ILA LFMC Model Solutions
Spring 2025

1. 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:

- The Candidate will be able to describe, apply and evaluate the appropriate IFRS 17 accounting and valuation standards for life insurance and annuity products
- Compare and apply methods for life and annuity product reserves
- Evaluate, calculate, and interpret liabilities
- Recommend and justify appropriate valuation assumptions

Sources:

International Actuarial Note 100 Application of IFRS 17 (exclude Section C Chapter 11 and Section D), Jan 2019

CIA Educational Note: IFRS 17 Measurement and Presentation of Canadian Participating Insurance Contracts

The IFRS 17 Contractual Service Margin: A Life Insurance Perspective (Sections 1-4.8)
IFRS 17 – Coverage Units for Life and Health Insurance Contracts

Commentary on Question:

This question tested the candidates' understanding of various IFRS 17 topics, including Measurement, Contractual Service Margin and Presentation of Canadian Participating Insurance Contracts.

Solution:

(a) ABC is developing a non-participating whole life product that will be valued using the General Measurement Model (GMM).

Explain how electing the OCI option will affect income volatility.

Commentary on Question:

Many candidates explained the change in income volatility with the OCI option. To receive full credit, candidates had to justify the underlying reasons and the approach to applying the OCI option, which few candidates did.

1. Continued

Overall, this would be expected to reduce earnings volatility by allowing some of the effect of time value of money, changes in time value of money, and the effect of financial risk and changes in financial risk to be temporarily moved to OCI. This minimizes P&L volatility due to changes in interest rates.

Must use a system allocation. The systematic allocations are also such that over the duration of the groups the total amount recognized in OCI is zero. This means that when a contact matures the carrying amount of the group is equal to the amount measured using the systematic allocation (paragraph B130(b)).

No overall impact on lifetime P&L or earnings but allows smoothing over time.

(b) ABC is developing a new participating whole life insurance product with following characteristics:

- Policyholder dividends are based on interest, mortality and expense experience of the participating fund.
- Gains in the par fund are to be split evenly between the shareholders and policyholders.

Assess the eligibility of the proposed participating product to be valued under the Variable Fee Approach (VFA). Justify your response.

Commentary on Question:
Candidates generally did well on this part of the question. Most candidates provided the conclusion on the eligibility of VFA. To receive full credit, candidates had to assess all three criteria and make a conclusion. Candidates generally assessed two of the three criteria.

Criteria for VFA Eligibility
1) contractual terms specify that the policyholder participates in a share of a clearly identified pool of underlying items
Met - Par fund qualifies as underlying
2) entity expects to pay the policyholder an amount equal to a substantial share of the fair value of returns on underlying items
Not met - even split between policyholders and shareholders does not constitute a substantial share
3) entity expects a substantial proportion of any change in the amounts to be paid to the policyholder to vary with the change in the fair value of the underlying items
Not met - minimum interest rate guarantee might be too high relative to recent/expected returns

Overall - Product does not currently meet the criteria for VFA

1. Continued

(c) Critique the following statements:

A. Interest accretion on the CSM will be the same under VFA and GMM because the determination of current discount rates and locked-in rates is not affected.

B. The use of YRT reinsurance for mortality risk will not affect income volatility under VFA if the reinsurance costs are passed through to policyholder dividends.

C. The risk adjustment for mortality and expenses will be part of the policyholders' share of the underlying under VFA because these amounts are passed through to the policyholders.

D. Adding a minimum interest rate guarantee to a participating product will not affect eligibility for VFA.

Commentary on Question:
Candidates generally did well critiquing statements A, C and D. Few candidates did well critiquing statement B. To receive full credit on statement B, candidates had to address RMO and the mismatches between the reinsurance contracts and the underlying direct contracts.

A: FALSE,
Locked in rates are used under the General Measurement Model (GMM), not the Variable Fee Approach (VFA). GMM has interest accretion on the Contractual Service Margin (CSM) based on locked-in rates. VFA, on the other hand, includes changes in the entity's share of the fair value of underlying items, measured at current discount rates.

B: FALSE,
Risk Mitigation Option cannot be used since economic risks are not reinsured. There may be further mismatches if liquidity characteristics of the reinsurance contract are different from the underlying direct contracts since different discount rates would be used. as the timing and amount of cash flows from reinsurance may not perfectly align with those of the direct insurance contracts, and the valuation of these cash flows may differ due to the use of different discount rates

1. Continued

C: FALSE,
It would be part of the entity's share of the underlying instead of policyholder's share of the underlying. Policyholders' share of the underlying = Perfect pass-through (PRE) portion of items
shared with policyholders; Entity's share of the underlying = Variable fee + FCF that do not vary with the underlying, where the FCF do not vary with the underlying including the RA

D: FALSE,
Depends on whether the product will still meet criteria for VFA. If the minimum interest rate guarantee is currently close to or expected to exceed the actual earned rate, then criteria c may not be fulfilled. The actuary must reassess eligibility for VFA if a minimum interest rate guarantee is added.

2. 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:

- The Candidate will be able to describe, apply and evaluate the appropriate IFRS 17 accounting and valuation standards for life insurance and annuity products
- Compare and apply methods for life and annuity product reserves
- Evaluate, calculate, and interpret liabilities
- Recommend and justify appropriate valuation assumptions

Sources:

CIA Explanatory Report: IFRS 17 Discount Rate Applications, Mar 2023

CIA Educational Note: IFRS 17 – Fair Value of Insurance Contracts (Including Excel)

Commentary on Question:

This question tested the candidates' knowledge of IFRS valuation principles and requires demonstration of this knowledge through the calculation of CSM under different approaches.

Solution:

(a) Critique the following statements with respect to IFRS17 discount rates and fair value:

A. Any impacts affecting the Contractual Service Margin (CSM) should be quantified using the discount rate at the time of issue regardless of the prevailing discount rate at any future valuation date.

B. Under IFRS 17, non-performance risk should be included in the fulfilment cash flows.

C. The same illiquidity premium for both reinsurance contracts and underlying direct contracts should be used to develop the IFRS 17 discount curve.

D. Non-attributable expenses are included in neither the IFRS 17 fulfilment cash flows nor the fair value of an insurance contract.

2. Continued

Commentary on Question:
Candidates did well critiquing the statements overall. Candidates struggled with statement B as they did not recognize that non-performance risk of the entity is not included in IFRS17 cashflows. For statement A, many candidates gave additional information about the distinction in the approaches for GMM versus VFA methods, but this was not required for full credit. For statement B, some candidates pointed out that the non-performance risk of a reinsurer may be included in the IFRS17 cashflows but it was not required for full credit.

A. TRUE
The IFRS17 standard references the use of locked-in yield curves for measuring certain changes to CSM.

B. FALSE
IFRS17 clearly specifies that the non-performance risk of the entity is not included in IFRS17 cashflows.

C. FALSE
Illiquidity premiums for direct contracts and reinsurance contracts held are set independently under IFRS17.

D. FALSE
Cashflows not directly included in IFRS17 fulfilment cashflows would need to be included in fair value calculation, for example, non-attributable expenses

(b) Using the information provided in Excel for a newly acquired block of business:

(i) Calculate the CSM using the Adjusted FCF approach.

(ii) Calculate the CSM using the Actuarial Appraisal Value approach.

Commentary on Question:
This part of the question tested candidates' understanding of IFRS to calculate the contractual service margin under two different approaches.

Candidates generally did well on part (i). Common mistakes included using the incorrect discount rate and/or missing a component of the CSM calculation. Candidates struggled more on part (ii). Where errors were made, candidates received partial credit if the errors were carried through correctly and where formulas were correctly stated.

2. Continued

(i)

(A) FCF = PV(FCF) @ 5% = 8,069.21
(B) Adjusted FCF = PV(FCF+NDA) @ 5% = 8,146,43
(C) Cost of Capital @ Hurdle Rate = 414.48
(D) Release of Risk Margin @ Hurdle rate = PV(FCF-BE CFs) @ hurdle = 276.51
(E) Profit Margin @ Hurdle rate = (C) – (D) = 137.97
(F) Fair Value = (B) + (E) = 8.284.40
(G) CSM = FV - FCF = (F) – (A) = (C) – [(D) + (A) – (B)] = 215.19

(ii)

(C) Cost of Capital @ Hurdle Rate = 414.48
(D) Release of Risk Margin @ Hurdle rate = 276.51
(H) Non-Directly Attributable Expenses @ Hurdle Rate = 61.45
(I) CSM = (C) – [(D) – (H)] = 199.42

See the spreadsheet for a detailed model solution to this part of the question.

3. Learning Objectives:

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

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

Learning Outcomes:

(4a) 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

(5a) The candidate will be able to describe, apply and evaluate considerations and matters related to:

- Insurance company mergers and acquisitions
- Embedded Value determinations
- Climate risk management

Sources:

OSFI Guideline B-15: Climate Risk Management

LFM-641-19: OSFI: Own Risk and Solvency Assessment (E-19), December 2017

Commentary on Question:

This question tested the candidates' knowledge of climate risk management and ORSA.

Solution:

(a) Critique the following statements with respect to the company's climate risk management practices and policies.

A. The company has identified that agricultural farming companies are greenhouse gas intensive, but it has no climate related financial risks in these investments.

B. The company's climate scenarios will be those promulgated by OSFI and publicly disclosed to allow comparison among peers.

C. The company began its disclosures in 2023. Disclosures will be made every two years and will change to keep up with how its competitors quantify their climate-related risks.

3. Continued

D. The company does not include its climate risk disclosures in its report to shareholders, but instead includes it in its ORSA.

E. The company's level of detail in its disclosure is significantly less than the average Canadian company and follows OSFI's recommended format.

F. The company uses tools developed by the Canadian Farmer's Association to identify and quantify the company's physical risk of flooding occurring on farms and resulting impact on insurance claims.

Commentary on Question:
Commentary is provided for each of the statements.

Statement A: Most candidates identified that there is still transitional risk. Candidates who received full credit elaborated on the types of transitional risks that the company is facing.

Statement B: Many candidates identified that the company should develop its own models for climate scenarios, but few candidates recognized that scenarios from OSFI are not meant for public disclosure.

Statement C: Most candidates recognized that disclosure should be annual. To receive full credit, candidates had to either identify that "adoption began in 2024 but early adoption was okay" or "disclosure should be consistent".

Statement D: Most candidates critiqued this statement well by identifying that climate risk should also be publicly disclosed.

Statement E: Most candidates critiqued this statement well. Common errors were (1) that the level of disclosure should be in line with competitors and (2) failing to recognize that there is no OSFI format for disclosure.

Statement F: Many candidates correctly recognized that using a third-party tool is fine. However, many candidates did not understand that the tool was to quantify physical risk of the assets and not to quantify insurance liabilities.

A. The statement is incorrect. Investments in greenhouse gas intensive companies will lead to transition risk, due to increased regulation related to greenhouse gas intensive industries). For example, there may be higher credit risk as the company will face higher costs of doing business, as well as higher liquidity risk due to diminished demand as assets become more liquid.

3. Continued

B. The statement is incorrect. Company should develop its own plausible and relevant models. OSFI scenarios will allow OSFI to assess aggregate exposures and compare approaches to climate scenario analysis. OSFI scenarios are not meant for public disclosure.

C. The disclosure should be annual. The disclosure should be consistent over time. While the adoption was effective in 2024, early adoption is OK.

D. Although climate risk should be considered in ORSA, ORSA is not a public document and does not meet disclosure requirements.

E. Less disclosure is fine, since company is small and does not have a complex product offering. No OSFI format for disclosure. Company may present in format that suits it best.

F. Company can use tools developed by third parties to quantify the physical risk on assets such as farm flooding, but not liabilities.

(b) Critique the following practices with respect to the company's Own Risk and Solvency Assessment (ORSA):

A. The company follows OSFI's Guideline on ORSA (E-19) on prescribed methodology, assumptions and data. However, the confidence level is lower than prescribed and requires approval by OSFI.

B. Material risks are quantified by applying stochastic approaches to its valuation models. Less material risks are quantified by using sensitivity testing.

C. The company identifies, defines and assesses the materiality of all known and reasonably foreseeable risks captured by LICAT.

D. ORSA is a point in time quantification to potential adverse capital impacts. The company's Financial Condition Testing contemplates the potential adverse capital impacts over a five-year planning horizon.

E. The company's ORSA is independently reviewed by their internal auditor every three years as part of its internal audit cycle.

F. The company sets their internal LICAT target ratio by adding 20% to the Supervisory Target Total Ratio and adding 15% to the Supervisory Target Core Ratio. This approach is validated by their ORSA.

3. Continued

Commentary on Question:
Commentary is provided for each of the statements.

Statement A: Candidates who received full credit not only pointed out that OSFI does not prescribe scenarios but also mentioned that the insurer should define its own approach.

Statement B: Most candidates pointed out the correct relationship between methodology complexity and materiality of risks.

Statement C: Most candidates did well critiquing this statement.

Statement D: Many candidates failed to point out that ORSA is not a point in time.

Statement E: Many candidates addressed the frequency of disclosure, which was not part of the statement.

Statement F: Many candidates failed to address that ORSA does not validate internal targets.

A. Incorrect. OSFI does not prescribe how an insurer should perform its ORSA or approval of any methodology. It is up to the insurer to define an approach which could vary across industry.

B. Correct. More sophisticated methods are used to calculate own capital needed for material risks. For less material risks insurers may use simpler methods.

C. Partially correct. It is true that the company should identify, define and assess the materiality of all known and reasonably foreseeable risks. However, this means that it needs to capture all risks including those not captured by LICAT.

D. Incorrect. ORSA is a forward looking process, consistent with an insurer's planning horizon. The statement on FCT is correct as per the SOP.

E. Correct. OSRA is subject to periodic review, and it can be done internally or externally. However, internal auditor must be someone with experience/knowledge and who reports to the board.

F. Incorrect. ORSA process helps develop internal targets, but not to validate (i.e. without undue reliance on reg capital). Internal targets should be first based on an insurer's assessment of its own capital needs instead of simply adding a margin to supervisory targets to get internal targets.

4. Learning Objectives:

4. 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:

(4a) 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-636-20: OSFI Guideline A-4 Internal Target Capital Ratio for Insurance Companies, December 2017

LFM-641-19: OSFI: Own Risk and Solvency Assessment (E-19), December 2017

LFM-645-23: OSFI LICAT Guideline, Chapters 1 - 11, excluding Sections 4.2-4.4 and 7.3-7.11

Commentary on Question:

This question tested the candidates' knowledge of financial management.

Solution:

(a) Explain how XYZ can ensure there are no adverse impacts to their LICAT ratio when switching from a registered to an unregistered reinsurer.

Commentary on Question:

Most candidates were able to identify collateral and letter of credit as ways to maintain LICAT ratio. However, few candidates were able to explain the requirements needed for the collateral and letter of credit.

XYZ should ensure that the unregistered reinsurer posts collateral or provides an acceptable letter of credit.

Collateral must:

- be held to secure the payment to the ceding insurer by the reinsurer of the reinsurer's share of any loss or liability for which the reinsurer is liable under the reinsurance agreement
- be in the form of cash or securities
- be owned by the reinsurer
- be freely transferrable

4. Continued

All letters of credit used to obtain credit in respect of an unregistered reinsurer must be issued by or have a separate confirming letter from a Canadian bank that is listed on Schedule I or Schedule II of the Bank Act.

(b) XYZ's Total Ratio is 120%. Explain possible reasons why the Appointed Actuary may want to improve the ratio.

Commentary on Question:
Candidates generally explained 1 or 2 reasons.

AA may want to improve the LICAT ratio for the following reasons:

- Regulatory guidelines are not in themselves reflective of a company's risk tolerance. While 120% exceeds the supervisory target, it may be below internal targets as defined in the company's ORSA.
- OSFI expects the level and quality of an insurer's capital and its capital management to be commensurate with its circumstances, risk profile, risk appetite and operating environment. These factors could also justify the concern from the AA, depending on their relation at time of measurement.
- Quality of the capital driving the high regulatory ratio may be low.
- AA may want a very high capital ratio to support new initiatives and business directions, so that it can withstand upcoming business impacts.

(c) List the conditions a product must meet to receive adjustable credit under LICAT.

Commentary on Question:
Although not all conditions listed below were required for full credit, most candidates only listed 1 or 2.

- Contractual adjustability is at the sole discretion of the insurer.
- All adjustable features associated with the products (e.g. premiums, fees and benefits) have been explicitly disclosed in the contract.
- The insurer should regularly review the product's experience and consider its potential impact on adjustments.
- The adjustability is reasonably flexible, and the insurer has tested the reasonable flexibility of the adjustable features in pricing the policy or subsequent to pricing the product.
- If an insurer takes credit for an adjustable feature, the insurer should have a documented internal policy on how it makes adjustments and the key considerations in making adjustments, including the consideration given to losses or shortfalls in actual overall experience.
- The insurer should be able to demonstrate to OSFI that it follows the adjustment policy and practices referred to above.

4. Continued

(d) You are given the following:

	Gross Cashflows	
Year	Best-Estimate	Mortality Level Shock
1	100	120
2	200	240
3	250	300
4	300	360
5	400	480

RC_{vol} =	150
RC_{cat}=	60
RC_{trend}=	0

Calculate required capital for mortality risk ($RC_{mortality}$).

Commentary on Question:
Candidates demonstrated a good understanding of the RC mortality formula but had the most difficulty with discounting the cashflows in calculating the RC level.

Discount Rate = 5.3%

RC Level = Sum of Shocked Cashflow – Sum of Best Estimate Cashflow
= 1251 – 1042 = 208

$$RC_{mortality} = \sqrt{RC_{vol}^2 + RC_{cat}^2} + RC_{level} + RC_{trend}$$

= Sqrt (150^2 + 60^2) + 208 + 0
= 370

(e) State the direction the Total LICAT ratio would move for each of the following. Justify your answer.

(i) An insurer issues additional common shares.

(ii) An insurer experiences rapid growth resulting in direct written premiums increasing by 50%.

4. Continued

(iii) An insurer selling only life-supported products acquires a block of annuities.

(iv) An insurer enters an Administrative Services Only (ASO) contract.

Commentary on Question:
Candidates did well in this part of the question. Most candidates correctly stated the movement of the LICAT ratio for parts (i) and (ii). Candidates struggled with part (iv).

(i) Provided the shares meet LICAT criteria, this will increase Tier 1 capital and increase the LICAT ratio.
(ii) This will increase the operational risk component, decreasing the LICAT ratio.
(iii) This will create diversification, particularly within-risk mortality diversification, but the total impact depends on whether the acquisition included enough assets to cover the required capital for the annuities block. If yes, the total LICAT ratio should decrease.
(iv) No impact, as these products are excluded from the calculation of the insurance risk component.

5. 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:

- The Candidate will be able to describe, apply and evaluate the appropriate IFRS 17 accounting and valuation standards for life insurance and annuity products
- Compare and apply methods for life and annuity product reserves
- Evaluate, calculate, and interpret liabilities
- Recommend and justify appropriate valuation assumptions

Sources:

IFRS 17 – Coverage Units for Life and Health Insurance Contracts

LFM-657-22: The IFRS 17 Contractual Service Margin: A Life Insurance Perspective

CIA Educational Note: Risk Adjustment under IFRS 17

Commentary on Question:

This question tested the candidates' knowledge of IFRS17.

Solution:

(a) Propose coverage units for the following insurance products:

(i) Disability insurance under Liability for Incurred Claims (LIC) approach

(ii) Permanent life insurance with cash surrender values

(iii) Universal life insurance where death benefit is face amount plus account value

(iv) Immediate annuities

Commentary on Question:

Many candidates forgot to multiply by the probability of survival, which led to a loss of credit. For part (ii), only a few candidates correctly recognized that the calculation of CU differs depending on whether the CSV is for investment-return service or not. Partial credit was received if the response included FA or NAAR.

(i) $CU_t = PV(Benefit\ Payments)_t \times {}_tp_x$

5. Continued

(ii) If CSV is for investment-return service,

$$CU_t = Face\ Amount\ \times {}_tp_x$$

If CSV is not considered for investment-return service,

$$CU_t = Net\ Amount\ at\ Risk\ _t \times {}_tp_x$$

$$Net\ Amount\ at\ Risk = Face\ Amount - Cash\ surrender\ values$$

(iii) $CU_t = (Face\ Amount + Account\ Value)_t\ \times {}_tp_x$

(iv) $CU_t = (Benefit\ Payment)_t\ \times {}_tp_x$

(b) You are provided with the following data:

- Portfolio of 10-year term insurance policies with face amount of 10,000
- Opening CSM = 500
- Decrement rate = 4% per year
- Initial insurance finance expense of 3, decreasing by 0.3 per period.
- Assume no discounting of coverage units.
- Locked-In Rate = 3%.

(i) Calculate the profit realized in each year. Show all your work in Excel.

(ii) Explain how using discounting in the calculation of coverage units would affect profit emergence. Justify your answer. Numerical answer is not required.

Commentary on Question:
Candidates generally did well on this part of the question. Most candidates correctly calculated the realized profit. However, some candidates did not calculate the interest accretion, and a few did not accurately identify the current and future service components in the appropriate years.

(i)

Period	1	2	3	4	5	6	7	8	9	10
Coverage	10,000	10000	10000	10000	10000	10000	10000	10000	10000	10000
(A) Probability of Survival	100%	96.0%	92.2%	88.5%	84.9%	81.5%	78.3%	75.1%	72.1%	69.3%
(B) Current Service	10,000	9,600	9,216	8,847	8,493	8,154	7,828	7,514	7,214	6,925
(C) Current service + future service	83,792	73,792	64,192	54,976	46,128	37,635	29,481	21,654	14,139	6,925
(D) CSM amortization factor	11.9%	13.0%	14.4%	16.1%	18.4%	21.7%	26.6%	34.7%	51.0%	100.0%
(E) Opening CSM	500	453.5	406.4	358.5	309.8	260.3	210.1	158.9	106.9	53.9
(F) CSM with interest accretion	515	467.1	418.6	369.2	319.1	268.2	216.4	163.7	110.1	55.5
Insurance Finance expense	3	2.7	2.4	2.1	1.8	1.5	1.2	0.9	0.6	0.3
(G) CSM amortized	61.5	60.8	60.1	59.4	58.8	58.1	57.4	56.8	56.2	55.5
(H) Ending CSM	453.5	406.4	358.5	309.8	260.3	210.1	158.9	106.9	53.9	0.0
(I) Profit Realized	58.5	58.1	57.7	57.3	57.0	56.6	56.2	55.9	55.6	55.2

5. Continued

A. $Probability\ of\ survival_t\ =\ (1-4\%)\ \times Probability\ of\ survival_{t-1}$

B. $Current\ Service_t\ =\ 10{,}000\ \times\ Probability\ of\ survival_t$

C. $(Current\ Service\ +\ future\ service)_t\ =\ \sum_{i=t}^{10} Current\ Service_i$

D. $CSM\ amortization\ factor\ =\ \frac{Current\ Service_t}{(Current\ Service\ +\ future\ service)_t}$

E. $Opening\ CSM_t = Ending\ CSM_{t-1}$

F. $CSM\ with\ interest\ accretion_t = Opening\ CSM_t \times (1+3\%)$

G. $CSM\ amortized_t = CSM\ with\ interest\ accretion_t \times$
$CSM\ amortization\ factor_t$

H. $Ending\ CSM_t = CSM\ with\ interest\ accretion_t - CSM\ amortized_t$

I. $Profit\ Realized_t\ =\ CSM\ amartized_t - Insurance\ Finance\ expense_t$

See the spreadsheet for a detailed model solution to this part of the question.

(ii) Use of discounting accelerates profit recognition in earlier years. Using discounting in coverage unit calculation results in higher CSM amortization factors in earlier years.

(c) Compare and contrast the margin and cost-of-capital approaches to setting the Risk Adjustment under IFRS17.

Commentary on Question:
Candidates generally did not do well on this part of the question. Many candidates described the margin approach and the cost-of-capital approach without comparing their similarities and differences.

Similarities
- Both approaches should reflect the compensation required by the entity for the uncertainty related to non-financial risk
- Measurement requirements are the same
- Both require the actuary to ensure diversification correctly reflected, as not all models are explicit.
- Not mutually exclusive - a cost of capital approach can be used to calibrate margin approach

5. Continued

Margin Approach
- Can be either unit-of -account or aggregate
- The sign of the margin may have to be different on a net basis versus on a direct basis in order to generate positive risk adjustments for the direct, ceded, and net components
- Benefits - similar to IFRS4, generally simple to apply
- Requires explicit reflection of diversification when applied at unit of account level

Cost of Capital Approach
- Benefit - conceptually closer to the definition of RA
- At aggregated level and will require allocation method (whereas margin approach could be unit-of-account)
- Requires actuary to determine appropriate cost of capital rate (not necessarily needed to margin approach)
- May not have relationship to economic capital mode (e.g. one-year vs lifetime time horizon)

6. Learning Objectives:

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

Learning Outcomes:

(2a) 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

Regulatory Capital Adequacy for Life Insurance Companies: A Comparison of Four Jurisdictions (including spreadsheet)

Commentary on Question:

This question tested the candidates' knowledge of international capital frameworks. Candidates were expected to clearly state whether each statement is true, partially true or false, and provide rationale for full credit.

Solution:

(a) Critique the following statements with respect to Solvency II:

A. The Solvency Capital Requirement (SCR) is the level of capital at which a company would be expected to remain solvent over the next year with 85% probability. A company with a SCR ratio of 76% would require an early intervention by the regulator.

B. The spread adjustment applied to the discount rate used in determining best estimate liabilities is meant to apply a level of conservatism to the technical provisions.

C. Asset and liability market values are determined using a model calibrated to market data. The model would include a risk premium.

Commentary on Question:

This part of the question tested the candidates' knowledge of Solvency II. The candidates generally did well critiquing statements A and C. A common error for statement B is mixing up the concepts between the Solvency II "spread adjustment" and the IFRS 17 "illiquidity premium". Many candidates stated that the "spread adjustment" in Solvency II is to reflect the liquidity characteristics of the liabilities.

6. Continued

A. This statement is false. The Solvency Capital Requirement (SCR) is the level of capital at which a company would be expected to remain solvent over the next year with a 99.5% probability (1-in-200 year probability). Early intervention occurs when the SCR ratio falls below 45%. Therefore, the company with a SCR ratio of 75% does not require an early intervention by the regulator.

B. This statement is false. The spread adjustment applied to the discount rate used in determining best estimate liabilities is NOT meant to add conservatism to the technical provision. It is meant to account for irrational movements in the market such as low liquidity or widening bond spreads.

C. This statement is partially true. In Solvency II, assets and liabilities are required to be marked to market when market data is available. The "marked to model" approach should only be used in calibration for non-traded assets and liabilities. The statement is correct regarding risk premium. The risk premium should be included in the model.

(b) Critique the following statements with respect to the U.S. regulatory environment:

A. For a principle-based valuation, the benefits and guarantees must be quantified at a level of conservatism for which conditions are reasonably probable of occurring at the tail end of the risk.

B. Under VM-20, a company may use its own mortality experience if relevant and credible for the deterministic reserve. If experience is not relevant and credible, VM-20 prescribes the most recent Commissioner's Standard Ordinary mortality table.

C. If a company's Risk Based Capital (RBC) ratio is 190% it must prepare a plan outlining its actions to bring its ratio above 200%. The plan must be filed with and approved by its regulator.

D. The RBC calculation is generally formulaic, with prescribed factors applied to its U.S. GAAP balance sheet. Other regulatory jurisdictions such as Europe and Bermuda use more model-based approaches. RBC correlation factors are consistent with other regulatory jurisdictions.

Commentary on Question:
This part of the question tested candidates' knowledge of the U.S. regulatory environment. The candidates generally did well critiquing statements B and D. A common error for statement A was not addressing the tail risk. A common error for statement C was not identifying that for a CAL event the company must file an action plan to bring the ratio back to 250%.

6. Continued

A. This statement is false. For a principle-based valuation, the benefits and guarantees must be quantified at a level of conservatism that are reasonably probable in general. For policies with significant tail risk, the valuation needs to reflect conditions that are appropriately adverse to quantify the tail risk.

B. This statement is partially true. It is correct that under VM-20, a company may use its own mortality experience if it is relevant and credible. If the company's own mortality experience is not credible, it must use the industry's mortality table, which is not necessarily to Commissioner's Standard Ordinary mortality table.

C. This statement is false. If a company's Risk Based Capital ratio is 190%, this is a Company Action Level event (i.e., the RBC ratio falls between 150% - 200%). For a Company Action Level event, the company must file an action plan to bring the ratio back to 250% with the regulator. However, the action plan does not need to be approved by the regulator.

D. This statement is partially true. It is correct that RBC is generally formulaic, while other regulatory jurisdictions in Europe and Bermuda are generally more model-based approach. RBC calculation applies to US Statutory balance sheet (NAIC). The correlation factors used by jurisdictions are vary based on the approaches they are using.

(c) Critique the following statements with respect to the Bermuda regulatory environment:

A. For interest rate risk, a company may use a duration-based approach or a shock-based approach. The duration-based approach is a function of the company's asset and liability mismatch. The shock-based approach applies interest rate shocks to the asset and liabilities. The shocks are determined by the company based on the nature of the assets and liabilities and must be approved by the regulator.

B. Mortality, morbidity and longevity risks are calculated using a factor-based approach. Fixed income and equity risks are calculated using a model-based approach.

C. Companies are expected to hold 120% of the Bermuda Solvency and Capital Requirement (BSCR). Available capital for the BSCR ratio is based on any widely accepted accounting measure such as IFRS or U.S. GAAP.

6. Continued

Commentary on Question:
This part of the question tested candidates' knowledge of the Bermuda regulatory environment. Candidates generally did not do well critiquing statement C. Few candidates identified that the TCL is 120% of ECR, which is the greater of the MSM and the BSCR. Another common error was not identifying the correct available capital measure.

A. This statement is mostly true. The only incorrect part is that the shocks are determined by the company based on the nature of the assets and liabilities, however, is not required to be approved by the regulator.

B. This statement is partially true. It is correct that in the Bermuda regulation, mortality, morbidity and longevity risk are calculated using factor-based approach. However, FI risk and equity risk are not calculated using a model-based approach. For fixed income and equity risk, the approach applies prescribed factors to the asset market value.

C. This statement is false. Companies are expected to hold eligible capital source to over the Target Capital Level (TCL), which is 120% of Enhanced Capital Requirement (ECR). The ECR is a measure of solvency capital used to monitor capital adequacy of insurance groups domiciled in Bermuda. It is defined as the maximum of the BSCR and MSM. The MSM's definition of available capital is based on an entity's "Bermuda Statutory" financials, where Bermuda Statutory financials are required to be based on a commonly accepted GAAP, such as USGAAP or IFRS. For BSCR, available capital is determined by EBS, an economic measure.

7. 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, Swales, et. Al., 4th Ed, 2015, Chapter 3, Liability for Income Tax

Canadian Insurance Taxation, Swales, et. Al., 4th Ed, 2015, Chapter 4, Income for Tax Purposes - General Rules,

Canadian Insurance Taxation, Swales, et. Al., 4th Ed, 2015, Chapter 5, Investment Income,

Canadian Insurance Taxation, Swales, et. Al., 4th Ed, 2015, Chapter 9, IIT

Canadian Insurance Taxation, Swales, et. Al., 4th Ed, 2015, Chapter 10, The Taxation of Life Insurance Policies

Commentary on Question:

This question tested the candidates' knowledge of Canadian insurance taxation.

Solution:

(a) Critique the following statements with respect to Canadian life insurance taxation:

A. Canadian companies are taxed on their worldwide income including foreign life insurance.

B. Policy loans do not affect company taxation.

C. A face amount increase of 50% over 5 years will not impact the exempt status of a life insurance policy.

D. The interest rate used in the calculation of the accumulating fund of an exempt-test policy is a function of prevailing government of Canada bond yields.

7. Continued

Commentary on Question:
For statement A, many candidates could not differentiate the tax difference on the non-insurance income and insurance income. For statement B, while the majority of candidates reached the correct conclusion, many did not provide complete justifications. For statement C, most candidates made the correct judgment and understood the exempt testing requirement. For statement D, many candidates arrived at the right judgment and provide details of interest rate used in current and new rules.

A. Partly True (or not totally accurate)
- will be taxed on worldwide non-insurance income
- only taxed on Canadian based insurance
- would put Canadian insurers at competitive disadvantage

B. Incorrect
- must include policy loan repayments and policy loan interest in income
- can deduct policy loans made during year from income

C. Incorrect
- Increases in excess of 8% per year result in a new Exempt test policy (ETP) being issued.
- Purpose is to avoid excess increases

D. False
- Current rules require interest rate based on pricing.
- New rules require 3.5%. (post 2017)

(b) Explain the rationale for introducing the Investment Income Tax (IIT).

Commentary on Question:
Candidates generally did well on this part of question. Some candidates explained how to calculate the IIT instead of the rationale of introducing the IIT.

Original intent was to tax policyholders directly
This was not feasible because of negative publicity
'IIT was an indirect tax intended to achieve the same objective

7. Continued

(c) You are given the following for a Canadian life insurer:

	Dec. 31 2023	Dec. 31 2024
Life Insurance Policies (issued to residents in last 30 years)-Direct Maximum Tax Reserves	400	500
Ceded life insurance policy reserves	90	100
Annuity reserves	200	250
60 month moving average Government of Canada bonds with remaining term to maturity greater than 10 years	3.5%	3.25%

Calculate the 2024 IIT based on the above information. Show all work.

Commentary on Question:
Most of the candidates receive partial credit on this part of the question. Many candidates used the wrong interest rates, and included reinsurance and annuities in the calculation.

- reinsurance is ignored
- annuities are taxed directly to the policyowner
- interest rate is 60 month average prior to the taxation year
- new rules for interest, mortality etc. are prescribed
- mean reserve = (400 + 500)/2 = 450 million

2024 IIT = 450 x 55% x 3.5%x15%
=1.3 million

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:

- The Candidate will be able to describe, apply and evaluate the appropriate IFRS 17 accounting and valuation standards for life insurance and annuity products
- Compare and apply methods for life and annuity product reserves
- Evaluate, calculate, and interpret liabilities
- Recommend and justify appropriate valuation assumptions

Sources:

LFM-659-24: Understanding IFRS 17: Solving for New Challenges, Fiera Capital, Oct 2021

CIA Educational Note - Market Consistent Valuation of Financial Guarantees for Life and Health Insurance Contracts

Commentary on Question:

This question tested the candidates' knowledge of IFRS 17. Candidates generally did well on this question.

Solution:

(a) Explain the CIA's recommended approach for developing discount rate curves for contracts with each of the following liquidity characteristics using a bottom-up methodology:

- Liquid
- Medium liquid
- Illiquid

Commentary on Question:

Most candidates described the basic components of a discount rate construct and demonstrated understanding of the concept of how the liquidity premium is derived.

The discount rate should be constructed using a risk-free rate plus liquidity premium. The risk free rate consists of observable rates, long term rates and ultimate rate.

8. Continued

The liquidity premium depends on the liquidity characteristics of the underlying contract: Liquid portfolio: 90% of provincial spread; illiquid portfolio: 70% of corporate spread + 0.5%; semi-liquid portfolio: average of liquid and illiquid portfolio.

(b) Explain the principles for determining long-term unobservable rates

Commentary on Question:
Most candidates demonstrated a good understanding of the key considerations.

Maximize the use of observable inputs, reflect current market conditions and develop unobservable inputs using the best information available in the circumstances; Develop unobservable inputs using the best information available in the circumstances and the entity may lace greater weight on long-term estimates than on short-term fluctuations.

(c) Critique the following statements with respect to the valuation of financial guarantees under IFRS17. Justify your response:

A. *Financial guarantees within insurance contracts (e.g minimum interest guarantees) are typically valued using replicating assets which closely match the insurance contract cash flows.*

B. *In a risk-neutral economic scenario generator, the expected return on assets would be equal to its long-term historical rate. Liability cash flows generated using this model would be equal to that rate less a spread.*

C. *IFRS 17 requires that a market consistent valuation of financial guarantees maximize the use of observable market inputs.*

D. *Market consistent rates beyond the observable period should be held constant at the last observable rate.*

E. *Consumer price index data should be used to set market-consistent inflation rate assumptions.*

Commentary on Question:
For statement A, many candidates considered replicated assets to be the appropriate approach. While it is a plausible approach, replicating assets are uncommon to match with the guarantees and therefore is not the typically chosen approach. For statement B, many candidates mixed up the definitions of risk-neutral and risk-free ESG. Statements C and D were generally well understood. For statement E, few candidates understood that the inflation assumption could be derived through market instruments (e.g. inflation swaps or indexed bonds).

8. Continued

A. False. Replicating assets are not always available and therefore stochastic modeling techniques are generally used to value financial guarantees.

B. False. Risk-neutral scenario generators (ESGs) are calibrated to produce scenarios which reproduce observable market prices of options. By contract, real-world scenarios are based on historical returns. Same projection is used for both assets and liabilities and the risk-adjustment only applies to non-financial assumptions.

C. True. Valuation should maximize the use of observable market data. Some items can be estimated based on inputs, such as discount rates and implied volatility. Others need to be developed using historical information and judgement.

D. False. Stable long-term estimate needs to be determined using historical information and judgement. Grading from last observable point to long term estimate.

E. False. CPI reflects short-term only and is not appropriate for setting the long term inflation rate assumption. The assumption should be set by looking to inflation swaps or the difference between yield on nominal return bonds and expected yields on real bonds

9. 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:

- The Candidate will be able to describe, apply and evaluate the appropriate IFRS 17 accounting and valuation standards for life insurance and annuity products
- Compare and apply methods for life and annuity product reserves
- Evaluate, calculate, and interpret liabilities
- Recommend and justify appropriate valuation assumptions

Sources:

CIA Explanatory Report: IFRS 17 Expense,

The IFRS 17 Contractual Service Margin: A Life Insurance Perspective (Sections 1-4.8)

Commentary on Question:

This question tests candidates' knowledge of IFRS17 valuation concepts.

Solution:

(a) Given the following for a group of insurance contracts issued with a coverage period of three years:

	Scenario A = Expected				**Scenario B**			
Time	**0**	**1**	**2**	**3**	**0**	**1**	**2**	**3**
Premiums	1,050				1,050			
Claims		175	175	175		175	175	175
Directly attributable acquisition expenses	90				90			
Directly attributable maintenance expenses		45	45	45		90	45	45
Non-directly attributable acquisition expenses	20				20			
Non-directly attributable maintenance expenses		30	30	30		30	30	30

9. Continued

	Scenario C				Scenario D			
Time	**0**	**1**	**2**	**3**	**0**	**1**	**2**	**3**
Premiums	700				1,050			
Claims		175	175	175		175	175	175
Directly attributable acquisition expenses	180				90			
Directly attributable maintenance expenses		45	45	45		45	45	45
Non-directly attributable acquisition expenses	20				35			
Non-directly attributable maintenance expenses		30	30	30		30	30	30

Assume the following:

- No risk adjustment or discounting.
- CSM is run off on a straight-line basis
- Insurance acquisition cash flows are amortized evenly over the three years.
- Time 0 cashflows occur at inception; time 1, 2, and 3 cashflows occur during the policy year.

Calculate the profit/loss in year 1 for each of the scenarios. Show all work.

Commentary on Question:
This part of the question tested the candidates' IFRS17 knowledge of CSM, insurance revenue, insurance service expenses, and how the gain / loss affect net income. Most of the candidates did well with Scenarios A, B and D. For Scenario C, full credit was received for Step 1, whether the candidate mentioned the Loss Component or floored the initial CSM to zero.

See the spreadsheet for the model solution for this part of the question.

9. Continued

(b) Critique the following statements:

A. Any expenses that are incurred at a higher level of aggregation than groups of contracts would not qualify as directly attributable.

B. Any abnormal amount of wasted labor or other resources that are used to fulfil the contracts would not be classified as directly attributable expenses and would be excluded from the fulfillment cashflows.

C. Investment expenses related to investment activities that enhance policyholder benefits (e.g., a larger amount of coverage offered to the policyholders for the same premium when investments are considered), should be considered directly attributable expenses, even if the assets are not part of the underlying item.

D. Premium taxes are transaction-based taxes collected on behalf of third parties and should be excluded from both insurance service expenses and insurance service revenue.

Commentary on Question:
This part of the question tested the candidates' IFRS17 knowledge of directly and non-directly attributable expenses. Most candidates did well on this part of the question. Full credit was received for providing rationale in the critique. For the statements falling into a grey area, partial credit is received for rationalizing only one side.

A. False. Expenses incurred at a higher level of aggregation may qualify as directly attributable - for example, training/HR/overhead related to pricing activities.

B. True. As per IFRS17 standard, abnormal costs such as wasted labor are not directly attributable, and only directly attributable expenses are included in the FCF.

C. This is a grey area. Some firms have taken the position that these expenses are not directly attributable, while some have taken the view that they can be. Insurers should ensure that they consult their auditor when making a decision.

D. This is a grey area. There are two views. The view given in this statement is supported by the fact that premium taxes are specifically given as an example as amounts relating to transaction-based taxes, and a paragraph in the standard referring to premium-based taxes separately from insurance acquisition cashflows. However, some insurers have taken a different view and include premium taxes as a component cost cash flows of the insurance contract.