
SOCIETY OF ACTUARIES
Life Pricing

Exam ILALP

MORNING SESSION

Date: Tuesday, October 28, 2014

Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).
 - a) The morning session consists of 7 questions numbered 1 through 7.
 - b) The afternoon session consists of 5 questions numbered 8 through 12.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.

****BEGINNING OF EXAMINATION****
Morning Session

- 1.** (5 points) LP Life currently sells a Universal Life product with the following features:
- Minimum interest guarantee: 6%
 - No surrender charges
 - Front-ended expenses
 - Optional child rider available

LP measures their profitability using a traditional pricing approach of Statutory IRR.

- (a) (1 point) Describe the limitations of using Statutory IRR as the main profit measure for this product.
- (b) (4 points) The CRO recently has become interested in the Market Consistent Pricing approach and has asked you to develop profitability results using this method.
- (i) Explain how the profitability would change under the Market Consistent Pricing approach.
 - (ii) Recommend product design changes that would increase profitability under Market Consistent Pricing. Justify your answer.

2. (9 points) Your company offers a Universal Life (UL) product in the U.S. You consider modifying the product to be a fixed premium UL (FPUL) policy with a tabular cash value as a secondary guarantee.

You are given the following information about a 100,000 policy issued to a 60-year-old female.

- Guideline Level Premium (GLP) of current UL design is 2,800
 - The annual level premium necessary to guarantee coverage of the new design is 2,500
 - Standard Nonforfeiture Law (SNFL) Adjusted Premium is 2,190.50
 - Guaranteed minimum interest rate is 4%
 - Interest rate basis of tabular cash values is 4.5%
 - Mortality basis is 2001 CSO which is the prevailing table
 - Guaranteed annual expense charge of the account value is 60
 - The base guaranteed account value lapses in policy year 30
 - The tabular cash value endows the policy at 100,000 at the end of policy year 40 (age 100)
 - The tabular cash value is greater than the guaranteed account value starting in year 16
- (a) (5 points) Evaluate assumptions for calculating IRC Section 7702 limits and predict the impact on the GLP.
- (b) (4 points) Assume the statutory valuation interest rate is changing from 3.5% to 3.0%.
- (i) Describe the NAIC nonforfeiture implications.
 - (ii) Describe the IRC Section 7702 implications assuming the FPUL contract follows CVAT.

3. (9 points) XYZ Life currently sells life insurance to the higher-income market. They are developing a new five-year level term product for the U.S. middle-income market.

You are given the following information and initial pricing results:

- Premiums are set equal to that of XYZ's primary competitor
- Persistency and mortality assumptions were derived from current experience
- Premiums are level and all policies expire at the end of the term period
- Premiums, expenses, and commissions are paid annually at the beginning of the year
- Commissions are the same level as commissions paid on 10 and 20 year term products
- After tax net earned rate is 2%

Year	1	2	3	4	5
Annual Premium	10,000	9,700	9,409	9,127	8,853
Investment Income on Cash Flows and Reserves	(60)	156	251	265	120
Investment Income on Accumulated Profits	–	(53)	(41)	(18)	27
Change in Terminal Reserves	–	6,000	3,000	(3,000)	(6,000)
Death Benefits Paid at End of Year	1,000	2,000	4,000	8,000	15,000
Expenses	5,000	500	500	500	500
Commissions	8,000	388	376	365	354
Gross Profits	(4,060)	915	1,743	3,509	(854)
Taxes (at 35% tax rate)	(1,421)	320	610	1,228	(299)
Net Income	(2,639)	595	1,133	2,281	(555)

Year	1	2	3	4	5
Cash Flows	(3,000)	7,812	6,533	4,262	–
Statutory Terminal Reserves (End of Year)	–	6,000	9,000	6,000	–
Required Capital (Target Surplus)	500	785	920	756	–

- (a) (5 points) Critique this pricing work and recommend any changes.
- (b) (2 points) Demonstrate that the Generalized ROI equals 12.6% using net income. Show all work.
- (c) (2 points) Identify common mistakes made in entering new markets and pricing products.

4. (7 points) For a Universal Life (UL) policy issued to a policyholder in Canada, you are given:

Target annual premium	5,000
Annual level cost of insurance	2,000
Level death benefit	250,000
Surrender charges	60% in the first policy year, grading linearly to 0% by the sixth policy year
Credited interest rate formula	Portfolio return less a 1% expense margin
Minimum credited interest rate	3%

- Costs of insurance and policy expense charges are deducted annually at the beginning of each year.
- The accumulating fund for tax purposes is equal to the UL accumulation value.

Policy Year	Portfolio Return	Policy Expense Charges	Exempt Test Policy Accumulating Fund for this policy
1	7.5%	600	2,875
2	4.5%	125	5,750
3	3.5%	125	8,625

- (a) (3 points) Determine whether this policy is tax-exempt throughout the first three policy years. Show all work.
- (b) (4 points) Evaluate the policyholder taxation impact of each of the following proposed changes to the exempt test:
- Based on an 8-pay endowment at age 90
 - Use 3.5% interest rate and CIA 86-92 mortality table
 - Use the UL cash surrender value as the tax accumulating fund

5. (7 points) Your company would like to enter the market for annuities with guaranteed minimum death benefit riders and you have been assigned leadership of the project.

(a) (1 point) List the core competencies, as suggested by Atkinson and Dallas, which the new product should build upon.

Your initial task is to get a basic understanding of how the product works by examining a single deterministic scenario per the following specifications:

- Initial single premium is 1,000
- Time period is 4 years
- Deaths occur at the end of each period
- There are no lapses
- The GMDB payoff at death is equal to 90% of initial premium accumulated at 3% per annum
- Risk free rate is 5% (continuously compounded)
- Management charge and margin offset are 2% and 0.5% respectively and charged at the beginning of each year

t	S_t	${}_tP_x^{\tau}$	${}_{t-1} q_x^d$	CF_t
0	1.000	1.0000		
1	1.075	0.9198	0.0802	
2	0.980	0.8433	0.0765	-2.93
3	0.800	0.7703	0.0730	13.93
4	0.975	0.7003	0.0700	

(b) (4 points) Determine whether the GMDB is profitable in this deterministic scenario using the actuarial approach.

You have now run this product through 10,000 stochastic equity scenarios and determined that it is profitable in all but 1,500 of them. Senior management is concerned with these results and has asked you to reconsider the product design to increase profitability.

(c) (2 points) Propose changes to the GMDB and/or base product to increase profitability.

6. (12 points)

- (a) (2 points) Determine product features that would reduce costs for:
- (i) A Standalone Long Term Care (LTC) product
 - (ii) A Standalone Critical Illness (CI) product
- (b)
- (i) (2 points) Construct a process for developing the CI incidence rates within your company.
 - (ii) (1 point) Explain why CI incidence rates vary by country.

You propose a Life/LTC combination product to increase profitability.

- (c) (2 points) Explain the advantages and disadvantages to the policyholder of a Life/LTC combination product.
- (d) (1 point) Describe a typical Life/LTC combination benefit payout design.
- (e) (4 points) Evaluate how the Life/LTC combination product creates a natural hedge in each of the following situations:
- (i) Mortality rates increase for all active lives (i.e. those insureds not on claim for LTC)
 - (ii) Incidence rates for LTC increase in all policy years
 - (iii) Periodic claim termination rates are reduced
 - (iv) Lapse rates decrease for both benefits

7. (11 points) BBF Insurance Company (BBF) recently purchased a distribution channel, through which a large volume of Equity Indexed Annuities (EIA) were sold every year over the last 5 years. BBF plans to enter the EIA market through this newly acquired distribution channel.
- (a) (2 points) Describe the components involved in the computation of the interest credited to an EIA product.
 - (b) (2 points) BBF is currently marketing traditional declared-interest Deferred Annuities with 100% invested in fixed interest bonds. Compare investment strategies between EIA and Deferred Annuity products.
 - (c) (5 points) BBF's investment guideline has been relatively conservative in general, and the CFO of BBF wants to keep this relatively conservative investment tradition for this product.
 - (i) (2 points) Describe the two main strategies available to hedge the option risk on this product. Include any advantages or disadvantages in your description.
 - (ii) (3 points) Recommend a hedging strategy based on BBF's actual situation. Include in your recommendation considerations in implementing that strategy.
 - (d) (2 points) BBF has decided to purchase a call spread option on the index to hedge the option risk.

You are given the following:

- Index period: 1 year point-to-point
- Hedge Budget is 3.5%
- Cap Rate is 10%
- Current index level is 1000

Strike Price	Option Price
1000	9.92%
1050	7.51%
1100	4.26%
1150	3.31%

- (i) Determine the cost of a call spread option. Show your work.
- (ii) Calculate the maximum participation rate the company can afford to provide. Show your work.

****END OF EXAMINATION****

Morning Session

USE THIS PAGE FOR YOUR SCRATCH WORK

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