's Reserve Valuation Method (CRVM) to the principles-based approach to statutory valuation found in Chapter 20 of the Valuation Manual (VM-20) with regards to the following assumptions:
- Mortality
 - Lapses
 - Expenses
 - Interest Rates
- (ii) Critique the following statements with regard to calculating the deterministic reserve under VM-20:
- A. *The only valid calculation approach is the present value of cash flows over a single economic scenario.*
- B. *The deterministic reserve is equal to the actuarial present value of future benefits and all future expenses less the actuarial present value of future gross premiums and other applicable revenue.*
- C. *This path of discount rates depends upon the pattern and amount of projected asset cash flows from the starting assets and uses the single economic scenario corresponding to the deterministic reserve calculation.*

Commentary on Question:

In part (i), candidates were generally able to identify that the assumptions (other than lapse) in historical CRVM method were prescribed and the assumptions in principle-based approach in VM-20 allow company's own experience if credible.

In part (ii) candidates were generally able to critique statement A appropriately. Candidates generally did not do well critiquing statement B.

Statement A: This statement is false.

The present value of cash flows approach over the single economic scenario is not the only approach. Alternatively, the deterministic reserve can be calculated using the "direct iteration approach." This method assigns an amount of starting assets which, when projected along with all premiums and investment income, results in the liquidation of all projected future benefits and expenses by the end of the projection horizon.

7. Continued

Statement B: This statement is false.

- The positive or negative pre-tax interest maintenance reserve (“PIMR”) balance allocated to the group of policies being modeled has to be subtracted when determining the deterministic reserve.
- All future expenses are not included. Federal income taxes and expenses paid to provide fraternal benefits in lieu of federal income taxes are excluded.
- The policy account value invested in the separate account at the valuation date should be added to the deterministic reserve. The actuarial present value of future net cash flows to or from the general account, or from or to the separate account should be subtracted from the deterministic reserve.
- Policy loan balance at the valuation date plus accrued interest should be included. The present value of future benefits should not include repayment of policy loans.
- The actuarial present value of future net reinsurance cash flows should be subtracted from the deterministic reserve.
- The actuarial present value of future derivative liability program net cash flows should be subtracted from the deterministic reserve.

Statement C: This statement is false (or partially correct).

The pattern and amount of projected asset cash flows should include reinvestment assets as well.

8. Learning Objectives:

1. The candidate will understand and apply pre-IFRS 17 valuation principles to individual life insurance and annuity products issued by Canadian life insurance companies.

Learning Outcomes:

- (1a) The Candidate will be able to:
- Compare and apply methods for life and annuity product reserves
 - Evaluate, calculate, and interpret liabilities
 - Recommend and justify appropriate valuation assumptions

Sources:

CIA Educational Note: Discount Rates under IFRS 17

IAN 100 Application of IFRS 17 (exclude Section D), Jan 2019

CIA Educational Note: Comparison of IFRS 17 to Current CIA Standard of Practice, Sept 2018

Commentary on Question:

This question tested the candidates' knowledge of discounting under IFRS 17.

Solution:

- (a) State the characteristics of the discount rate under IFRS17.

Commentary on Question:

Candidates were generally able to identify the first characteristics. Few candidates identified the second and third characteristics.

- reflect the time value of money, the characteristics of the cash flows and the liquidity characteristics of the insurance contracts.
 - be consistent with observable current market prices (if any) for financial instruments with cash flows whose characteristics are consistent with those of the insurance contracts, in terms of, for example, timing, currency and liquidity.
 - exclude the effect of factors that influence such observable market prices but do not affect the future cash flows of the insurance contracts.
- (b)
- (i) Evaluate the appropriateness of each market to be used as a reference portfolio.
 - (ii) Recommend the end of the observable period based on your evaluation in (i)

8. Continued

Commentary on Question:

Candidates generally did not demonstrate sufficient knowledge on this part of the question.

- (i) Market A: sufficient volumes relative to all 3 markets
bid-ask spread is minimal indicating an active market
Market B: sufficient volumes relative to all 3 markets
bid-ask spread is large possibly indicating an inactive market
Market C: Minimal trade volumes and large bid-ask spread indicates an inactive market
- (ii) Market A is the most appropriate with the end of observable period to be set at 30 years given that there is a lack of transaction for 60 year bonds
- (c)
 - (i) Replacing the YRT premium structure with a Fully Guaranteed Level Premium rate
 - (ii) Including a conversion option to a permanent life product with no underwriting
 - (iii) Including a Waiver of Premium benefit upon Job Loss & Disability
 - (iv) Offering a cash surrender value after five years

Commentary on Question:

For this part of question, candidates were expected to justify their response when determining if liquidity would increase or decrease.

For part (i), few candidates identified that liquidity would decrease further with the increase in contract boundary.

For part (iv) few candidates identified liquidity will be greater in the longer term.

- (i)

A level premium structure and guaranteed premium feature would build up the contract's inherent value. This would decrease the liquidity characteristics of the contract

The increase in the contract boundary would further decrease the liquidity characteristics of the contract.
- (ii)

The conversion option and removal of underwriting requirements would build up the contract's inherent value. This would decrease the liquidity characteristics of the contract

8. Continued

(iii)

The inclusion of the Waiver of Premium would build up the contract's inherent value. This would decrease the liquidity characteristics of the contract

(iv)

The inclusion of a CSV would increase the exit value. This would increase the liquidity characteristics of the contract.

The liquidity of the contract would be greater in the longer term (after 5 years) when the CSV kicks in.

(d) You are given:

| | |
|----------------------------------|------|
| Risk-Free Rate | 5.0% |
| Reference Portfolio Yield | 8.0% |
| Market Risk Premium | 0.5% |
| Liquidity Risk Premium | 0.3% |
| Credit Risk Premium | 0.2% |

Calculate the discount rate under the following approaches based on the table above:

(i) Top-down approach

(ii) Bottom-up approach

Commentary on Question:

Candidates generally did well on this part of the question.

(i) Discount Rate = Reference Portfolio Yield - Credit Risk Premium - Market Risk Premium
 $= 8\% - 0.50\% - 0.20\% = 7.3\%$

(ii) Discount Rate = Risk-Free Rate + Liquidity Premium
 $= 5\% + 0.3\% = 5.3\%$

(e) Company MBX is developing a discount rate for a Yearly Renewal Term product following the hybrid bottom-up approach using a reference portfolio containing private debts and mortgages without any adjustments. Evaluate the appropriateness of the approach.

8. Continued

Commentary on Question:

Some candidates compared the liquidity of YRT and the reference portfolio; however, they did not discuss the discount rates need to be adjusted for the liquidity premium.

YRT is a highly liquid product. The reference portfolio is highly illiquid. The discount rates should be adjusted for a liquidity premium

9. Learning Objectives:

2. The candidate will understand the professional standards addressing IFRS 17 financial reporting and valuation.

Learning Outcomes:

- (2a) The Candidate will be able to describe, apply and evaluate the appropriate IFRS 17 accounting and valuation standards for life insurance products.

Sources:

CIA Draft Educational Note – IFRS 17 Risk Adjustment for Non-Financial Risk for Life and Health Insurance Contracts

LFM-649-20: International Actuarial Note 100: Application of IFRS 17 (excluding section C chapter 11 and section D)

CIA Educational Note: IFRS 17 Estimates of Future Cash Flows for Life and Health Insurance Contracts, Sep 2019

Commentary on Question:

This question tests candidates' understanding about IFRS 17 financial reporting. Candidates were expected to evaluate the appropriateness of IFRS 17 choices while evaluating the insurance contract liabilities.

Solution:

- (a) You are reviewing an implementation document for IFRS 17 in your company, effective January 1, 2023. Critique the following statements from the document with respect to the risk adjustment:
 - A. *The IFRS 17 standard prescribes the methodology for how the risk adjustment is measured in practice. Measurement requirements will be based on the contract level unit of account. Presentation and disclosure requirements will be at the total legal entity level.*
 - B. *The legal entity aggregate risk adjustment will be equal to the sum of the risk adjustments for all the units of account. The parent entity risk adjustment will apply a diversification benefit to the risk adjustment such that a higher confidence level of the parent risk adjustment would result in a higher diversification benefit.*
 - C. *The risk adjustment confidence level will be calculated and disclosed at the contract level.*
 - D. *For operational efficiencies, LICAT will be used as a calibration point in quantifying the confidence level, such that the aggregate base solvency buffer represents approximately an 85% confidence level on the risk adjustment.*

9. Continued

- E. *The direct and ceded liabilities from the same contract group use the same unit of account in calculating the risk adjustment. The risk adjustment for reinsurance held will create an asset, and the risk adjustment will have the effect of increasing the value of the reinsurance asset.*
- F. *The same discount curve will be used to discount the future cash flows and the risk adjustment.*
- G. *The risk adjustment will include the uncertainty caused by long-term disability claimants returning to work, paying a quarterly annuity benefit monthly, and expense inflation exceeding the consumer price index.*
- H. *The risk adjustment will not include the uncertainty caused by defaults on fixed income assets, and higher universal life policy lapses as a result of low investment returns.*

Commentary on Question:

Candidates generally did well in demonstrating knowledge of the following:

- *IFRS 17 does not prescribe the risk adjustment methodology.*
- *The LICAT framework can be used for calibration with modification.*
- *Distinguishing the uncertainty which should be included and the uncertainty which should be excluded from the risk adjustment.*

Candidates generally did not do well in demonstrating knowledge of the following:

- *The risk adjustment measurement and presentation can be done at lower level*
 - *The relationship between diversification and confidence level*
 - *The risk adjustment confidence level can be calculated and disclosed at the contract level.*
 - *The required modification required to use LICAT framework for calibration*
 - *Paying the quarterly claim monthly is an operational risk and should not be included in RA*
- A. *The IFRS 17 standard does not prescribe a methodology for how the RA would be measured in practice. Measurement requirements are based on the IFRS 17 unit of account (i.e., RA determined for a single contract or group of contracts), whereas presentation and disclosure requirements tend to be at a higher level (RA for the aggregation of portfolios of contracts, or entity-level RA).*

9. Continued

- B. When the RA is developed at the unit-of-account level, the entity's aggregate RA would be the sum of the risk adjustments for the various units of account. The more conservative view an entity takes in applying diversification at the unit-of-account level, the higher will be the resulting RA and its reported confidence level.
- C. It would be at the discretion of the entity to disclose the confidence level of risk adjustments at anything less than an entity-level.
- D. Only portions of LICAT framework can be used for calibration benchmarks for confidence level, particularly those with level and trend shocks (mortality, longevity, etc). Calibration of the LICAT level and trend shocks reflected a particular discount rate, diversification and LICAT credits. To the extent that these parameters are different in an entity's estimate of future cash flows, the LICAT benchmark may not necessarily correspond to a confidence level at or around 85%. If seg funds represent a non-material portion, It is OK to include. Otherwise, a more sophisticated approach required.
- E. Under IFRS 17, direct liabilities must be calculated separately from ceded liabilities because these contracts would never be in the same unit of account. For reinsurance held, because the risk adjustment for reinsurance held is defined based on the amount of risk transferred to the reinsurer, the risk adjustment for reinsurance held will normally create an asset. On this basis, where a reinsurance contract held is reported as an asset the risk adjustment will have the effect of increasing the value of the asset, and will decrease the liability value where the reinsurance contract held is reported as a liability.
- F. IFRS 17 provides no direction regarding the discounting of the RA. Consequently, the use of discounting (or not) and the methodology to determine discount rates are at the discretion of the entity. The same discount curve can be used to discount the future cash flows and the risk adjustment.
- G. Accidentally paying the quarterly claim monthly is an operational risk and should not include in RA. The other two statements are true.
- H. policyholder behavior associated with investment returns is a non-financial risk and would be included. The other statement is true.

9. Continued

- (b) You are given the following expense items:
- (i) *Commissions payable to agents upon sale of policy*
 - (ii) *Marketing expenses for TV commercials promoting the life insurance company's philanthropic initiatives*
 - (iii) *Cost of fuel for the CEO's private jet*
 - (iv) *Rent payable on the corporate head office located in Bermuda*
 - (v) *Cost of mailing claim payments to clients*
 - (vi) *Expenses incurred from investigating employee fraud*

Assess whether the above expense items should be included in the fulfillment cash flows. Justify your response.

Commentary on Question:

Candidates generally did well in identifying that commission expense and cost of mailing claim payments should be included in the fulfillment cash flows.

Candidates generally did well in excluding marketing expenses, cost of fuel, employee fraud from the fulfillment cash flows.

Candidates generally did not do well in explaining whether the rent payable should be included or not as the expense can go either way.

As a general statement, IFRS 17 valuation includes cash flows that relate directly to the fulfilment of an insurance contract. This includes expense cash flows that are directly attributable to a portfolio of insurance contracts. These include both acquisition and maintenance expenses.

- (i) The expense is directly related to the sale of insurance contract.
- (ii) This is an indirect cost. It is not specific for the fulfillment of insurance contract and is more general overhead for the company.
- (iii) This is an indirect cost. Cost of executive perks is not directly related to the fulfillment of the contract.
- (iv) It can be either direct or indirect. A portion of the overhead expense could be attributed to the insurance contract.

9. Continued

- (v) Expense of client mailings is directly related to the administration of the insurance contract.
- (vi) This is an indirect cost. It is not specific to the fulfillment of the insurance contract and is more general overhead for the company.

10. Learning Objectives:

5. The candidate will understand how to explain and apply the methods, approaches and tools of financial management in a life insurance company context.

Learning Outcomes:

- (5a) The Candidate will be able to:
- Explain and apply methods in determining regulatory capital and economic capital
 - Explain and evaluate the respective perspectives of regulators, investors, policyholders and insurance company management regarding the role and determination of capital
 - Explain Canadian regulatory capital framework and principles
 - Explain and apply methods in capital management

Sources:

LFM-645-21: OSFI Guideline – Life Insurance Capital Adequacy Test (LICAT), Chapters 1-11, excluding Sections 4.2-4.4 and 7.3-7.11, October 2018

CIA Educational Note: LICAT and CARLI, March 2018

Commentary on Question:

This question tested the candidates' knowledge of the Life Insurance Capital Adequacy Test (LICAT), including the calculation of required capital for two of the components.

Solution:

- (a) Describe the margins which are to be included in the Surplus Allowance.

Commentary on Question:

Candidates were generally able to identify the appropriate PfADs to be included but did not identify that PfADs related to non-economic assumptions are to be calculated net of registered reinsurance and that PfADs related to risk-free interest rates are to be calculated net of all reinsurance.

The specific PfADs included in the Surplus Allowance used to calculate the LICAT ratios are:

- PfADs relating to scenario assumptions for risk-free interest rates associated with insurance contracts other than segregated fund contracts, calculated net of all reinsurance; and
- PfADs for the following non-economic assumptions associated with insurance contracts other than segregated fund contracts, calculated net of registered reinsurance only: insured life mortality, annuitant mortality, morbidity, withdrawal and partial withdrawal, anti-selective lapse, expense and policy owner options.

10. Continued

- (b) You have split the UL block into two portfolios and calculated the following required capital components for mortality risk:

| | Designation | Level | Trend | Volatility | Catastrophe |
|-------------|-----------------|-------|-------|------------|-------------|
| Portfolio A | Life-supported | 100 | 50 | 20 | 5 |
| Portfolio B | Death-supported | 75 | 25 | 10 | 5 |
| Total UL | | 175 | 75 | 30 | 10 |

- (i) Explain the steps for designating portfolios as either life-supported or death-supported.
- (ii) Calculate the required mortality risk capital for the total UL block using the information in the table above.

Commentary on Question:

For part (i), candidates were generally able to correctly explain the steps. Some candidates mixed up life-supported and death-supported.

For part (ii), candidates generally did not calculate the diversification credit properly, applying it to the total mortality risk capital for each block instead of just the level and trend components.

- (i) The present value of cash flows for each portfolio is calculated using a -15% mortality level shock applied to the best estimate assumption for the mortality rate and a +75% mortality trend shock applied to the best estimate assumption for mortality improvement, discounted using either CALM valuation rates, or the discount rates specified in the LICAT Guideline. The result of this calculation is compared to the present value of best estimate cash flows using the same discount rates. If the present value of the shocked cash flows is greater than the present value of the best estimate cash flows, the portfolio is designated as death supported business; otherwise, the portfolio is designated as life supported.

- (ii) Undiversified Mortality Risk Required Capital =

$$\begin{aligned} &+ \text{Required Capital Level} \\ &+ \text{Required Capital Trend} \\ &+ \sqrt{(\text{Required Capital Volatility}^2 + \text{Required Capital Catastrophe}^2)} \\ &= + 175 + 75 + \sqrt{(30^2 + 10^2)} \\ &= 281.62 \end{aligned}$$

10. Continued

There is a within-risk diversification credit between life supported and death supported level and trend mortality risk.

Diversified Level and Trend Required Capital =

$$\sqrt{(\text{Required Capital Life Supported Level and Trend}^2 + \text{Required Capital Death Supported Level and Trend}^2 - 1.5 * \text{Required Capital Life Supported Level and Trend} * \text{Required Capital Death Supported Level and Trend})}$$

$$= \sqrt{(150^2 + 100^2 - 1.5 * 150 * 100)}$$

$$= 100$$

Diversification Credit =

+ Undiversified Level and Trend Required Capital
– Diversified Level and Trend Required Capital

$$= 250 - 100$$

$$= 150$$

Diversified Mortality Risk Required Capital =

+ Undiversified Mortality Risk Required Capital
– Diversification Credit

$$= 281.72 - 150$$

$$= 131.62$$

- (c) Assume that the death benefit for a UL policy is equal to a level amount of 100 plus an accumulated account value of 50.

Explain how the net cash flows for the LICAT interest rate risk calculation would be projected.

Commentary on Question:

Candidates generally did not do well on this part of the question. Most candidates discussed the LICAT interest rate shocks and not how the net cash flows are determined. To receive full credit, candidates were required to explain one of the two approaches below.

10. Continued

For the interest rate risk net cash flows projection, two approaches are possible:

- Net cash flow includes a liability cash flow on death of 150 and an offsetting asset cash flow of -50 for the release of the investment account value.
- Net cash flow includes a liability cash flow on death of 100, with no release of investment account value in the asset cash flows.

- (d) Describe the characteristics of the index-linked products which are subject to the correlation factor calculation.

Commentary on Question:

In general, candidates described the second and third characteristics below, but few candidates included the first characteristic.

The correlation factor calculation may be used for index-linked products having the following characteristics:

1. Both assets and liabilities for these contracts are held in the general fund of the life insurer;
2. The policyholder is promised a particular return in the contract, based on an index, possibly subject to a floor. The following are examples of such returns:
 - (a) The same return as a specified public index. This includes, but is not limited to a public stock index, a bond index, or an index maintained by a financial institution.
 - (b) The same return as is earned by one of the insurer's segregated funds or mutual funds.
 - (c) The same return as is earned by another company's mutual funds; and
3. The insurer may invest in assets that are not the same as those that constitute the indices.

- (e) You have the following information for an index-linked UL policy:

| | Q3 2020 | Q4 2020 | Q1 2021 | Q2 2021 | Q3 2021 |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|
| Asset Value (millions) | 10 | 10.2 | 9.8 | 9.9 | 9.7 |
| Historical Correlation between returns credited to policyholder funds and returns on asset for past 52 weeks | 0.7 | 0.72 | 0.69 | 0.57 | 0.82 |
| standard deviation of return on assets for past 52 weeks | 3.2 | 3.4 | 3.6 | 3.9 | 3.1 |
| standard deviation of return on policyholder funds for past 52 weeks | 3.8 | 3.4 | 3.1 | 3.7 | 3.9 |

Calculate the required capital for market risk for this product for Q3 2021.

10. Continued

Commentary on Question:

Candidates generally did not do well on this part of the question. Common errors include omitting the "20" in the factor formula below; and identifying F as the required capital.

Firstly, the factor F is determined as follows, for each of prior 4 quarters:

$$F = 20 \times (C - B + B \times \sqrt{2 - 2A})$$

Where:

- A is the historical correlation between the returns credited to the policyholder funds and the returns on the subgroup's assets;
- B is the minimum of [standard deviation of asset returns, standard deviation of returns credited to policyholder funds]; and
- C is the maximum of [standard deviation of asset returns, standard deviation of returns credited to policyholder funds].

Q4 2020: A = 0.72, B = 3.4, C = 3.4, F = 50.89

Q1 2021: A = 0.69, B = 3.1, C = 3.6, F = 58.82

Q2 2021: A = 0.57, B = 3.7, C = 3.9, F = 72.62

Q3 2021: A = 0.82, B = 3.1, C = 3.9, F = 53.20

Index-linked required capital

= Max F in the prior 4 quarters * Account Value at Quarter-End

= 72.62 * 9.7 = 704.46