# SOCIETY OF ACTUARIES
## Life Pricing

# Exam ILALP

## AFTERNOON SESSION

**Date:** Wednesday, May 4, 2016
**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.** (*12 points*) JDB Life is redesigning its 10 Year Term (Term 10) insurance product. Currently, JDB uses a manual, paper-based, full underwriting process for all applications. JDB is considering the adoption of one of the following approaches to a new Automated Underwriting System (AUS):

**Approach 1**: Implement AUS for all applications that flags "out-of-range" risk factors for the underwriter to review.

**Approach 2:** Implement AUS and replace current underwriting with non-medical underwriting. Any applications that cannot be decisioned by the AUS will be underwritten by a traditional underwriter.

**Approach 3:** Implement AUS and replace current underwriting with a 3 question Simplified Issue underwriting process. All decisions are made by the system.

(a) (*2 points*) Currently, JDB Life underwrites 500 applications per year. You are given the following for AUS Approach 2:

- There will be a 10% increase in applications
- 70% of applications will be decided by AUS
- Cost of underwriting when a AUS decision is made is 250 per application
- Cost of underwriting when AUS does not make a decision is 500 per application
- Implementation cost of AUS is 2,000,000
- Costs are incurred at the beginning of the year

Calculate the present value of total underwriting and implementation costs of Approach 2 over the next 3 years using an annual discount rate of 5%. Show your work.

(b) (*2 points*) Rank each of the AUS underwriting approaches in order of expected mortality change from current fully medically underwritten mortality. Justify your answer.

## 7. Continued

(c) (*2 points*)

(i) Describe two additional criteria to evaluate the AUS underwriting approaches.

(ii) Identify additional data you would need to evaluate each approach.

(d) (*2 points*) JDB wishes to add a conversion option to Term 10 that would allow conversions to its more profitable permanent insurance products.

(i) Describe the two ways of incorporating the additional cost of anti-selective mortality due to term conversions in pricing.

(ii) Recommend two ways to charge for the cost of a term conversion option.

(e) (*2 points*) Describe, with reference to the CIA 2014 Lapse Experience Study, how lapse rates for Term 10 would vary by:

(i) Issue age for the level period

(ii) Issue age for duration 10

(iii) Rating class

(iv) Gender

(v) Payment frequency and mode

(f) (*2 points*) In order to improve profitability on Term 10, JDB is considering an increase to the post-level premium rates from a "3 times" jump from level period rates to a "10 times" jump. The rationale is that the level premium that is used for competitive purposes will not change and the income in durations 11 and greater will improve.

(i) Describe the effect of this premium increase on other assumptions.

(ii) Propose three alternative methods that could be used to increase profitability.

**8.** (*8 points*) ASD Life, a U.S. based life insurer, currently sells a stand-alone Long Term Care (LTC) product, and a stand-alone Universal Life (UL) product through captive agents.

ASD is introducing a UL / LTC combination product (Combo) with a rider providing 2-years of accelerated benefits followed by 5-years of extension benefits. ASD will only sell this product online through a new website.

(a) (*2 points*) Outline the advantages of an extension of benefits provision for UL / LTC combination products.

(b) (*3 points*) You are given the following scenarios:

- Scenario 1: LTC incidence rates decrease
- Scenario 2: Active life mortality rates decrease
- Scenario 3: Lapse rates increase

(i) Predict the effect on the PV of Profits for the Combo product for each scenario. Justify your answer.

(ii) Compare the effect on the PV of Profits for the Combo product for each scenario relative to the stand-alone UL and LTC products. Justify your answer.

(c) (*3 points*) Evaluate ASD's plan to sell the Combo product online. Justify your answer.

**9.** (*12 points*)

(a) (*2 points*) Explain the challenges a life insurance company has with using predictive modeling to estimate mortality as the target variable.

(b) (*4 points*) You have a predictive model with the underwriting decision as the target variable. The goal is to produce an underwriting score based on the inputs which can then be used to triage the preferred class into "Preferred Silver" and "Preferred Gold" classes.

You are given:

| **Data Requirement for Predictive Model** | **Cost** |
|---|---|
| Spending habits database | 25 per applicant |
| Internet browsing history | 500,000 lump sum |
| Subscriptions database | 1 per applicant |

- PV(Premium) is 100 per preferred applicant.
- For the 100,000 preferred applications placed, PV(Benefits) is 8,000,000.
- Preferred Silver risks are expected to have 125.71% of preferred mortality.
- 30% of preferred applications are expected to be in the Preferred Gold class.
- If the predictive model can be implemented, an additional 100,000 Preferred Gold applications will be expected to be placed because premiums will be discounted 20%.

Recommend whether the predictive model should be implemented. Justify your answer.

(c) (*6 points*) For the following competitor-oriented pricing strategies:

- Cooperative pricing
- Adaptive pricing
- Opportunistic pricing
- Predatory pricing

(i) (*2 points*) Describe each strategy.

(ii) (*4 points*) Evaluate how each strategy could benefit from predictive modeling.

**10.** (*8 points*) Propose changes to JTM Life Insurance Company's dividend illustration below to ensure it is compliant with the NAIC Life Insurance Illustrations Model Regulations for policies sold in the U.S.

**WHOLE LIFE ILLUSTRATION**

**Presented to:** John Smith
**Proposed Insured:** John Smith
**Prepared by:** Karen Henry

**PLAN SUMMARY**

**Client: John Smith**
Base Plan: Whole Life
Insurance Type: Life Payment
Dividend Option: Buy Additional Insurance

Total Base and Term Rider Coverage: $200,000

Premium Frequency: Monthly
Total Initial Monthly Premium: $277.56

**An important note about illustrations**
This illustration is prepared to assist you in understanding the operation of permanent life insurance. It is not a contract or an offer to provide insurance. Only items marked "Guaranteed" are guaranteed.

Life insurance policies are complex to analyze. Comparisons of features among policy types may provide incomplete information about the differences, as underlying assumptions often vary. Be sure you address any questions you may have about this product with your agent.

**Be certain to review all pages for complete understanding.**

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## 10. (Continued)

**PRODUCT DESCRIPTION**

**Coverage:** This plan provides a guaranteed level death benefit for the lifetime of the person insured.

**Cash Values:** Cash Values provide for a payment to the policy owner upon surrender of the policy prior to maturity. Cash Values marked "Guaranteed" are contractually guaranteed, provided premiums are paid within the grace period. Total values at death and surrender include guaranteed values and non-guaranteed values generated by dividends.

**Dividends:** Dividends provide an opportunity for the policy owner to participate in the experience of the Company with polices of a similar kind. Factors which may affect dividends include Company experience with expenses, taxation, policy termination and the rate at which persons insured die. Dividends are determined annually by the Board of Directors on the basis of recommendations from Management. **They are not in any way guaranteed and it is certain that experience will differ (positively and/or negatively) from the values shown.**

**This is not a contract and the terms of the policy will apply.**

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***Question 10 continues on the next page***

## 10. (Continued)

**SCENARIO ANALYSIS**

The **Base Scenario** assumes the current dividend scale continue indefinitely.
**Alternate Scenario 1** assumes an immediate decrease in the dividend scale of approximately 1.5% continuing indefinitely.
**Alternate Scenario 2** assumes an immediate increase in the dividend scale of approximately 1.5% continuing indefinitely.

The alternate scenarios are intended to help you understand the variability in the dividends. Factors which may affect dividends include: Company experience with expenses, taxation, policy termination, and the rate at which persons insured die.

| | | |
|---|---|---|
| Proposed Insured: | John Smith | Insurance Age |
| Base Plan: | $200,000 Whole Life | 41 |
| Insurance Type: | Life Payment | |
| Dividend Option: | Buy Additional Insurance | |

| | Guaranteed | | Basic Scenario | | Alternate Scenario 1 | | Alternate Scenario 2 | |
|---|---|---|---|---|---|---|---|---|
| End of Policy Year | Cash Value | Death Benefit | Total Value at Surrender | Total Value at Death | Total Value at Surrender | Total Value at Death | Total Value at Surrender | Total Value at Death |
| 1 | - | 200,000 | - | 200,000 | - | 200,000 | - | 200,000 |
| 2 | - | 200,000 | - | 200,000 | - | 200,000 | - | 200,000 |
| 3 | 600 | 200,000 | 604 | 200,014 | 600 | 200,000 | 612 | 200,042 |
| 4 | 3,400 | 200,000 | 3,423 | 200,082 | 3,400 | 200,000 | 3,482 | 200,287 |
| 5 | 6,200 | 200,000 | 6,261 | 200,207 | 6,200 | 200,000 | 6,412 | 200,719 |
| 6 | 9,000 | 200,000 | 9,116 | 200,379 | 9,000 | 200,000 | 9,409 | 201,335 |
| 7 | 12,000 | 200,000 | 12,190 | 200,601 | 12,000 | 200,000 | 12,675 | 202,131 |
| 8 | 15,000 | 200,000 | 15,285 | 200,870 | 15,000 | 200,000 | 16,019 | 203,106 |
| 9 | 18,000 | 200,000 | 18,401 | 201,183 | 18,000 | 200,000 | 19,440 | 204,249 |
| 10 | 21,200 | 200,000 | 21,742 | 201,543 | 21,200 | 200,000 | 23,153 | 205,564 |
| 15 | 57,000 | 200,000 | 60,496 | 207,239 | 57,000 | 200,000 | 70,342 | 227,624 |
| 25 | 96,400 | 200,000 | 106,413 | 215,944 | 96,400 | 200,000 | 136,996 | 264,643 |
| 35 | 134,200 | 200,000 | 154,785 | 226,804 | 134,200 | 200,000 | 223,331 | 316,056 |
| 45 | 163,800 | 200,000 | 198,211 | 239,283 | 163,800 | 200,000 | 323,801 | 382,649 |
| 55 | 185,800 | 200,000 | 236,507 | 253,041 | 185,800 | 200,000 | 440,189 | 466,097 |
| 65 | 200,000 | 200,000 | 262,006 | 262,006 | 200,000 | 200,000 | 526,435 | 526,435 |
| Surrender/loan tax liability starts in year: | | | 18 | | 20 | | 15 | |

**This is not a contract and the terms of the policy will apply.**

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## 10. (Continued)

**DIVIDEND OPTION**

The **Base Scenario** assumes the current dividend scale continue indefinitely.
**Alternate Scenario 1** assumes an immediate decrease in the dividend scale of approximately 1.5% continuing indefinitely.
**Alternate Scenario 2** assumes an immediate increase in the dividend scale of approximately 1.5% continuing indefinitely.

The alternate scenarios are intended to help you understand the variability in the dividends. Factors which may affect dividends include: Company experience with expenses, taxation, policy termination, and the rate at which persons insured die.

| | | Insurance Age |
|---|---|---|
| Proposed Insured: | John Smith | |
| Base Plan: | $200,000 Whole Life | |
| Insurance Type: | Life Payment | 41 |
| Dividend Option: | Buy Additional Insurance | |

| | Basic Scenario | | | Alternate Scenario 1 | | | Alternate Scenario 2 | | |
|---|---|---|---|---|---|---|---|---|---|
| End of Policy Year | Basic Annual Dividend | Additional Insurance Annual Dividend | Total Additional Insurance | Basic Annual Dividend | Additional Insurance Annual Dividend | Total Additional Insurance | Basic Annual Dividend | Additional Insurance Annual Dividend | Total Additional Insurance |
| 1 | - | - | - | - | - | - | - | - | - |
| 2 | - | - | - | - | - | - | - | - | - |
| 3 | 4 | - | 14 | - | - | - | 12 | - | 42 |
| 4 | 20 | - | 82 | - | - | - | 72 | - | 287 |
| 5 | 38 | - | 207 | - | - | - | 130 | 2 | 719 |
| 6 | 54 | - | 379 | - | - | - | 190 | 5 | 1,335 |
| 7 | 72 | 1 | 601 | - | - | - | 252 | 9 | 2,131 |
| 8 | 90 | 1 | 870 | - | - | - | 316 | 15 | 3,106 |
| 9 | 108 | 2 | 1,183 | - | - | - | 378 | 22 | 4,249 |
| 10 | 128 | 3 | 1,543 | - | - | - | 446 | 31 | 5,564 |
| 15 | 342 | 19 | 7,239 | - | - | - | 1,198 | 251 | 27,624 |
| 25 | 578 | 56 | 15,944 | - | - | - | 2,024 | 795 | 64,643 |
| 35 | 806 | 118 | 26,804 | - | - | - | 2,818 | 1,778 | 116,056 |
| 45 | 982 | 200 | 39,283 | - | - | - | 3,440 | 3,225 | 182,649 |
| 55 | 1,114 | 296 | 53,041 | - | - | - | 3,902 | 5,159 | 266,097 |
| 65 | 1,200 | 363 | 62,006 | - | - | - | 4,200 | 6,628 | 326,435 |

**This is not a contract and the terms of the policy will apply.**

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

**USE THIS PAGE FOR YOUR SCRATCH WORK**