SOCIETY OF ACTUARIES
Life Pricing

Exam ILALP

AFTERNOON SESSION

Date: Wednesday, April 29, 2015
Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 4 questions numbered 7 through 10 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.

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 morning or afternoon session for Exam ILALP.
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.

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Exam ILALP-Front Cover

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

7. (*10 points*) You are an actuary on the corporate capital team of a large life insurance company in the US. Your company is a major player in the term insurance market, and is expected to continue being a leading seller in this market.

(a) (*3 points*) The CFO seeks to understand insurance-linked securitization (ILS) to help finance the statutory reserve and capital requirements of term insurance required by US regulation. He is not particularly concerned with extreme catastrophic events, such as earthquakes.

(i) List the three most relevant benefits ILS could potentially bring to your company.

(ii) List two reasons why fixed income investors may find these life bonds attractive.

(iii) List two reasons why securitization benefits the insurance industry.

(b) (*1 point*) List three disadvantages to using a letter of credit with an offshore reinsurer to get capital relief.

(c) (*2 points*) The CFO is considering XXX securitization.

(i) Outline how this approach would work.

(ii) List reasons for using this approach.

7. Continued

(d) (*3 points*) You are given the following information at time zero:

	Amount
Premium	30
Product Cashflows	20
XXX Reserves	100
Redundant Reserves	60

Assume:

- Required capital is 25% of statutory reserves
- There are no taxes

Calculate the new business strain at time zero with and without using XXX securitization.

(e) (*1 point*) Describe a way of lowering the structuring cost of a securitization.

8. (*10 points*)

(a) (*2 points*) Describe the characteristics of a participating policy that differentiate it from a non-participating policy.

(b) (*2 points*) Explain the benefits and drawbacks of the two methods for changing dividend scales: pegging and substitution.

LNO Life is a large mutual life insurance company with a great market reputation and quality customer service. Their strategy for the next year focuses on two main goals:

- acquiring a closed block of participating whole life insurance
- expanding their product offerings to include variable universal life (VUL) for the first time

The closed block of participating whole life that they have been reviewing is from a small stock company.

(c) (*2 points*) Describe considerations that LNO Life will have regarding the post-acquisition dividend scale if they move forward with the acquisition.

(d) (*2 points*) Outline the considerations that LNO Life should have in expanding into the new line of VUL business.

(e) (*2 points*) Define "Adaptive Pricing" and discuss whether it is an appropriate pricing strategy for the new VUL product.

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9. (*11 points*) STW Life was recently acquired by KJO, a European insurance company. KJO is planning to switch their pricing approach from real-world (RW) to risk-neutral (RN) and wants to see the potential impact on the value of new business (VNB). Equity-indexed annuity (EIA) and Term are STW's two main products.

(a) (*2 points*) Describe the differences between the RW and RN approaches for discount rate and swap curve setting.

(b) (*4 points*) You are given:

	Product A		Product B	
	% of PV PREM		% of PV PREM	
MCVNB/TEV COMPONENTS	**RN**	**RW**	**RN**	**RW**
PVFP (CEQ) / PVFP (RW DET)	12.0%	13.0%	1.6%	5.0%
TVOG	0.4%	0.0%		−1.9%
CNHR	−8.0%		−0.2%	
FC		−1.0%		−0.5%
MCVNB/TEV	3.5%	12.0%	−1.6%	2.6%

Where:

MCVNB is market consistent value of new business
TEV = traditional value of new business
PVFP = present value of future profits
CEQ = certainty equivalent scenario
RW DET = real-world deterministic
TVOG = time value of financial options and guarantees
CNHR = cost of residual non-hedgeable risks
FC = frictional cost of required capital

(i) (*3 points*) You are given the PVFP (stochastic) for Product B under RN is −1.2% of the present value of premium. Calculate the following:

- TVOG for Product B under RN
- FC for Product A under RN
- FC for Product B under RN

Show all work.

(ii) (*1 point*) Determine which product is the EIA. Justify your answer.

(c) (*1 point*) The projected cash flows were discounted using a swap curve adjusted by a liquidity premium of 50 basis points. Determine the credit spread. Show your work.

9. Continued

(d) (*4 points*) With regard to a market-consistent framework:

(i) (*2 points*) Describe the product features that will improve performance.

(ii) (*1 point*) Evaluate how Payout Annuity and UL/VUL products perform.

(iii) (*1 point*) List considerations for replacing a traditional pricing framework with a risk-based pricing approach.

10. (*9 points*) You are developing the capital market assumptions for a Variable Annuity Guaranteed Minimum Accumulation Benefit (GMAB) which can be exercised 20 years after issue, based on the geometric Brownian motion (GBM):

$$d S_t = \mu_t S_t d t + \sigma_t S_t d W_t$$

You are estimating the volatility parameter σ for the S&P 500 index. You have an initial estimate of implied volatility of 15%.

On the valuation date, the S&P 500 index is valued at 2,000. The risk-free rate is 2%. You received the following from Bloomberg:

Time to Maturity	Strike	Put Option Price
1 Year	1,600	8.06
1 Year	2,000	101.11
1 Year	2,400	371.35
5 Year	1,600	92.19
5 Year	2,000	218.45
5 Year	2,400	406.92

(a) (*2 points*) Given:

Time to Maturity	Strike	$N(-d1)$	$N(-d2)$	Put Option Price
1 Year	1,600	0.045	0.061	$5.67
1 Year	2,000	0.417	0.477	$101.11
1 Year	2,400	0.843	0.876	
5 Year	1,600	0.129	0.213	$50.37
5 Year	2,000	0.321	0.448	
5 Year	2,400	0.531	0.660	$371.26

Calculate the missing put option prices based on the Black-Scholes formula using your initial estimate of implied volatility.

(b) (*3 points*) Assess the reasonableness of the results in part (a) by explaining the differences between the theoretical prices from Black-Scholes you just calculated and the market prices from Bloomberg.

(c) (*2 points*) Describe methodologies to improve the estimates of implied volatility.

(d) (*2 points*) Describe two approaches to model calibration.

****END OF EXAMINATION****
Afternoon Session

USE THIS PAGE FOR YOUR SCRATCH WORK

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