SOCIETY OF ACTUARIES
Life Risk Management

Exam ILALRM

Date: Friday, May 6, 2016
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 4 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.

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. (*9 points*)

(a) (*2 points*) Describe the four categories of objectives of Enterprise Risk Management as defined in the COSO report.

XYZ Life is a Canadian insurer considering purchasing a closed block of Term insurance from a competitor, ABC Life. Your manager is concerned about the interest rate sensitivity of the block.

(b) (*4 points*) You are given the following information for ABC Life:

	Asset	**Liability**
Present Value	431.92	447.25
Modified Duration	2.86	unknown
Convexity	unknown	7.30
Interest	5%	5%

t (in years)	**Liability Cash Flows**
1	100
2	150
3	250

These liabilities are backed by a single zero-coupon bond maturing in 3 years with a face amount of 500.

(i) (*1 point*) Calculate the modified duration of the liability portfolio.

(ii) (*1 point*) Calculate the convexity of the asset portfolio.

(iii) (*2 points*) Estimate the change in surplus given a 2% increase in interest rates by using modified duration and convexity.

(c) (*3 points*) An actuary at ABC Life contacts you after you've performed your analysis and informs you that the asset backing the liabilities is in fact a 3-year callable bond.

(i) (*1 point*) Describe why the analysis you have already conducted is no longer appropriate.

(ii) (*2 points*) Recommend a methodology which would better measure the impact of interest rate changes on the value of the asset backing the portfolio. Justify your answer.

2. (*10 points*) FLD Life is reviewing the company's exposure to credit risk with its reinsurer, PAQ Re.

(a) (*1 point*) Explain how FLD Life and PAQ Re face bilateral exposure.

(b) (*2 points*) FLD Life has three reinsurance treaties with PAQ Re with a two-way collateral agreement. Collateral is transferred once a year based on the expected exposure over three scenarios specified below.

You are given:

- Netting is allowed
- Collateral threshold is 50
- Minimum transfer amount is 10
- PAQ Re has previously transferred 25 of collateral to FLD Life

The model produced the following results for the current year:

Amounts in millions	Future Value of Expected Exposure for Treaty 1	Future Value of Expected Exposure for Treaty 2	Future Value of Expected Exposure for Treaty 3
Scenario 1	100	20	35
Scenario 2	-20	45	-80
Scenario 3	55	40	-30

Determine the amount of collateral that must be transferred assuming equally weighted scenarios. Show all work.

(c) (*3 points*) The following proposals have been made to manage FLD Life's credit risk:

(i) FLD Life has had no problems receiving collateral from PAQ Re in the past and is confident it will receive collateral from PAQ Re immediately if the need arises; therefore, it should not consider payment of collateral a risk.

(ii) FLD Life should add provisions to its contracts with PAQ Re, specifying the unwinding of the contracts if either company's ratings are downgraded.

(iii) Since PAQ Re has grown rapidly to become one of the largest reinsurers in the industry, FLD Life should use them for all of its reinsurance needs.

Critique each proposal.

2. **Continued**

(d) (*4 points*) The Chief Risk Officer of FLD Life wants to use stress testing to evaluate all of the company's risks and has provided the following guidelines:

(i) Each risk will be modeled separately, with results capturing the ending asset and liability values. The results will be added together to get a view of the company's total risk.

(ii) The models used will be built, maintained, and reviewed by the actuarial department. The actuaries will be responsible for determining the most relevant risks to test.

(iii) The worst case scenario will be derived by using the lowest interest rates and equity returns experienced in the past 30 years and assuming those are sustained for 10 years.

Assess FLD Life's plan. Recommend improvements.

3. (*10 points*)

(a) (*2 points*) Define four diversification strategies a company can use to manage the type and amount of risk in its portfolio.

DNT Life currently offers only the following two products:

Universal Life (UL)

- Launched in 1995
- All policies have an initial guaranteed credited interest rate of 4%
- After a policy is in force for 5 years, an additional 1% interest is credited
- Flexible premium

Term Life

- Launched in 2015
- 10 year level premium
- First year sales were 20% above expected

(b) (*5 points*) You have been asked to provide a risk assessment of DNT Life's products.

(i) Explain the risks DNT Life currently faces, based on its current products.

In an effort to expand DNT Life's product portfolio, the CEO would like to introduce a new product. He makes the following statement:

> *"To diversify our product offerings, I think we should develop a variable annuity product. An annuity would be a good complement to our life products. The stock market is very good right now, and customers are eager to take advantage of excellent equity returns through a product like this. In fact, I've heard three companies similar to us are developing new variable annuity products right now. In keeping with our tradition of being a life insurer, we should design our variable annuity to have a guaranteed minimum death benefit."*

(ii) Identify risks of the proposed product.

(iii) Propose ways to reduce the risks of the proposed product.

3. **Continued**

(c) (*3 points*) BGL Life is a company of similar size to DNT Life. BGL Life's financial strength rating was recently downgraded and DNT Life is considering acquiring it.

DNT Life has been given the following information about BGL Life's products:

Universal Life (UL)

- 6,000 policies in force
- No surrender charges
- 3% guaranteed credited interest
- One standard risk class for all policies

Immediate Annuities

- 9,000 policies in force

Variable Annuities with Guaranteed Minimum Death Benefit

- 2,000 policies in force
- No surrender charges
- Variable account invested in historically conservative funds

Actual Mortality Experience divided by Pricing Mortality Assumption

	2012	2013	2014
UL	1.10	1.20	1.12
Immediate Annuities	0.90	0.95	0.87
Variable Annuities	0.99	1.01	0.97

Analyze the risks each product could pose to DNT Life.

Question 4 pertains to the Case Study.
Each question should be answered independently.

4. (*11 points*) Simple Life is investigating possible strategies to improve the profitability and risk profile of its term life product.

(a) (*2 points*) Define the following four fundamental types of risk cultures:

(i) Conservator

(ii) Maximizer

(iii) Manager

(iv) Pragmatist

(b) (*2 points*) Assess whether Simple Life's term product design was influenced by each of the four risk cultures in part (a). Justify your answer.

(c) (*2 points*) Assess how the following aspects of Simple Life's term life product could explain its 2013 financial results:

(i) Competitive pricing

(ii) Lapse/policyholder behavior

(iii) Reinsurance

(iv) Mortality assumption

(d) (*5 points*) Based on the 2013 financial results for its term life business, Simple Life management is considering the following actions for its next product iteration:

(i) Increase premium rates

(ii) Defer agent commissions to be paid out over two or more years

(iii) Enter the direct to consumer channel to reduce distribution costs

(iv) Introduce paramedical underwriting for face amounts over 500,000

(v) Reinsure exposure over 1 million per policy on a YRT basis

Recommend which actions to pursue. Justify your answer.

****END OF EXAMINATION****

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