
SOCIETY OF ACTUARIES
Life Risk Management

Exam ILALRM

Date: Tuesday, November 1, 2016
Time: 2:00 p.m. – 4:15 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 40 points.

This exam consists of 5 questions, numbered 1 through 5.

The points for each question are indicated at the beginning of the question. Question 2 pertains to the Case Study, which is enclosed inside the front cover of this exam booklet.
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 Exam ILALRM.
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.

CASE STUDY INSTRUCTIONS

The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.

****BEGINNING OF EXAMINATION****

- 1.** (10 points) Your US-based company has acquired a large inforce block of Whole Life policies and Immediate Payout Annuities.
- (a) (1 point) Describe the reserve adequacy risk that has been introduced in this acquisition, as defined in the AAA report to the NAIC on the mapping of life insurance risks.
- (b) (2 points) Cash Flow Testing will be required for the acquired inforce block.
- (i) List the steps involved in the Cash Flow Testing process.
- (ii) Determine the 10 year treasury rate at the end of year 5, assuming the current 10 year treasury rate is 8.00%, for each of the seven cash flow testing interest rate scenarios defined by NAIC Standard Valuation Law.
- (c) (4 points) You have been tasked with the responsibility of building an ALM model.
- (i) Describe modeling simplification methods for the acquired inforce block and their validation methods.
- (ii) Consider the following model output:

T	1	2	3	4	5
FreeCashFlow(<i>t</i>)	1.7	-0.3	1.4	0.9	0.7

1. Describe two methods to handle the free cash flows output at $t=2$.
2. Describe two methods to handle the free cash flows output at $t=3$.

- (d) (3 points) Assess the appropriateness of the following two ALM techniques to reduce the interest rate risk of the acquired inforce block. Justify your answer.
- (i) Immunization
- (ii) Dynamic Financial Analysis

Question 2 pertains to the Case Study.
Each question should be answered independently.

- 2.** (8 points) You are the new CRO of Simple Life. You have decided to use the CIA DCAT methodology for stress testing within the ERM program you are developing. The valuation actuary has proposed the following list of four adverse scenarios:

Scenario	Description
Adverse Mortality	<ul style="list-style-type: none"> • Mortality assumed to be 150% of expected for Term, UL, and SPIA • Increased mortality applies to all future years • No updates to valuation assumptions
Adverse Lapse	<ul style="list-style-type: none"> • Lapses rates assumed to be 200% of expected for Term, UL, and Variable Annuity • Assume no anti-selective lapses on Term
Large Increase in Sales	<ul style="list-style-type: none"> • Sales double for Variable Annuity and Universal Life • No sales increase for Term since sales already very strong • For Variable Annuity, assume no change in product design for simplicity • Assume no impact on expenses
Increased Expenses	<ul style="list-style-type: none"> • Expenses increase by 100% in the Variable Annuity and SPIA lines • No expense increase for Term and UL

- (a) (2 points) Describe the goals of stress testing.
- (b) (3 points) Assess the appropriateness of the four proposed adverse scenarios.
- (c) (3 points) Evaluate the appropriateness of the following management actions suggested by the SVPs:
- (i) Adverse Mortality – Cede additional business with Aggressive Re
 - (ii) Adverse Lapse – Increase the COI on inforce UL policies to offset the lapse experience
 - (iii) Increased Expenses – Outsource some administrative functions with a resulting 50% drop in expenses

3. (9 points) ABC Life is implementing a Risk Management Framework:

(a) (2 points) Describe the three levels of a risk appetite framework:

- (i) Enterprise risk tolerance
- (ii) Risk appetite within each risk category
- (iii) Risk limits

(b) (2 points) Describe the actuarial approach to use for measuring and assessing operational risk.

(c) (3 points) You are given the following from ABC's balance sheet:

	Market Value
Assets (10-year Zero Coupon Bonds)	750 million
Actuarial Liabilities	680 million
Surplus	70 million

Assume:

- The modified duration of the actuarial reserve is 12 years
 - ABC Life's interest rate risk appetite is defined as 12 million for a 200 basis points decrease in interest rates
- (i) Determine if the interest rate risk profile of the company is consistent with its risk appetite.
- (ii) Calculate the maximum duration mismatch allowed under the current risk appetite assuming the liability duration is constant.
- (d) (2 points) Explain the advantages and disadvantages of using the following assets to manage interest rate risk:
- Equity
 - Interest Rate Swaps

4. (7 points)

- (a) (1 point) List three considerations in using collateral to reduce the exposure to credit risk.
- (b) (3 points) DEF Life holds the following Interest Rate Swap with XYZ Bank. The value of the swap from DEF's perspective is:

	Probability	Year 1	Year 2	Year 3
Scenario 1	30%	20	45	60
Scenario 2	60%	15	10	-5
Scenario 3	10%	-10	-20	-15

Calculate the following credit risk metrics at year 3:

- (i) Expected future value
- (ii) Expected positive exposure
- (iii) Effective expected positive exposure
- (c) (1 point) Explain how forward rates contribute to differences between current future value and expected future value.
- (d) (2 points) DEF Life is considering purchasing a second interest rate swap. The value of this swap from DEF's perspective is:

	Probability	Year 1	Year 2	Year 3
Scenario 1	30%	10	20	30
Scenario 2	60%	20	20	10
Scenario 3	10%	-15	-15	-15

Assess the impact of netting exposures on DEF's swap portfolio.

5. (6 points)

(a) (2 points)

- (i) Describe the process of estimating the value at risk (VaR) of a portfolio of assets.
- (ii) List possible shortcomings of using VaR as a measure for risk management purposes.

(b) (4 points) Your company currently uses the following risk measures to monitor GMAB in-the-money exposure for its variable annuity block:

- Monthly calculation of 99% VaR for an immediate drop in market value
- Monthly calculation of CTE(95) for an immediate drop in market value
- Quarterly scenario testing over a 5 year projection period

The CRO has decided that the current level of risk monitoring for variable annuities is excessive. The market value/guaranteed value (MV/GV) ratios for the block have been steadily improving, and the company has recently closed 4 of the 7 most volatile funds to new deposits.

Your department manager has recommended the following reduced risk monitoring process:

- *Maintain monthly calculation of 99% VaR for an immediate drop in market value*
- *Reduce to quarterly calculation of CTE(95) for an immediate drop in market value*
- *Reduce scenario testing to once every two years, over a 5 year projection period*

Critique this recommendation.

****END OF EXAMINATION****

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