
SOCIETY OF ACTUARIES
Exam ILALRM
Life Risk Management Exam

Exam ILALRM

Date: Thursday, May 1, 2014

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 7 questions, numbered 1 through 7.

The points for each question are indicated at the beginning of the question. Questions 1 and 5-7 pertain 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****

***Question 1 pertains to the Case Study.
Each question should be answered independently.***

- 1.** (9 points) Lyon will be hiring a Chief Risk Officer (CRO) for Simple Life and transitioning the risk management from the Risk Management Committee (RMC) to the CRO.

The Board has agreed that the Simple Life RMC will be disbanded when the CRO becomes an officer of Simple Life after three to five years of experience at the company.

The CRO will be responsible for establishing an effective enterprise risk management (ERM) process to support Lyon's long term strategic objectives.

- (a) (3 points) Assess the effectiveness of the RMC in dealing with the following risk issues faced by Simple Life:
- (i) Operational risk
 - (ii) Non-life insurance risk
 - (iii) Liquidity risk
- (b) (1 point) Identify risks associated with the plans to disband the RMC and recommend an appropriate transition plan to maintain good risk management practice.

*Question 1 pertains to the Case Study.
Each question should be answered independently.*

1. Continued

- (c) (5 points) The president of Simple Life believes that properly constructed compensation will help focus the CRO on developing a stronger risk management culture for Lyon.

A consultant has recommended that the incentive compensation structure for the CRO be aligned with the management team and has proposed the following structure:

- Annual bonus of 50% of salary based on embedded value growth.
- Medium term bonus of 25% of salary based on a 2-year moving average of US GAAP earnings.
- Long term incentive valued at 50% of salary using Black-Scholes with a combination of stock options and deferred shares payable based on a 3-year relative growth of the share price in comparison to competitors' share price.

The CRO will also be eligible to participate in:

- An annual innovation bonus based on the contribution of the CRO and his team to implementing innovative ideas that support revenue growth in new lines of business.
- An acquisition bonus based on completion of a project to acquire companies, distribution channels, new lines of business or closed blocks of business.

Assess the consultant's proposed compensation structure and recommend changes to ensure that the CRO is provided with appropriate incentives to establish and manage an effective ERM process for Lyon that is consistent with Lyon's long term strategic direction.

2. (7 points) You are holding a bond value of 1,000,000 with effective duration 7 and the following current yield curve:

| | | | | |
|--------|-------|--|---------|-------|
| Year 1 | 1.20% | | Year 6 | 2.50% |
| Year 2 | 1.50% | | Year 7 | 2.60% |
| Year 3 | 1.80% | | Year 8 | 3.00% |
| Year 4 | 2.00% | | Year 9 | 3.80% |
| Year 5 | 2.10% | | Year 10 | 4.50% |

To measure the sensitivity of the bond value, you are modeling key rate durations by identifying the rates at years 2, 5 and 10 as key rates.

- (a) (1 point) Describe Asset Liability Management techniques available to insurers.
- (b) (2 points) Calculate the yield curve for years 1 through 10 based on a 10 basis point increase in each of the following key rates. Show all work.
- (i) Year 2
(ii) Year 5
(iii) Year 10
- (c) (4 points) Scenario testing has produced the following three yield curves:

| | Yield Curve 1 | Yield Curve 2 | Yield Curve 3 |
|---------|---------------|---------------|---------------|
| Year 1 | 1.40% | 1.00% | 1.40% |
| Year 2 | 1.70% | 1.20% | 1.80% |
| Year 3 | 2.00% | 1.50% | 1.83% |
| Year 4 | 2.20% | 1.80% | 1.87% |
| Year 5 | 2.30% | 2.10% | 1.90% |
| Year 6 | 2.70% | 2.60% | 2.48% |
| Year 7 | 2.80% | 3.10% | 3.06% |
| Year 8 | 3.20% | 3.60% | 3.64% |
| Year 9 | 4.00% | 4.10% | 4.22% |
| Year 10 | 4.70% | 4.60% | 4.80% |

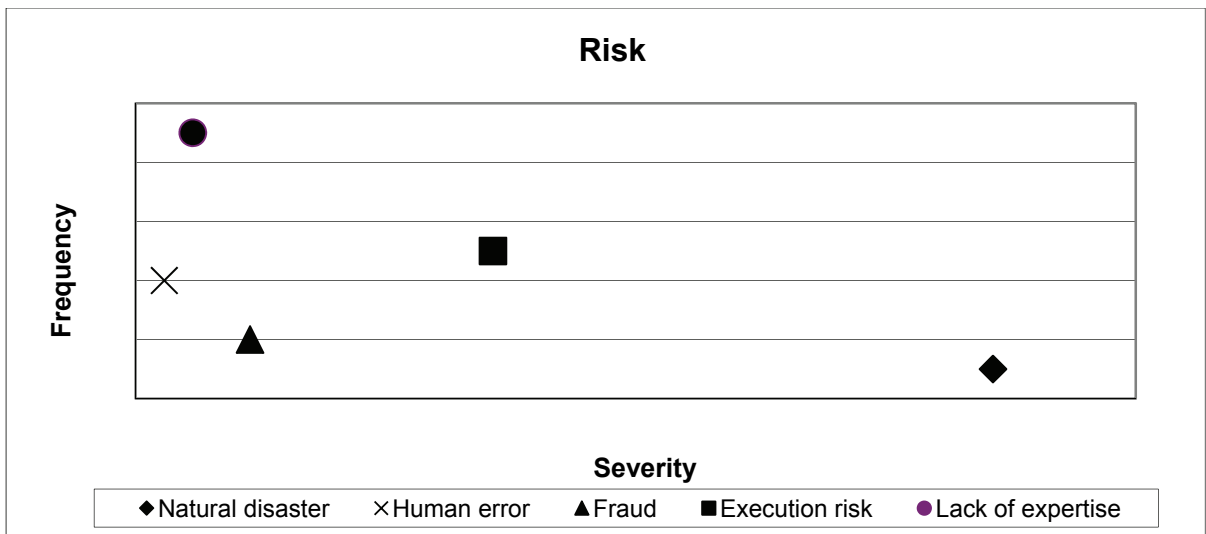
You are given:

| | Key Rate Durations |
|--------|--------------------|
| Year 2 | 1 |
| Year 5 | 2 |

Estimate the bond prices based on each of yield curves 1, 2, and 3. Show all work.

3. (4 points) The new Chief Risk Officer of IRM Life has decided to move from Traditional Operational Risk Management (Traditional ORM) to Modern Operational Risk Management (Modern ORM). He has produced the following executive summary of his framework.

- Each business unit head identified their major key operational risks:
 - Natural disaster and recovery
 - Human error in valuation
 - Fraud
 - Execution risk due to lack of resources
 - Lack of expertise due to loss of resources
- Each risk has been mapped in the following manner using soft and hard data:



- Risk measurement tools have been identified and quarterly monitoring and reporting on each risk is in place.
- Mitigation action plans were developed after a brainstorming session:
 - Natural disaster and recovery – People able to work from home
 - Human error in valuation – Monitor; no action taken
 - Fraud – Ethics training, compulsory compliance for all employees
 - Execution risk due to lack of resources – Hire consultants, identify talent gaps and hire new staff
 - Lack of expertise due to a loss of resources – Hire consultants

- (a) (3 points) You are asked to audit IRM Life’s new framework. Critique the framework and recommend changes so their new ORM process follows the modern approach.
- (b) (1 point) Identify the highest risk for IRM Life under the modern approach based on the graph above. Justify your answer.

4. (5 points) You are an actuary working for Harbor Life & Annuity Company. You have been asked to work with the Chief Risk Officer (CRO) in making some strategic management decisions.

(a) (3 points) You have received the following required risk capital data for Harbor's three business units:

| Business Unit | Stand-Alone Required Risk Capital (in Millions) |
|-------------------------------------|---|
| Life | 250 |
| Annuities | 450 |
| Accident & Disability (A&D) | 125 |
| Total Before Diversification | 825 |
| Total After Diversification | 610 |

| Business Units | Required Risk Capital (in Millions) |
|------------------|-------------------------------------|
| Life + Annuities | 530 |
| Life + A&D | 490 |
| Annuities + A&D | 475 |

(i) The CRO states "I am concerned about the profitability of the Annuities unit due to high risk capital requirements. We should consider exiting this line of business." Analyze this statement.

(ii) Determine the amount of required risk capital that should remain unallocated to the business units. Show all work.

(b) (2 points) The CRO is considering two potential risk management strategies for Harbor to use. You are given:

| Strategy | Expected Profit (in Millions) | Increase in Probability of Distress | Expected Cost of Distress (in Millions) | Expected Rate of Return |
|----------|-------------------------------|-------------------------------------|---|-------------------------|
| 1 | 8 | 0.18 | 25 | 8% |
| 2 | 12 | 0.28 | 75 | 10% |

Company Cost of Capital = 8%

Determine whether each strategy is worth taking. Show all work.

*Questions 5 - 7 pertain to the Case Study.
Each question should be answered independently.*

5. (7 points)

- (a) (2 points) Simple Life appointed you as the Chief Risk Officer (CRO) to lead its Enterprise Risk Management (ERM) department, and you are working on developing Simple Life's ERM framework.
- (i) (1 point) Describe the CRO's role in the successful implementation of an ERM framework.
- (ii) (1 point) Critique Mr. Lyon's preference that the CRO report to the EVP-Planning at Simple Life.
- (b) (3 points) The ERM department is conducting stress testing of Simple Life's general account investment portfolio.

You are given:

- Annualized volatility is 10%
- There are 250 trading days in a year.

Describe alternative measures of a 4-sigma daily event.

- (c) (2 points) Propose strategies the ERM department can implement to meet stakeholders' demands to improve the trade-offs between risk and return in Simple's Life's Variable Annuity block.

Questions 5 - 7 pertain to the Case Study.
Each question should be answered independently.

6. (4 points)

- (a) (2 points) You are the Chief Risk Officer (CRO) of Simple Life. The Chief Investment Officer (CIO) is considering simplifying the portfolio of assets backing the Term Insurance product by reducing it to just US Agency Bonds and US Corporate Investment Grade Bonds. To accomplish this, all other assets will be sold and the proceeds will be used to purchase US Agencies. Assume the changes in asset values are normally distributed.

Refer to the *Portfolio Summary* (section 2.14) and the *Historical Market Data* (section 2.15) in the Case Study. Calculate the 1-year VaR(99%) of the new portfolio of assets backing the Term Insurance product, as proposed by the CIO, at December 31, 2013.

*Questions 5 - 7 pertain to the Case Study.
Each question should be answered independently.*

6. Continued

(b) (2 points) The CIO proposes to include a new asset in the portfolio to help improve its yield. Annual returns for 100 scenarios have been projected. You are given:

- Starting Market Value = 100 million
- Raw data of annual returns (in millions):

| | | | | |
|-----|-----|----|----|----|
| 14 | 18 | 23 | 0 | 14 |
| 4 | 14 | 16 | 25 | 14 |
| 1 | 21 | 7 | 16 | 4 |
| -23 | -10 | 20 | 12 | 1 |
| 22 | 6 | 8 | 15 | 6 |
| 7 | 19 | 0 | 8 | 2 |
| 24 | -16 | 21 | 17 | 10 |
| 15 | 25 | 21 | 14 | 15 |
| 21 | 4 | 0 | 15 | 20 |
| -25 | 1 | 21 | 2 | 16 |
| 11 | 10 | 22 | 4 | 16 |
| 18 | 17 | -8 | 22 | 19 |
| 15 | 15 | 11 | 5 | 20 |
| 13 | 24 | 19 | -4 | 9 |
| 20 | 10 | 21 | 13 | 6 |
| 8 | -1 | 12 | 11 | 3 |
| 8 | 9 | 14 | 8 | 7 |
| 16 | 14 | 25 | 15 | 22 |
| 21 | 20 | 11 | 19 | 16 |
| 15 | 11 | 10 | 12 | 15 |

Negative returns are highlighted.

Determine the VaR (95%) and CTE (95%) of the annual return for the new asset.

*Questions 5 - 7 pertain to the Case Study.
Each question should be answered independently.*

- 7.** (4 points) Recommend enhancements to Simple Life's current stress testing method so that it can be more useful for testing capital adequacy. Justify your recommendations.

****END OF EXAMINATION****

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