SOCIETY OF ACTUARIES
Life Risk Management

Exam ILALRM

Date: Tuesday, October 27, 2015
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 4 questions, numbered 1 through 4.

   The points for each question are indicated at the beginning of the question. Question 3 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.

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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. (*9 points*) XYZ is a Canadian Life Insurance company.

(a) (*2 points*) Describe the goals of stress testing as discussed in the CIA DCAT Educational Note.

(b) (*1 point*) Describe reverse stress testing.

(c) (*2 points*) You are given the following profile of the Market Risk for a block of XYZ's annuities:

Business	(Millions)	Modified Duration
Assets	2,000	7.5
Liabilities	1,500	30
Surplus	500	

Assuming interest rates decrease by 2.5%:

(i) Calculate the change in surplus using modified duration.

(ii) Calculate the change in asset duration which results in zero surplus using modified duration.

(d) (*4 points*) Under the base DCAT scenario, you have calculated the following for XYZ's three lines of business:

Business	Assets (Millions)	Liabilities (Millions)	Investor Capital (Millions)	Standard Deviation of Profits
A	4,000	3,000	1,000	25%
B	4,000	2,500	1,500	50%
C	2,000	1,500	500	75%

You are also given:

- The profits of businesses A and B are correlated at a rate of 75%
- The profits of business C are uncorrelated with the other two lines of business

Calculate:

(i) (*1 point*) Stand-alone risk capital

(ii) (*3 points*) Diversification benefit

2. (*11 points*) You are modeling a block of disability income insurance which offers only one benefit amount.

(a) (*1 point*) Describe two ways to validate modeling simplifications.

(b) (*1 point*) Describe two types of trade-offs arising from modeling simplifications.

(c) (*5 points*) You are given the following subset of the inforce data:

Issue Age	Number of Policies	Total Annualized Premium	Total Reserve
34	300	300,000	500,000
35	250	275,000	500,000
36	260	300,000	540,000
37	200	232,000	425,000
38	225	270,000	480,000
39	240	300,000	525,000
40	275	350,000	620,000

An analyst has developed the following approach for modeling the age mix distribution:

Age Band	Modeled Age	% of Inforce
18-24	21	5.9%
25-29	27	8.4%
30-34	32	10.7%
35-39	37	12.4%
40-44	42	13.3%
45-49	47	13.1%
50-54	52	10.6%
55-59	57	8.2%
60-64	62	6.1%
65-69	67	5.1%
70-74	72	3.8%
75-79	77	2.1%
80-84	82	0.3%
Total		100.0%

(i) (*1 point*) Calculate the age error for the 35-39 age band, using the number of policies for weighting purposes.

(ii) (*2 points*) Calculate the average known error for the 35-39 age band.

(iii) (*2 points*) Critique the analyst's approach to modeled age. Justify your answer.

2. Continued

(d) (*4 points*) The marketing area recommends adding a return of premium (ROP) rider to attract new sales. At the end of every ten year period, for an additional charge of 30% of base premium, 75% of cumulative gross premiums for that period are refunded.

(i) (*3 points*) Assess three risks mapped according to the Federal Reserve Risk categories for the proposed ROP rider.

(ii) (*1 point*) Recommend an asset liability management technique suitable for the ROP rider.

Question 3 pertains to the Case Study.
Each question should be answered independently.

3. (*10 points*) You are an analyst for S&P, conducting an ERM assessment of Simple Life. You've gathered the following from interviews with various officers of Simple Life:

- A CRO is recently hired to develop an ERM framework that is currently non-existent. The CRO replaced the Risk Management Committee that reported to the Board.
- The executive bonus structure was recently updated to be based 100% on sales, in order to encourage faster sales growth over the next two years.
- The SVP for Variable Annuities indicated the product development team has not discussed the proposed new product with the hedging team because "the valuation group will do that after launch."
- Simple Life does not have a formal pricing policy outlining the risk assessment that must be completed before any new product or changes can be implemented.
- The hedging team has an economic capital model to quantify exposures to interest rate risk, equity price risk, credit risk, and mortality risk. All other risk measurements adopt their own factor-based capital models.
- Each risk exposure is calculated for each line of business, and summed for the company. Each risk is aggregated using a correlation matrix derived from the prior ten years of market movements.

(a) (*1 point*) List the possible overall ERM assessment scores and subfactor scores in the S&P methodology.

(b) (*3 points*) Describe sources of market risk which could emerge if the valuation group does not perform a timely review of the new Variable Annuity product structure.

(c) (*6 points*) For the following subfactors:

- Risk management culture
- Risk models
- Emerging risk management

(i) Recommend scores for each subfactor.

(ii) Propose ways for Simple Life to improve their scores.

Justify your answer.

4. (*10 points*) DBM Life is entering the variable annuity (VA) business. The chief actuary is considering hedging as a risk management strategy for this business.

(a) (*2 points*) Describe the advantages and disadvantages of using hedging as a risk management strategy for VAs.

(b) (*2 points*) DBM Life measures market risk using the value-at-risk (VaR) method and wants to measure future credit risk exposure generated by the hedging program using the same method.

Evaluate the appropriateness of using VaR to measure credit risk exposure. Justify your answer.

(c) (*2 points*) Recommend ways DBM Life can manage risk related to money deposited into VAs.

A new actuary at the company mentioned reinsurance was an effective risk mitigation strategy for VAs.

(d) (*2 points*) Critique the new actuary's statement.

(e) (*2 points*) Assess trends in the marketplace which may make reinsurance for VAs a more attractive risk management strategy in the future.

****END OF EXAMINATION****

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