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**SOCIETY OF ACTUARIES**  
**Life Pricing**

# Exam ILALP

## AFTERNOON SESSION

**Date:** Wednesday, April 30, 2014

**Time:** 1:30 p.m. – 3:45 p.m.

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### INSTRUCTIONS TO CANDIDATES

#### General Instructions

1. This afternoon session consists of 5 questions numbered 7 through 11 for a total of 40 points. The points for each question are indicated at the beginning of the question.
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.
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 morning or afternoon session for Exam ILALP.

#### Written-Answer Instructions

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



**\*\*BEGINNING OF EXAMINATION\*\***  
**Afternoon Session**  
***Beginning with Question 7***

- 7.** (7 points) For each of the following:
- (i) Term to 100 Life Insurance Product
  - (ii) Long Term Care Standalone Product
- (a) (4 points) Compare and contrast the key pricing assumption risks.
- (b) (3 points) Assess the key changes to the pricing assumptions which companies have made to the products since their introduction into the marketplace. Justify your assessments.

8. (5 points) Your company sells Universal Life (UL) with a secondary guarantee. For internal reporting purposes, you want to see the impact of moving from your fully prescribed, current statutory reserve method to something more principles-based.

One of your staff has written the following memo proposing a stochastic approach to calculate the liability:

**Review of Universal Life Secondary Guarantee (ULSG) Stochastic Model**

**SCOPE:**

The ULSG product is relatively new in our block of business and has significant tail risk due mainly to the secondary guarantee, whereby extreme events can cause poor results. Although the analysis of the stochastic results will not help us with our regulatory reporting requirements, it can be used as an independent analysis of results.

**STOCHASTIC RISK FACTORS:**

**Bond Rates**

A Lognormal (LN) model will be used to generate 1, 2, 3, 5, 7, 10, 20, 30 year points on the yield curve. Linear interpolation will be used to determine rates in between these points.

**Equity Rates**

A Regime Switching Lognormal model with 2 regimes (RSLN-2) will be used.

The model has been calibrated using maximum likelihood estimators based on the past 30 years of stock market data.

**RISK MEASURES:**

Our Consultants suggest using Value at Risk (VAR) to determine relatively conservative reserves for pricing.

Critique the technical content of the memo. Justify any recommended changes.

9. (10 points) Company BRL sells term insurance through independent brokers. From 1995 to 2005 BRL were price and compensation leaders in the Term 10 market. Since 2005 BRL has been in the top 10 for price but have significantly reduced the compensation to meet their profitability targets.

A recent lapse study for BRL shows the following:

Duration	1-9	10	11	12+
Expected Lapses	3%	25%	10%	10%
Actual	6%	75%	35%	15%

- (a) (5 points) Explain the implications to BRL of the difference between expected and actual lapse rates.
- (b) (5 points) A recent SOA study has indicated that there is a correlation between renewal lapses and the ratio of the renewal premium to the initial premium on Term 10 policies.

You are given:

Ratio of renewal premium to initial premium	Up to 250%	250% to 500%	Over 500%
Lapse rate at duration 10	25%	50%	85%
Lapse rate at duration 11	15%	20%	40%

BRL's ratios of renewal premiums to initial premiums are between 400% and 500%.

- (i) Provide plausible reasons why BRL's lapse experience in durations 10 and 11 differs from the SOA study.
- (ii) Two renewal premium structures are being proposed:
- Lower the ratio of renewal premiums to initial premiums to 200% for all new business and inforce policies
  - Increase the ratio of renewal premiums to initial premiums to 800% on new business only.

Compare the impact of both proposals on BRL.

**10.** (8 points)

- (a) (6 points) You are given the following information for a Universal Life policy sold in the U.S.:

Life Insured: Male, Age 50
Expenses: 5% of premium, plus monthly administrative fee of 10
Death Benefit Option 1 (Level Death Benefit)
Face Amount: 100,000
Interest Rate: 3.00%
Tax Rate: 25%
Policy Issue Date: 12/31/2013

You are also given the following factors for an endowment to age 100.

Factors	3%	4%	5%	6%
$A_{[50]}$	0.32	0.30	0.24	0.19
$\ddot{a}_{[50]}$	16.00	15.00	14.00	13.00
$\ddot{a}_{[50]:7}$	6.50	6.00	5.50	5.00

The policy owner would like to pay the following premiums:

Year	Annual Premium
1	1000
2	9000
3+	6000

Determine the minimum premium that can be paid in each of the first three years and still pass the Guideline Premium Test and not be a Modified Endowment Contract (MEC). Show your work.

- (b) (2 points) Explain how the classification as a MEC might affect pricing assumptions for:
- (i) Partial withdrawals
  - (ii) Policy loans

**11.** (10 points)

- (a) (2 points) Outline the key areas to be considered when developing a product strategy.

STM is a leader in the term insurance market and is looking to capitalize on the growth in the Canadian Critical Insurance (CI) market by introducing a new CI product. The pricing actuary has developed the following preliminary product design:

Product Type	Standalone 10-year renewable term to age 75
Face amount	Level, fully paid for each condition
Premiums	Fully guaranteed
Issue ages	18 to 65
Covered Conditions	Cancer, stroke, coronary artery bypass graft (standard definitions and exclusions) Covered conditions and definitions are guaranteed
Survival Period	5 days
Waiting Period for Cancer	None
Rider	Return of premium on death (ROPD)

- (b) (4 points) Critique the product design, and recommend appropriate improvements.
- (c) (4 points) You are given the following as it pertains to the final product design:

	Present Value (millions) at		
	5%	10%	15%
Premiums	480.4	356.9	272.9
Pre-Tax Solvency Earnings	43.6	31.5	23.3
Taxes	13.1	9.5	7.0
Increase in Required Capital	9.7	14.9	17.5
After-Tax Investment Income on assets backing Required Capital	1.8	1.4	1.2

Hurdle rate = 10%

Calculate the following profit measures using distributable earnings on the basis for profits:

- (i) Embedded value  
 (ii) Return on investment  
 (iii) Percentage of premium (assume a discount rate of 5%)

Show all work.

**\*\*END OF EXAMINATION\*\***

**Afternoon Session**

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