

Exam ILALPM

Date: Wednesday, November 10, 2021

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has 9 questions numbered 1 through 9 with a total of 100 points.

The points for each question are indicated at the beginning of the question.

2. 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 provided in this document.

Written-Answer Instructions

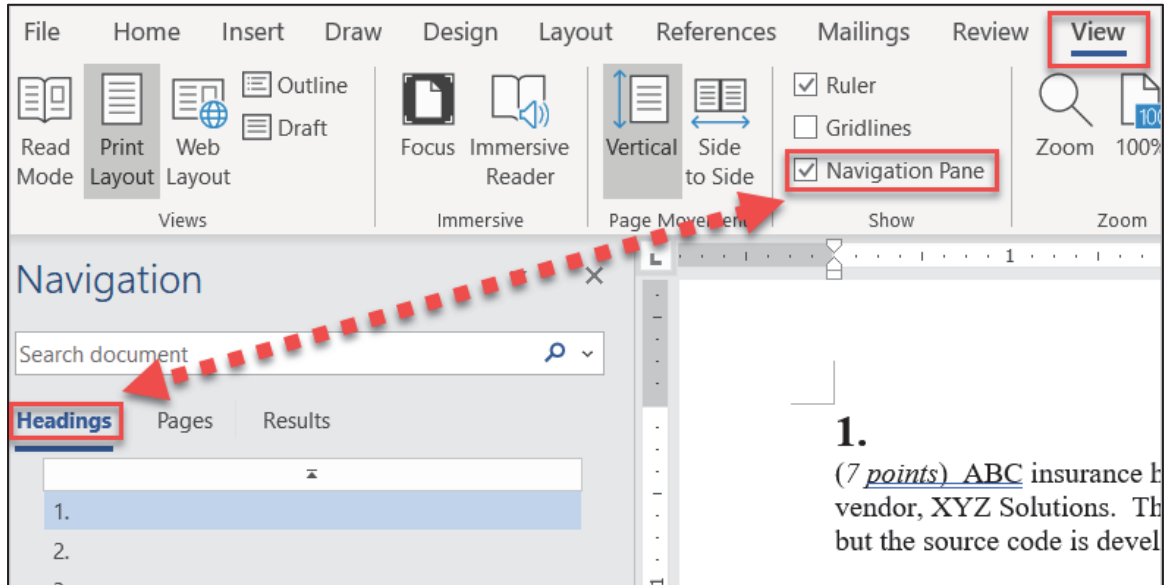
1. Each question part or subpart should be answered either in the Word document or the Excel document as directed within each question. Graders will only look at work in the indicated file.
 - a) In the Word document, answers should be entered in the box marked ANSWER within each question. The box will expand as lines of text are added. There is no need to use special characters or subscripts (though they may be used). For example, β_1 can be typed as beta_1, and x^2 can be typed as x^2.
 - b) In the Excel document formulas should be entered. For example, $X = \text{component1} + \text{component2}$. Performing calculations on scratch paper or with a calculator and then entering the answer in the cell will not earn full credit. Formatting of cells or rounding is not required for credit.
 - c) Individual exams may provide additional directions that apply throughout the exam or to individual items.
2. The answer should be confined to the question as set.
3. Prior to uploading your Word and Excel files, each file should be saved and renamed with your five-digit candidate number in the filename.
4. The Word and Excel documents that contain your answers must be uploaded before the five-minute upload period expires.

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Navigation Instructions

Open the Navigation Pane to jump to questions.

Press Ctrl+F, or click View > Navigation Pane:



1.

(10 points) LBD Life has been selling insurance for decades through career agency, direct selling, and independent advisors. You have been asked to create mortality tables for the company's life core Universal Life insurance product.

(a) (3 points)

(i) (1 point) Describe the five steps of the Table Development Flow Chart.

ANSWER:

(ii) (2 points) List important considerations for three of the Table Development Flow Chart steps.

ANSWER:

(b) (3 points) You are concerned about the mortality variation by distribution channel and with the mortality table development due to the advancing age of the block.

(i) Compare the differences in mortality by LBD Life's distribution channels.

ANSWER:

(ii) Describe ways to address any mortality variation from different distribution channels.

ANSWER:

(iii) Describe potential issues with the mortality table development due to the advancing age of the block.

ANSWER:

1. Continued

LBD Life is developing an aggregate mortality assumption for attained age 90+ and experience for very old ages is limited. The Society of Actuaries has a credible mortality table that reaches Age 105.

(c) (2 points) Recommend an approach to finalize the mortality rates for:

(i) Ages 90-95

ANSWER:

(ii) Ages 96-105

ANSWER:

(d) (2 points) Describe the four methods of ending a mortality table beyond age 105.

ANSWER:

2.

(10 points) Your company sells Universal Life insurance with the following features:

- Sold by independent agents
- Paper application form containing 60 questions spread across 15 pages
- Vitals (such as blood pressure and pulse), urine, and blood sample to be collected by third party examiner visiting the insured's home
- 10-year no lapse guarantee (NLG):
 - A minimum monthly NLG premium based on the insured's age, sex, and smoker status is determined at issue
 - The policy will remain in force if the sum of the cumulative premiums paid is greater than the sum of the NLG premiums required
- Minimum guaranteed credited interest rate of 2%
- Current credited interest rate of 3%
- No riders are available

(a) (4 points) Critique each of the following statements:

- A. *Accelerated underwriting will make it easier to sell our product because it offers the benefit of fully underwritten rates without all the hassle of blood tests and lengthy applications to fill out.*

ANSWER:

- B. *Life settlements are mutually beneficial since the policyholder could have otherwise lapsed their policy and the insurer would lose a stream of future premiums that will instead continue to be paid.*

ANSWER:

- C. *Premium financing is a low risk way to expand availability of insurance to older individuals, provided that adequate medical underwriting is performed.*

ANSWER:

2. Continued

The proposed pricing assumption for premium persistency is to use weighted average factors across two assumed funding patterns:

- Single premium to fund the policy until attained age 75
- Level premium required to keep the policy in force until attained age 100 at the current credited interest rate

(b) (2 points)

- (i) Critique the use of weighted average premium persistency factors for pricing.

ANSWER:

- (ii) Propose a sensitivity test that helps to understand the risk associated with using an approach of employing a weighted average premium persistency assumption for pricing purposes. Justify your proposal.

ANSWER:

The portfolio investment returns are expected to decrease; consequently a commensurate reduction in the credited interest rate is being considered.

(c) (4 points)

- (i) Compare the filing requirements for the proposed reduction in the credited interest rate against those for an increase in the cost of insurance (COI) rates under New York Regulation 210.

ANSWER:

- (ii) Recommend two ways to incorporate dynamic assumptions into a pricing model to more accurately capture the impact of the interest rate environment.

ANSWER:

3.

(11 points) CCC Life offers 3 products:

- 20-year Term insurance with a guaranteed level premium for 20 years followed by annually increasing premiums
- Universal Life with Secondary Guarantee (ULSG)
- Variable Annuity with Guaranteed Minimum Death Benefit (GMDB) and Guaranteed Lifetime Withdrawal Benefit (GLWB)

Market Consistent Value of New Business (MCVNB) results for the three products are given below, expressed as a percentage of the present value of future premiums.

	Product #1	Product #2	Product #3
Present Value of Future Profits	13.1%	2.1%	4.4%
Time Value of Option & Guarantees	0.1%	-3.5%	-2.6%
Cost of Non-Hedgeable Risk	-8.0%	-0.4%	-9.9%
Frictional Costs	-1.1%	-0.1%	-0.4%
Market Consistent Value of New Business	4.1%	-1.9%	-8.5%

- (a) (2 points) Describe each of the four components of MCVNB, and explain how each component is calculated.

ANSWER:

- (b) (3 points) Justify which of CCC Life's products are most likely to correspond to each column in the table of results by relating the components of MCVNB to CCC Life's different lines of business.

ANSWER:

3. Continued

- (c) (3 points) Evaluate how components of MCVNB are affected for each of the following scenarios:
- (i) Removal of the GMDB rider from the Variable Annuity product.
 - (ii) An increase in the tax rate applicable to investment income.
 - (iii) Introduction of a dynamic premium funding component to the ULSG stochastic model.

ANSWER:

- (d) (3 points) Evaluate the likely changes to profitability metrics for a product when moving from an Market Consistent Embedded Value (MCEV) basis to a Traditional Embedded Value (TEV) basis, including the impact on each component of the MCVNB calculation.

ANSWER:

4.

(12 points) ABC Life has historically sold a variety of Universal Life (UL) products in the US and is currently working on the development of a new Term insurance product.

- (a) (1 point) Describe the key intangible marginal cost affecting the profitability of the firm in the context of macro pricing and how it should be considered in decision making.

ANSWER:

- (b) (2 points) Describe one of the methods to determine the optimal price structure of a new product form that maximizes profitability.

ANSWER:

4. Continued

You received an email from a member of your pricing team regarding the new Term product. Note each comment below is a part of the same email.

(c) (6 points) Critique each of the following comments from the email:

- A. *I used the Actuarial Standard of Practice 24 definition of lapse support to verify we can use the non-guaranteed values in the illustration for the new Term product. The product is still profitable assuming higher lapses in later years therefore meets the ASOP's requirement.*

ANSWER:

- B. *The marketing department head has requested we reduce the price in order to increase sales. The reduced price will result in a higher perceived value and thus lower lapses.*

ANSWER:

- C. *The marketing department assured me that the agents selling the product have high persistency. Given this, we can reduce the lapse rate in all years.*

ANSWER:

- D. *Since we expect high persistency, we should offer a return of premium rider. The return of premium rider makes the product look cheaper, as well.*

ANSWER:

4. Continued

- E. *We will not need to include the reduction in the lapse assumption within the reserve calculation.*

ANSWER:

- F. *Since the product is not lapse supported, the path of the reserves does not matter and I have therefore excluded it from my analysis.*

ANSWER:

The marketing team has heard from agents that persistency for the UL product is high. Marketing has asked your team to consider reducing lapse assumptions to help with more competitive premiums. Before making this change you review the Setting Assumptions ASOP Exposure Draft.

- (d) *(3 points)* Recommend additional considerations your team should make prior to implementing the assumption change.

ANSWER:

5.

(12 points) YKT Life Insurance Company, is considering the addition of a new fixed annuity product with a five-year interest guarantee period. You are given the following information. Assume all values are beginning of year.

Risk-Free Rates	
1-Year	1.0%
2-Year	2.0%
3-Year	2.5%
4-Year	3.0%
5-Year	4.0%

Risk Capital Cost	2.5%
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Time	1	2	3	4	5	6
Premiums	100,000	0	0	0	0	0
Admin Fees	50	50	50	50	50	0
Investment Income	0	6,510	6,603	6,669	6,705	6,711
Claims	0	4,719	5,206	5,668	6,100	103,725
Expenses	6,000	350	350	350	350	350
Change in Reserves	93,000	1,333	1,222	1,111	1,010	(97,676)
Risk Capital	1,800	400	400	400	400	0
Account Value (AV)	100,000	100,281	100,089	99,426	98,297	0
AV Released on Claim	0	5,074	5,598	6,095	6,559	103,725
Interest Credited	0	5,355	5,406	5,432	5,430	5,428

- (a) (4 points) Assuming a before tax and before risk-based capital basis:
- (i) (3 points) Calculate the Economic Value created by this product.

The response for this part is to be provided in the Excel document

- (ii) (1 point) Calculate the change in the Economic Value, assuming an annual spread for default and liquidity of 0.5% is also included within the discount rate.

The response for this part is to be provided in the Excel document

5. Continued

- (b) (1 point) Describe sources of frictional capital costs used in the calculation of Economic Value.

ANSWER:

- (c) (2 points) Recommend one way in which each source of frictional capital costs could be decreased.

ANSWER:

- (d) (2 points) Explain three ways YKT Life's Economic Value may be distorted if YKT Life decides to instead use book value for assets and a fixed discount rate for valuing liabilities in the calculation of the product's Economic Value.

ANSWER:

- (e) (3 points) Management has asked for a different view of the income statement in order to see where expected profits are expected to be realized from.

- (i) (2 points) Construct a Source of Earnings profile for actual results assuming the company's hurdle rate of 7% is used to discount future cash flows. Include the following margins:

- Investment Margin
- Claims Margin
- Expense Margin
- Reserve Margin

The response for this part is to be provided in the Excel document

- (ii) (1 point) Verify the sum of the margins equals the total Traditional Embedded Value of the product.

The response for this part is to be provided in the Excel document

6.

(9 points) You are the dividend actuary for a mutual company that sells Participating Whole Life products with the following currently payable dividend scale specifications:

- The annually set scale is based on contribution principle of distributable surplus certified by the board of directors
- Dividend calculation method follows the three factor formula
- Policyholder equity considerations include attained age, policy duration, and underwriting risk class
- Pegging has been an ongoing practice
- The scale has followed a single portfolio method with several blocks of policies
- Policy loans have fixed rates and are without direct recognition
- Fixed policy loan rates are lower than the current portfolio book yield

The following experience and other outcomes were realized during the annual review period:

- The Covid-19 pandemic contributed to an anomalous mortality A/E ratio of 125%
- During the four years prior to the pandemic, the mortality A/E ratio graded from 90% to 105%
- The portfolio book yield has dropped 10 basis points every year
- The company incurred significant realized capital gains on asset sales in the last three months
- Based on the latest expense study, management has decided to move product development and market costs from acquisition to company overhead
- Due to a strain on economic conditions, lapse rates have increased
- As a result of lower divisible surplus and a resulting tightening of retained earnings, management has decided to cease pegging

(a) (4 points) Analyze considerations when using the three factor formula to set the dividend scale, based on the information above.

ANSWER:

6. Continued

Management plans to implement an update program in response to a potentially rapidly rising interest rate environment. The program includes the following provisions:

- Applies to all new policies and will be optional for in force policies
- The program will move from book yield to market yield approach on the portfolio assets
 - Market yield will be approximated using the Moody's Corporate Bond Index as a benchmark
- The policy loan rate will be variable and set equal to the Moody's Corporate Bond Index with a maximum limit of 8% and without direct recognition
- Reinstate pegging only for the update program participants

(b) (5 points)

(i) (4 points) Evaluate the update program.

ANSWER:

(ii) (1 point) Evaluate the use of the currently payable scale in the illustration of new policies.

ANSWER:

7.

(12 points) Your company is investigating the use of reinsurance and has summarized the main motivations in three broad categories:

1. Structured protection and risk transfer
2. Corporate finance driven
3. Enabling strategy and growth

(a) (4 points)

- (i) Explain the objectives for the company in considering the use of reinsurance for each motivation category.

ANSWER:

- (ii) Identify the mapping of the following reinsurance solutions to the motivation categories. Justify your answer.

1. Life in force solutions
2. Solutions supporting growth
3. Solutions for mutual insurers

ANSWER:

7. Continued

- (b) (4 points) Describe areas where reinsurance provides value to buyers and sellers in merger and acquisition deals.

ANSWER:

- (c) (4 points) Critique each of the following statements concerning reinsurance:

A. *Reinsurers cost of capital is less expensive than insurer cost of capital.*

ANSWER:

B. *Reinsurance capital offers more flexibility to a company than traditional capital.*

ANSWER:

C. *An insurance company should avoid the use of collateral when it uses reinsurance to monetize the value of long-term savings and protection policies.*

ANSWER:

D. *Increasingly sophisticated regulatory capital requirements will increase the use of reinsurance employed by smaller mono-line insurers, with the objective to avoid being acquired.*

ANSWER:

E. *Under Solvency II, non-life reinsurance has become more attractive for insurers.*

ANSWER:

8.

(13 points) JPB Life is expanding its annuity portfolio and developing a new Fixed Deferred Annuity. The Chief Actuary proposes using asset portfolio yield as a basis for the crediting strategy would be optimal in the current low interest rate environment.

- (a) (3 points) Describe risks JPB Life could face if interest rate rises rapidly.

ANSWER:

JPB Life currently has 500 million of assets under management, predominately invested in corporate bonds. Due to the appeal of the current low interest rate environment, JPB Life is planning to borrow 250 million to fund future business growth. The investment manager decided to use LIBOR as the benchmark rate.

- (b) (2 points) Evaluate the investment manager's proposal.

ANSWER:

- (c) (2 points) Recommend a financial instrument for JPB Life to hedge against any increases in the cost of borrowing in a rising interest rate environment. Justify your answer.

ANSWER:

8. Continued

(d) (6 points) You are given the following information:

Days to Maturity	Zero Coupon Bond Price
90	0.99009
180	0.97943
270	0.96525
360	0.95328

- (i) (2 points) Calculate the difference between the implied forward rate of a 270-day loan commencing on day 90 and the implied forward rate of a 90-day loan commencing on day 90.

The response for this part is to be provided in the Excel document

- (ii) (4 points) Identify a strategy to replicate the cash flows of a 10 million 90-day loan commencing on day 180 using zero coupon bonds.

The response for this part is to be provided in the Excel document

9.

(11 points) You are the Chief Actuary of XYZ Insurance Company, a US subsidiary of a European holding company. XYZ's liability in force business is exclusively comprised of fixed Universal Life.

XYZ's current asset portfolio backing these policies has large segments of:

- Long-term lower rated Bullet bonds
- Euro-denominated Bullet bonds

XYZ wishes to avoid selling or transferring such assets during this calendar year. To help mitigate risk, XYZ is considering entering an interest rate swap with a notional value of 100 million and the following forward rates:

	Forward Rate
Q1 2021	2.0%
Q2 2021	5.0%
Q3 2021	8.0%
Q4 2021	11.0%

Assume 90 days in all quarters.

(a) (4 points)

(i) (1 point) Define the swap rate.

ANSWER:

(ii) (2 points) Calculate the present value of the floating rate payment.

The response for this part is to be provided in the Excel document

(iii) (1 point) Calculate the swap rate.

The response for this part is to be provided in the Excel document

9. Continued

XYZ Insurance is also considering other derivatives that will mitigate interest rate risk. One option is using a swaption.

- (b) (2 points) Explain key factors that would increase the value of a pay fixed interest rate swaption.

ANSWER:

- (c) (3 points) Recommend two other potential derivative strategies that address risks not covered by XYZ's interest rate swap; include an assessment of the cash flow needs.

ANSWER:

Recent updates to experience studies have indicated:

- XYZ's mortality underwriting has been excellent
 - XYZ's policyholder persistency is much more sensitive to interest rate levels than previously believed
 - XYZ's asset performance is strong
- (d) (2 points) Propose a reinsurance structure to address XYZ's policyholder persistency risk and optimize its capital position. Justify your proposal.

ANSWER:

****END OF EXAMINATION****