

Exam ILALFMC

Life Financial Management - Canada

Date: Monday, November 8, 2021

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 10 questions numbered 1 through 10 with a total of 100 points.

The points for each question are indicated at the beginning of the question.

2. While every attempt is made to avoid defective questions, sometimes they do occur. If you believe a question is defective, the supervisor or proctor cannot give you any guidance beyond the instructions provided in this document.

Written-Answer Instructions

1. Each question part or subpart should be answered either in the Word document or the Excel document as directed within each question. Graders will only look at work in the indicated file.
 - a) In the Word document, answers should be entered in the box marked ANSWER within each question. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1, and x^2 can be typed as x^2.
 - b) In the Excel document formulas should be entered. For example, $X = \text{component1} + \text{component2}$. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
 - c) Individual exams may provide additional directions that apply throughout the exam or to individual items.
2. The answer should be confined to the question as set.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.
4. The Word and Excel documents that contain your answers must be uploaded before the five-minute upload period expires.

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Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



1.

(13 points)

- (a) (1.5 points) Describe the three A.M. Best Opinion Outlooks.

ANSWER:

- (b) (2.5 points) 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.*

ANSWER:

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.*

ANSWER:

C. *The process relies almost entirely on quantitative measures including analysis of accounting ratios, balance sheet strength and key management performance indicators.*

ANSWER:

1. Continued

D. The process only considers information available from public sources. AM Best assumes the information is reliable and does not audit it.

ANSWER:

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.

ANSWER:

(c) (3 points) 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

ANSWER:

(ii) AM Best's Financial Strength Rating

ANSWER:

1. Continued

ABC Bank and DEF Life have independently prepared actuarial appraisals as part of a competitive bidding process to acquire XYZ Life. DEF's appraisal resulted in a higher value than ABC's. ABC Bank currently does not have any insurance operations while DEF Life is one of the largest global life insurers. XYZ Life is a small life insurer offering products similar to those of DEF Life.

- (d) (3 points) Identify four differences between the inputs to an actuarial appraisal and the inputs to an AM Best Issuer Credit Rating.

ANSWER:

- (e) (3 points) Describe possible reasons why DEF's appraisal value is higher than ABC's, considering each of the three main components of an actuarial appraisal.

ANSWER:

2.

(9 points) PCLC Life Insurance Company is currently an A-rated company by S&P. The company has recently implemented economic capital models in order to explore the implications of various capital levels on multiple key business objectives.

The following information is provided:

- Risk threshold by financial variables

Financial Variable	Risk Threshold-Name	Risk Threshold-Quantity	Company Rating
RBC Ratio	Default	100% of authorized level	D or Below
S&P Capital Adequacy Ratio (CAR)	One-Notch Downgrade	150%	BB or Below

- Simulated capital information

	RBC Default	S&P CAR
Probability of One-Notch downgrade or default over 1 year	0.05%	2%
Value at Risk (VaR) of RBC or S&P CAR	160%	190%
Mean of risk capital	650,000	740,000
Annual Discount Rate	3%	4%

- (a) (2 points) Calculate the amount of RBC and S&P capital available for release for year 1. Show all work.

The response for this part is to be provided in the Excel document.

2. Continued

(b) (2 points) 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.

The response for this part is to be provided in the Excel document.

2. Continued

(c) (5 points) Critique the following statements:

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

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

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

ANSWER:

3.

(12 points) You are the valuation actuary responsible for setting the best estimate expense assumption for the year-end valuation. The Company only writes Life insurance products.

(a) (4 points) 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.

ANSWER:

(ii) Identify an appropriate measurement base for setting the unit of expense for those included expense categories.

ANSWER:

3. Continued

(b) (3 points) 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.

ANSWER:

- (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

ANSWER:

- (iii) Vary the unit expense by province of issue to reflect the differences in operating costs

ANSWER:

3. Continued

(c) (5 points) 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.

ANSWER:

4.

(10 points) Suica Life is a Canadian insurance company with a large block of inforce whole life policies, which is still open to new business. Suica Life is currently invested entirely in fixed income assets for this product.

You are provided the following information as of the balance sheet date:

Ultimate reinvestment rates prescribed by the Actuarial Standards Board:

	Short Term	Long Term
low	1.3%	3.2%
median	4.0%	5.2%
high	9.6%	10%

Canadian Risk-Free Yield Curve							
1-yr	2-yr	3-yr	5-yr	7-yr	10-yr	20-yr	30-yr
0.10%	0.50%	1.00%	1.25%	2.00%	2.50%	3.25%	3.50%

(a) (3 points)

(i) Describe the construction of the CALM base scenario.

ANSWER:

(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		

The response for this part is to be provided in the Excel spreadsheet.

4. Continued

- (b) (4 points) 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.*

ANSWER:

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

ANSWER:

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

ANSWER:

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

ANSWER:

4. Continued

(c) (3 points) 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.

The response for this part is to be provided in the Excel document.

5.

(7 points) You are given the following information for a Canadian life insurance company for 2019 (in millions):

Income Item	Total
Direct Written Premium	400
Premium Ceded	50
Premium Assumed	40
Foreign Insurance Premium	150
Refunded Premiums	15
Cash Value of Policy Dividends – Cash	30
Cash Value of Policy Dividends – Paid-up Additions	45
Loan Repayment	20
Loan Interest Repayment	5

Balance Sheet Item	Tax Basis	Statutory Basis
Beginning of Year Reserves – Direct Written	140	100
End of Year Reserves – Direct Written	180	130

Maximum Taxable Actuarial Reserve (MTAR)	
Mean MTAR - Reinsurance Assumed	10
Mean MTAR - Reinsurance Ceded	30

Taxable income attributable to policyholders	2
Premium Tax Rate	4%
Yield on Investments	3%
IIT rate	2.5%
Corporate tax rate	20%

Calculate the following:

- (i) (1 point) Premium tax payable.

The response for this part is to be provided in the Excel document.

- (ii) (2 points) Investment income tax (IIT) payable.

The response for this part is to be provided in the Excel document.

- (iii) (4 points) Net after-tax statutory income.

The response for this part is to be provided in the Excel document.

6.

(11 points)

- (a) (2 points) Contrast the calculations between initial recognition and subsequent measurement for the Contractual Service Margin (CSM) under IFRS17 general measurement model.

ANSWER:

- (b) (5 points) 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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

6. Continued

- (c) (4 points) A company has a closed block of incurred disability claims, a closed block of payout annuities and an open block of universal life insurance. The payout annuities are onerous. You are given the following total company CSM roll forward forecast for 2024.

Opening balance on January 1	3,000
New Contracts Issued	50
Interest Accretion	41
Changes in fulfilment cash flows relating to future services	-80
Ending balance on December 31	3,011

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.

ANSWER:

7.

(10 points)

- (a) (1 point) List the recommendations made by the Bipartisan Policy Centre's (BPC) Insurance Task Force to improve global insurance regulation.

ANSWER:

- (b) (4 points) 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).

ANSWER:

B. A US insurer has just been deemed a Systematically Important Financial Institution (SIFI), but is demanding this designation be reviewed and overturned.

ANSWER:

C. An amendment to the global reserve standard has been proposed and all countries in the world have been asked to adopt the standard.

ANSWER:

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.

ANSWER:

7. Continued

- (c) (5 points) A US-based company is implementing VM-20 for a block of newly issued Universal Life insurance policies.
- (i) (2 points) 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

ANSWER:

- (ii) (3 points) 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.*

ANSWER:

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.*

ANSWER:

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.*

ANSWER:

8.

(8 points)

- (a) (1 point) State the characteristics of the discount rate under IFRS17.

ANSWER:

- (b) (2 points) Company MBX is evaluating a market to establish the observable period for risk free assets for its life insurance product. You are given the following markets:

Market	A	B	C
Trading Volume (Millions)	400	500	20
Bid-Ask Spread	2.0-4.0 bps	10.0-20.0 bps	10.0-20.0 bps
Bond Maturity Duration	% of Daily Transactions		
3	35%	50%	35%
5	25%	30%	25%
10	17%	20%	17%
20	12%	0%	12%
30	10%	0%	10%
60	1%	0%	1%

- (i) Evaluate the appropriateness of each market to be used as a reference portfolio.

ANSWER:

- (ii) Recommend the end of the observable period based on your evaluation in (i)

ANSWER:

8. Continued

(c) (3 points) Company MBX currently sells a Yearly Renewable Term product. Evaluate what the following product changes would do to the liquidity characteristics of the product

- (i) Replacing the YRT premium structure with a Fully Guaranteed Level Premium rate

ANSWER:

- (ii) Including a conversion option to a permanent life product with no underwriting

ANSWER:

- (iii) Including a Waiver of Premium benefit upon Job Loss & Disability

ANSWER:

- (iv) Offering a cash surrender value after five years

ANSWER:

8. Continued

(d) (1 point) 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

ANSWER:

(ii) Bottom-up approach

ANSWER:

(e) (1 point) 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.

ANSWER:

9.

(10 points)

- (a) (7 points) 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.*

ANSWER:

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.*

ANSWER:

C. *The risk adjustment confidence level will be calculated and disclosed at the contract level.*

ANSWER:

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.*

ANSWER:

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.

ANSWER:

F. The same discount curve will be used to discount the future cash flows and the risk adjustment.

ANSWER:

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.

ANSWER:

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.

ANSWER:

9. Continued

- (b) (3 points) 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.

ANSWER:

10.

(10 points) LHW Insurance is a Canadian-based company subject to the LICAT framework. The Company writes Universal Life (UL) business. You are an actuarial student being asked to help prepare the LICAT return.

- (a) (1 point) Describe the margins which are to be included in the Surplus Allowance.

ANSWER:

- (b) (3 points) 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.

ANSWER:

- (ii) Calculate the required mortality risk capital for the total UL block using the information in the table above.

The response for this part is to be provided in the Excel spreadsheet.

- (c) (1 point) 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.

ANSWER:

10. Continued

- (d) (2 points) Describe the characteristics of the index-linked products which are subject to the correlation factor calculation.

ANSWER:

- (e) (3 points) 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.

The response for this part is to be provided in the Excel spreadsheet.

****END OF EXAMINATION****