
SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

MORNING SESSION

Date: Thursday, April 30, 2015

Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).
 - a) The morning session consists of 7 questions numbered 1 through 7.
 - b) The afternoon session consists of 5 questions numbered 8 through 12.

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 ILALFVC.
6. Be sure your essay answer envelope is signed because if it is not, your examination will not be graded.

Tournez le cahier d'examen pour la version française.

****BEGINNING OF EXAMINATION****
Morning Session

1. (8 points) XYZ Life sells a 3-year single premium term insurance product in Canada with a return of premium (ROP) rider which refunds 100% of the premium after three years if the policy is still in force.

You are given the following assumptions:

Face Amount	250,000
Premium	10,000

Age (x)	e_x	q_x
40	20	0.005
41	15	0.006
42	10	0.007

- No expenses, lapses, or commissions
- Future Mortality Improvements included in valuation
- Decrements occur at the end of the year
- XYZ Life is new to the term life market, and does not have credible mortality experience for this product.

With respect to Canadian GAAP reserving:

- (a) (7 points) Calculate the mortality provision for adverse deviation (PfAD) for a new policy issued at age 40, using a 5% annual interest rate as an approximation in the determination of the CALM reserve. Show your work and justify all assumptions used.
- (b) (1 point) State the guidelines for selecting mortality improvement assumptions if the business is sold outside of Canada.

2. (7 points) ACL Life is a Canadian Life insurer that offers a wide variety of individual life insurance products which includes a 10-year renewable term product. ACL has recently added a 5-year renewable term product, IMCovered (IMC), to its existing product portfolio.

You are given:

Product Feature	10-year renewable term	5-year renewable term (IMC)
Issue Ages	18 – 65	45 – 65
Maturity Age	80	80
Underwriting requirement	Full underwriting	Guaranteed Issue
Conversion Privilege	Can convert to a permanent product prior to attained age 70	No conversion privilege

- (a) (4 points) Assess the appropriateness of using the existing 10-year renewable term product's valuation assumptions for setting each of the following valuation assumptions for IMC:
- (i) Mortality
 - (ii) Lapse
 - (iii) Expense
- (b) (3 points) ACL is considering the following two investment strategies to support the IMC product:

Strategy 1 – Invest and reinvest only in government bonds

Strategy 2 – Invest and reinvest only in corporate bonds, BB grade

Explain how each investment strategy will affect:

- (i) CALM reserves
- (ii) MCCSR

3. (8 points) Critique the following statements made by the actuary for JJB Life, a Canadian insurance company, with respect to the IFRS 4 Phase II exposure draft on insurance contracts:
- A. *“IFRS may have an impact on the reporting for our SuperUL Universal Life product that has a segregated fund investment option guaranteeing 95% return of deposits on death.”*
- B. *“The profitability of our SuperTerm, a term life insurance product, won’t be affected. New SuperTerm sales will continue to add to our bottom line at issue. For instance, take a hypothetical SuperTerm policy with a present value of cash inflow of 20,000, a present value of cash outflow of 12,000 and a total margin for uncertainty of 5,000. This policy will produce a 3,000 gain at issue since there is a liability at initial recognition of -3,000. This will allow the SuperTerm business to continue to offset the loss at issue from our disability income business.”*
- C. *“There are similarities to CALM. The discount rate for both CALM and IFRS used to discount the fulfillment cash flows should reflect the characteristics of the supporting assets, and we should be adding risk margins to reflect uncertainties in cash flows.”*
- D. *“We should consider the following when estimating the cash flows from our in-force insurance contracts:*
- *Investment returns on underlying items*
 - *Directly attributable acquisition costs*
 - *Premium taxes*
 - *Reinsurance premiums, but not reinsurance benefits.”*
- E. *“Updates for current estimates and for current market rates will flow through our financial reporting in the same way.”*
- F. *“Disclosure requirements have not changed. The focus remains on the amounts recognized in the financial statements, and the nature and extent of the risks.”*

- 4.** (12 points) Company ABC sells life insurance products in many markets around the world, including Canada. You have been asked to analyze regulatory and economic capital frameworks.
- (a) (2 points) Explain why Canada is introducing a new standard approach to setting capital requirements to replace Minimum Continuing Capital and Surplus Requirement (MCCSR) and Test of Adequacy of Assets in Canada and Margin Requirements (TAAM).
- (b) (6 points) Compare the pros and cons of the new Canadian capital requirement framework with respect to its choice of:
- (i) Time horizon
 - (ii) Risk measure
 - (iii) Target security level
- (c) (4 points) ABC's economic capital has the following characteristics:
- Includes all risks ABC is exposed to
 - Time horizon: one-year mark-to-market approach
 - Risk measure and security level: CTE(99.5)
 - Security level is calibrated to corporate bond defaults
 - Risks are aggregated using a correlation matrix
 - Negative cumulative surplus is permitted within the time horizon
 - 1 year of future new business is taken into account
- (i) Identify the areas where ABC's economic capital may be lower, similar or higher than the new Canadian capital requirement.
- (ii) Identify the areas where the relationship between ABC's economic capital and the new Canadian capital requirement is unknown as that particular aspect is still under consideration in the new Canadian framework.

5. (9 points)

- (a) (2 points) Describe how you would determine the discount rate for each of the following:
- (i) Actuarial Appraisal Value
 - (ii) Embedded Value
- (b) (4 points) Recommend using either Embedded Value or Actuarial Appraisal Value for each of the following circumstances:
- (i) Your company wants to determine the value of a company that it is acquiring.
 - (ii) Your company is valuing some stocks and other assets that it is selling.
 - (iii) Your company wants to distinguish movements from economic earnings in values.
 - (iv) You want to determine the value of a company as a "going concern."

Justify your recommendation.

- (c) (3 points) You are given the following for a block of variable annuities with guaranteed minimum income benefits:

Required capital	100
Free surplus	150
Present Value (PV) of after-tax statutory book profits	2,000
PV of cost of capital	500
Value of future new business	300

For the guaranteed minimum income benefit:

Mean of PV of distributable earnings for a set of stochastic scenarios	1,300
PV of distributable earnings for a single deterministic scenario	900

Calculate the Embedded Value and Actuarial Appraisal Value. Show all work.

6. (10 points) DEF Life, a Canadian insurer, is looking to reinsure its Critical Illness product.

DEF Life's retention structure is as follows:

- The first dollar retention amount of DEF Life is 50,000 of the face amount of the principal policy.
- Excess face amount is ceded at 60% quota share.
- The maximum retention limit is 150,000 on any one life insured.

As of beginning of year t , three policies remain in-force as follows:

Policy Number	Face Amount (FA)	Risk Class	Mortality Rates q_t	Lapse Rates w_t	Reserve Factors $V_t / 1000 \text{ FA}$	Expected Reserve Factors $V_{t+1} / 1000 \text{ FA}$
1	250,000	MNS	0.005	0.025	20.0	22.0
2	350,000	FNS	0.003	0.020	33.0	35.0
3	45,000	MSM	0.008	0.040	17.3	20.4

- (a) (3 points) Describe how DEF Life would comply with OSFI B-3 Guidelines in selecting a reinsurer.
- (b) (2.5 points) DEF Life decides to enter into a modified coinsurance (mod-co) contract with XYZ Re, a Canadian reinsurer, on the Critical Illness product. The treaty specifies a mod-co interest rate of 4% for all durations. DEF Life's reserve factors would be used to calculate the increase in reserves for the mod-co reserve adjustment.
- (i) Define mirror reserving.
- (ii) Explain why it is inappropriate for XYZ Re to use mirroring to set its reserves.
- (c) (4.5 points) Calculate the expected cash flow at the end of year t to DEF Life due to the mod-co reserve adjustment.

7. (6 points) KLM Life is hiring another actuary to peer review the work of their Appointed Actuary.
- (a) (3 points) KLM is considering a candidate with the following characteristics:
- An FCIA
 - Worked in Canada for three of the last six years
 - Performed valuations of Canadian actuarial liabilities of an insurance company for six months in the past six years
 - Worked his entire career at KLM Life before resigning three years ago to teach actuarial science at a local university
 - Holds shares in KLM Life from his previous employment
 - Holds shares in XYZ Life, a main competitor of KLM Life
- (i) Identify which of these characteristics are not suitable for a peer reviewer.
- (ii) Recommend remedies to allow this candidate to peer review the Appointed Actuary's work.
- (b) (2 points) Describe the work the peer reviewer is expected to perform.
- (c) (1 point) KLM Life wishes to use the peer reviewer's work in place of an external audit. Critique this decision.

****END OF EXAMINATION****
Morning Session

USE THIS PAGE FOR YOUR SCRATCH WORK