Life Risk Management

Exam ILALRM

Date: Friday, May 3, 2019
Time: 2:00 p.m. – 4:15 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 40 points.

   This exam consists of 4 questions, numbered 1 through 4.

   The points for each question are indicated at the beginning of the question. Question 3 pertains to the Case Study, which is enclosed inside the front cover of this exam booklet.

2. Failure to stop writing after time is called will result in the disqualification of your answers or further disciplinary action.

3. 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 on the exam booklet.

Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.

2. Write on only one side of a sheet. Start each question on a fresh sheet. On each sheet, write the number of the question that you are answering. Do not answer more than one question on a single sheet.

3. The answer should be confined to the question as set.

4. When you are asked to calculate, show all your work including any applicable formulas.

5. When you finish, insert all your written-answer sheets into the Essay Answer Envelope. Be sure to hand in all your answer sheets because they cannot be accepted later. Seal the envelope and write your candidate number in the space provided on the outside of the envelope. Check the appropriate box to indicate Exam ILALRM.

6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

Recognized by the Canadian Institute of Actuaries.

Tournez le cahier d'examen pour la version française.

CASE STUDY INSTRUCTIONS

The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.

BEGINNING OF EXAMINATION

1. (*10 points*)

(a) (*2 points*)

(i) Define risk appetite.

(ii) Describe the three increasingly detailed levels in a risk appetite framework.

ABC Insurance Company has the following risk appetite statement:

- The company maintains a target risk-adjusted return on capital (RAROC) of 15%.
- The post-stress capital following a 1-in-200-year event should not exceed 85% of the company's current available capital.

You are given the following information on the company's current product portfolio:

		Base Scenario			
Product	Premium	Required Capital	PV (required capital)	PV(investment income on capital)	PV (underwriting profit)
Whole Life Insurance	70	60	80	10	2
Group Health Benefits	50	15	20	2	5

1-in-200-year Stress Level Scenario					
Product	Premium	Required Capital	PV (required capital)	PV(investment income on capital)	PV (underwriting profit)
Whole Life Insurance	70	70	95	2	1
Group Health Benefits	50	20	25	0	2

- The company has current available capital of 100.
- The company assumes a 10% diversification benefit when aggregating total required capital.
- The effective corporate tax rate is 21%

1. Continued

(b) (*4 points*) Determine if ABC is currently fulfilling its risk appetite statement. Show all work.

(c) (*2 points*) Recommend actions the company can take to optimize capital allocation to maintain a 120% internal target capital ratio.

(d) (*2 points*) ABC is proposing the following be added to the company's risk appetite statement:

(i) *"Asset portfolio risk limits should be set using a Value-at-Risk (VaR) metric comparable to a similar-sized insurer's VaR."*

(ii) *"Portfolio managers should receive an annual bonus if the company's total VaR is below the limit."*

Critique the proposal.

2. (*9 points*)

(a) (*3 points*)

(i) Define immunization of an investment portfolio.

(ii) Explain the benefits of immunizing an investment portfolio.

(iii) Contrast exact matching versus duration matching.

(b) (*6 points*) Your company sells Universal Life (UL) insurance with an adjustable crediting rate feature.

The expected end-of-year liability cash flow profile is outlined in the chart below:

Year	UL
1	100
2	150
3	200
4	500

Two fixed income assets are available for purchase:

- 1-year zero coupon bond
- 4-year zero coupon bond

The yield curve is flat at 4%.

(i) (*3 points*) Derive a duration matched investment portfolio.

(ii) (*1 point*) Describe the limitations of only having the above two fixed income assets available for purchase to back the existing product line.

(iii) (*2 points*) Recommend changes to the investment strategy under the following interest rate environments:

- Interest rates are expected to rise
- Interest rates are expected to fall

Question 3 pertains to the case study.
Each question should be answered independently.

3. (*12 points*)

(a) (*2 points*) Explain how a depository institution can manage its liability-side liquidity risk.

(b) (*4 points*) For each of the four products offered by Simple Life:

(i) Assess the liquidity risk.

(ii) Propose risk mitigation strategies.

Simple Life's Investment area has an excess of capital. The Insurance area experienced unusually large claims and has asked Investments to supply additional capital.

(c) (*1 point*)

(i) State the concept that describes Investment capital being used to cover the insurance loss.

(ii) Recommend an approach to ensure capital flexibility under future stressed scenarios.

(d) (*5 points*) The risk modeling team has developed a stochastic model for mortality risk with the following design characteristics:

(i) The model only includes term and UL.

(ii) Calibration was based on the last 5 years of combined term and UL mortality experience.

(iii) Variable annuities have been excluded as the GMDB is deep out of the money.

(iv) Single premium immediate annuities have been excluded as a conservative approach.

Critique the model design. Recommend any changes.

4. (*9 points*)

(a) (*3 points*) The Risk Management Department for LAN Life documented the following approach for managing the company's operational risk:

(i) All LAN Life managers are asked to identify the major risks in their department;

(ii) A Monte Carlo simulation is used to calculate the cumulative loss potential across all risk classes;

(iii) Both frequency and severity are aggregated enabling the overall results to be aggregated;

(iv) The probability weighted loss is measured for each specific incident;

(v) Loss prevention is accomplished through day-to-day management of current threats arising from imminent operational failures.

Critique the approach if the objective is to manage operational risk under a Modern Operational Risk Management approach.

(b) (*3 points*) LAN is considering implementing an internal loss prevention system. The table below illustrates the expected losses with and without the system:

Level of Loss (in millions)	**With Loss Prevention System**	**Without Loss Prevention System**
99% Level Aggregate Loss	20	50
Expected Loss	6	15
Unexpected Loss (99%)	14	35

You are given:

- Cost of Loss Prevention System: 10 million
- Cost of Capital: 12%

Assess whether the loss prevention system should be implemented. Show all work.

4. Continued

(c) (*3 points*) LAN implements a loss prevention system maintained by a third-party vendor which is expected to reduce losses by 30%. In the Dynamic Capital Adequacy Test (DCAT), LAN's Chief Actuary recommends including a scenario that captures the breakdown of this system.

(i) Explain if this is a plausible adverse scenario.

(ii) Describe two potential ripple effects and management actions for each.

****END OF EXAMINATION****

USE THIS PAGE FOR YOUR SCRATCH WORK