

Exam ILALPM

MORNING SESSION

Date: Tuesday, April 28, 2020

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 6 questions numbered 1 through 6.
 - b) The afternoon session consists of 4 questions numbered 7 through 10.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 ILALPM.
6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

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Tournez le cahier d'examen pour la version française.

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

- 1.** (9 points) AJZ Life's asset portfolio backing its single premium deferred annuity products have the following characteristics:

The current average liability portfolio duration is the same as the current average asset portfolio duration (6.4 years).

The current asset portfolio is comprised of 100% fixed income assets.

- (a) (3 points) Describe risks AJZ could face in a rapidly rising interest rate environment.
- (b) (3 points) Critique the following recommendation:

After discussion with the Investment and Risk Officers, we recommend using a strategic asset allocation based on AJZ's long term exposure to systematic risk. The asset allocation should be reviewed and adjusted quarterly to ensure the allocation meets AJZ's risk and investment return objectives. We strongly recommend an asset-only approach to determine the asset allocation strategy. Asset-only should be adequate to achieve AJZ's needs.

1. Continued

- (c) (3 points) Below is a subset of bond issuers that comprises AJZ's fixed income asset portfolio.

Issuer	Rating	Market Value in Fixed Income Portfolio (millions)	Average Duration (in years)	Par value
Airline public company	A	100	6.5	105
Financial public company	AA	100	10	120
Technology public company	BBB	100	3	110
Other issuers	Various	200	5	90
Total		500		

The investment team foresees a downgrade of the technology public company from BBB to BB and has recommended a replacement issuer with average duration of 6.5 years which is sold at a 98% discount relative to the bond's par value.

Calculate the amount of replacement bond to purchase without changing the duration profile of the asset portfolio. Show all work.

2. (11 points) Company XYZ is offering a long-term care product with the following features:

- Elimination period: 100 days
- Original benefit amount: 3,000 per month
- Compound inflation protection: 5% annual on original benefit amount

(a) (2 points) Propose three product feature changes that would reduce payout variability from the base design. Justify each proposal.

(b) (2 points) You are given:

Present Value (PV)	PV at 5%	PV at 10%	PV at 12%
Premium	382.7	249.8	207.3
Pre-tax solvency earnings	35.2	29.5	24.7
Tax	14.1	11.8	9.9
Increase in required capital	8.6	12.3	15.9
After-tax investment income on assets backing required capital	1.5	1.2	1.1

- XYZ's hurdle rate is set using a weighted average cost of capital method.
- XYZ's capital structure is 65% equity and 35% debt.
- Stockholders demand a return of 13% after-tax.
- Pre-tax cost of debt is 7%.
- The return on investment for the asset backing the liability is 5%.
- Corporate tax rate is 40%.

Calculate the following profit measures:

- Embedded value
- Profit margin

Show all work.

2. Continued

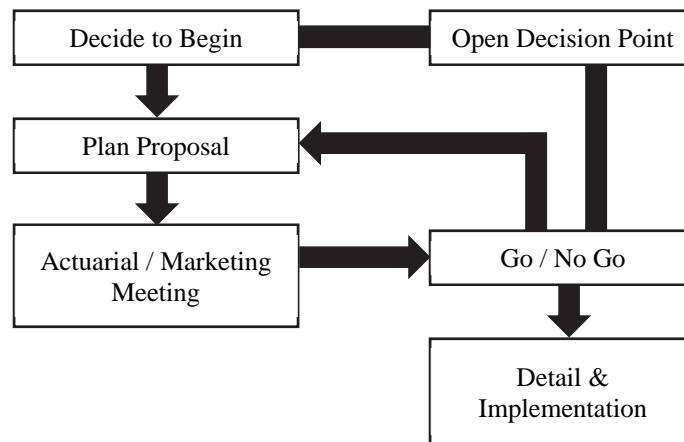
- (c) (2 points) For each of the following sensitivity tests:
- Morbidity decreases
 - Mortality decreases
 - Lapses decrease
 - Interest rate drops
- (i) Describe the impact on profitability.
- (ii) Provide a realistic example that would lead to the above scenarios.
- (d) (2 points) Propose an approach XYZ can use to better understand the impact on profitability for combined changes in morbidity and interest assumptions. Justify your answer.

Question 2 continued on the next page.

2. Continued

(e) (3 points) Critique each of the statements about XYZ's product development process:

- (i) *Profitability should be expressed as a percent of first year sales. This makes it easy for management to easily calculate and understand profitability with varying levels of sales.*
- (ii) *Two profitability targets need to be set – one based on marginal expenses only and one based on fully allocated expenses.*
- (iii) *The product development decision making process can be depicted by:*



This allows for an iterative process between pricing actuaries and marketing to develop a price that is agreeable to both parties.

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3. (8 points) A reinsurer is providing a quotation for a client ceding a single life, increasing death benefit universal life product.

Yearly Renewable Term (YRT) reinsurance premiums will be quoted as a constant percentage of either the CIA 9704 industry mortality table or the client's own "RFP 2019" mortality table. Both tables end using the less-than-one method with a value of 0.45, plus an ultimate mortality rate of 1.00 at age 120.

- (a) (2 points) The following premium rates achieve comparable profitability targets for the reinsurer:

	CIA 9704	RFP 2019
Male nonsmoker	50%	95%
Male smoker	45%	90%
Female nonsmoker	54%	99%
Female smoker	52%	96%

The reinsurer's marketing actuary has made the following comment:

"Since the profitability numbers look similar, we should be indifferent to the choice of mortality table and propose both options to the ceding company to let them decide which one to use."

Critique the statement. Justify your response.

3. Continued

- (b) (6 points) The client is seeking to add a joint last survivor option to their UL product. It will be administrated on an equivalent single age (ESA) basis.
- (i) (3 points) The ceding company provides the following information about the joint last survivor option:

- The ESA will be based on mapping to male nonsmokers
- No changes in underwriting
- Single life lapse rates and independent mortality rates for each life are assumed
- Reinsurance premiums will be based on CIA 9704

The reinsurer determines male nonsmoker premium rates must increase from 50% to 80% of the CIA 9704 male nonsmoker table to support the joint last survivor business at an adequate profitability level.

Justify the premium rate increase to the ceding company.

- (ii) (3 points) The client has acknowledged the need to support substandard and uninsurable lives, and is proposing the following approach:
- For standard or substandard lives, the joint rating will be the greater of the individual life ratings and the rating will be applied to the ESA YRT premiums
 - If one life is deemed uninsurable, a regular single life product will be offered to the insurable life

Assess the feasibility of this proposal. Justify your assessment.

- 4.** (13 points) FGH Insurance has an inforce block of standalone long-term care (LTC) policies. You are requesting premium rate increases due to deteriorating experience, pending regulatory approval.

Your company is currently considering three options to improve the profitability of the standalone block of LTC policies.

Option 1: Co-insure 50% of the LTC business while maintaining the policy and claim administration.

Option 2: Implement an exchange program to offer paid up policies instead of premium rate increases.

Option 3: Improve claims management by increasing process efficiency and fraud detection.

- (a) (6 points) Analyze how the following inforce experience assumptions will be impacted under each of the three options. Justify your responses.
- (i) Morbidity
 - (ii) Mortality
 - (iii) Lapses
 - (iv) Expenses
- (b) (3 points) Identify two advantages and disadvantages of each option for FGH.

Given the observed unfavorable experience of the inforce block, a consultant has recommended that FGH revisit its current LTC product design.

- (c) (2 points) Recommend two product design modifications to improve profitability. Justify your answer.
- (d) (2 points) Compare and contrast Return on Equity (ROE) and Return on Asset (ROA).

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5. (10 points) You are given:

Mortality Group	Actual Claims	Expected Claims	A/E
Male Nonsmoker	1,000	830	120%
Female Nonsmoker	850	945	90%
Male Smoker	600	510	118%
Female Smoker	50	55	91%
Total	2,500	2,340	107%

- (a) (1 point) Compare and contrast the Limited Fluctuation and Buhlmann Empirical Bayesian credibility methods.
- (b) (1 point) Calculate the minimum number of claims required for full credibility under the Limited Fluctuation credibility method, assuming 95% confidence with a corresponding z-value of 1.96, and an error margin of 5%. Show all work.
- (c) (2 points) You have decided to combine smoker and nonsmoker experience for increased credibility. Evaluate the credibility of experience as measured by Limited Fluctuation for each gender and propose mortality adjustment factors as needed. Show all work.
- (d) (2 points) You are given key product differences summarized below:

	Current Product	Repriced Product
Target market	Middle class	High net worth
Risk classes	Smoker, Nonsmoker	Smoker, Nonsmoker, Preferred
Distribution	Career agent	Career agent, brokerage
Premiums	ART premium rates increase by 400% after level term period	ART premium rates increase by 150% after level term period

Describe the expected impact on the current mortality assumption for each of the differences above.

5. Continued

- (e) (4 points) The experience studies team is exploring mortality assumption adjustments for the following products:

Product Description	Deaths	A/E Ratio
Universal Life offered on Simplified Issue basis	200	200%
Permanent life insurance sold to issue ages 18-25	600	105%
Term life insurance for substandards	10,000	130%
Permanent life insurance with 2 years of sales	20,000	60%

- (i) Evaluate the use of the Limited Fluctuation credibility method for each product, assuming the minimum number of deaths required for full credibility is 2,000 and the A/E ratios were developed using industry mortality rates.
- (ii) Recommend refinements to the mortality assumption for each product.

6. (9 points) ABC Life issues both universal life and group term life insurance. ABC is concerned with surplus strain and is considering reinsuring its individual life insurance policies to XYZ Re, a non-licensed reinsurer.

(a) (2 points) You are given the following reinsurance methods

- Yearly renewable term
- Coinsurance

(i) Describe how each reinsurance method alleviates surplus strain.

(ii) Evaluate which method is more effective.

(b) (1 point) Identify reasons ABC might choose modified coinsurance (Mod-co) instead of coinsurance with XYZ Re.

ABC would like to transfer the risk on its group term life insurance business to a licensed reinsurer and is considering either indemnity reinsurance or assumption reinsurance.

(c) (2 points) Recommend one of the two reinsurance methods based on their impact on the following:

(i) Group term life policyholders

(ii) Speed of execution

(iii) Ability for ABC to recapture the business

Justify your answer.

6. Continued

ABC has decided to enter into a Mod-co treaty with XYZ Re.

You are given the following information:

Product Type	Universal Life
Face Amount	500,000
Premium Rate per 1,000	12
Annual Policy Fee	30
Commissions	
Year 1	75%
Year 2	10%
Premium Tax	2%
Amount Reinsured	400,000
Guaranteed Mod-co Interest Rate	5%
Mean Reserves per 1,000	
Year 1	0.95
Year 2	7.15

Other Treaty Terms

- Reinsurance premiums are paid on an annual basis
- No premium tax reimbursement
- XYZ Re will pay ABC an allowance of 2% of all ceded premiums
- XYZ Re can terminate the treaty at any time and force ABC to recapture the business
- XYZ Re will not participate in any policy loans

(d) (2 points) Calculate the ABC's Mod-co adjustment in year 2. Show all work.

(e) (2 points)

- Identify two reinsurance treaty terms which could cause concern from a regulatory risk-transfer perspective.
- Propose a better alternative for each. Justify your answers

****END OF EXAMINATION****
Morning Session

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