
SOCIETY OF ACTUARIES
Life Finance & Valuation - Canada

Exam ILALFVC

AFTERNOON SESSION

Date: Thursday, April 27, 2017

Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 4 questions numbered 7 through 10 for a total of 40 points. 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****

Afternoon Session
Beginning with Question 7

7. (8 points) You are given the following for a Canadian life insurance company:

- All the assets backing insurance contract liabilities are designated as Held for Trading (HFT).
- All the assets backing investment contract liabilities are designated as Held to Maturity (HTM).
- All the assets backing surplus are designated as Available for Sale (AFS).
- All of the assets held are corporate bonds with a credit rating of A.
- There are no qualifying participating or adjustable products.

	September 30, 2016		December 31, 2016	
	Carrying value	Fair value	Carrying value	Fair value
Assets backing insurance contract liabilities	1000	1000	1000	1100
Assets backing investment contract liabilities	500	600	525	675
Assets backing surplus	100	100	100	90

	Coupon payments received	
	3 rd Quarter 2016	4 th Quarter 2016
Assets backing insurance contract liabilities	10	10
Assets backing investment contract liabilities	0	0
Assets backing surplus	1	1

7. Continued

	September 30, 2016	December 31, 2016
Insurance contract liabilities	1000	1100
Investment contract liabilities	500	500
Contributed Surplus		100
Fair value of the hedge before rebalancing (Hedge notional)	(100)	(50)
Hedge effectiveness		50%
Retained earnings		600

Income tax rate = 27%.

- (a) (4 points) Construct the income statement for the 4th quarter of 2016. Show all work.
- (b) (2 points) Calculate the Gross Tier 1 available capital and Asset Default risk (C-1) component as at December 31, 2016. Show all work.
- (c) (2 points) The company decides to sell the assets backing surplus on December 31, 2016. Determine the impact of the sale on the balance sheet and income statement.

8. (10 points)

(a) (3 points) Critique the following statements:

- A. *The emergence of provisions for adverse deviation will impact the difference in an insurer's income according to tax rules and generally accepted accounting principles.*
- B. *Changes to tax legislation effective in 2019 should be accounted for in the determination of the future tax asset/liability.*
- C. *CALM scenario testing will have an explicit impact on the difference in an insurer's income according to tax rules and generally accepted accounting principles.*
- D. *Expected release of provisions for adverse deviation should be taken into account when forecasting taxable income.*
- E. *When considering cash flows from alternative taxes, the taxes on investment income from assets supporting the insurer's capital should not be included.*

(b) (2 points) Compare the treatment of projected tax cash flows resulting from the reversal of underclaims if they are:

- (i) associated with insurance contracts
- (ii) not associated with insurance contracts

8. Continued

(c) (5 points) You are given:

Calendar Year	2016	2017	2018
Benefit cash flow		400	700
Minimum Tax Actuarial Reserve (MTAR)	1,000	500	0
Future Tax Carve-Out (FTCO)	20	XX	0
Taxable income		50	XX

- The earned rate on inforce assets is 0%
- Assets and liabilities are perfectly matched under CALM
- The FTCO is calculated on a gross up basis

- (i) Calculate the prevailing tax rate.
- (ii) Calculate net income in 2017.

Show all work.

9. (9 points) Maggie Life is a Canadian life insurance company.

(a) (3 points) You are given the following for a non-participating and lapse supported life insurance product:

Best estimate liability assuming y% lapse rate	$100,000 * [1+(1-y\%)/2]$
Best estimate lapse rate	5%

- (i) Recommend a lapse margin for adverse deviation (MfAD).
- (ii) Calculate the lapse risk capital under MCCR. Show all work.

(b) (6 points) You are given the following two-year capital projection for Maggie Life:

Profit Centre	Two-Year ROE	Beginning Equity	Ending Equity	Beginning Internal Capital Targets (Plan)	Beginning Internal Capital Targets (Stressed)	Beginning Supervisory Capital Targets
X	7%	50	58	40	45	30
Y	12%	40	52	35	50	28
Z	15%	20	25	25	32	28
Total Company	11%	110	135	100	127	86

- Weighted Average Cost of Capital (WACC) = 12%

- (i) Describe the differences between the supervisory target ratio according to the MCCR guideline and the internal target ratio calculated using ORSA.
- (ii) Critique the proposed equity allocation among profit centres with respect to the WACC and ROE.
- (iii) Critique the proposed equity allocations among profit centres with respect to the Internal Capital Targets and Supervisory Capital Targets.

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- 10.** (13 points) Jazz Life is currently selling a Term-to-100 (T100) life insurance product with the following valuation assumptions:

Policy Year	Lapse Rate
1	6.0%
2	5.0%
3	4.0%
4	3.0%
5	2.0%
6-10	1.5%
11-25	1.0%
26+	0.5%

- Mortality is 80% of CIA 97-04 table
- Maintenance Expenses are 30 per policy, inflated at 2% per year.

You are developing a Universal Life (UL) product for Jazz Life with the following features:

- Flexible premiums
- High surrender charges for the first 10 years, none thereafter
- A small persistency bonus payable each year starting in year 15
- Level cost of insurance (COI) rates
- A range of investment options will be available, including guaranteed interest and equity-linked funds.

The product will not be reinsured.

- (a) (3 points) Recommend modifications to the T100 valuation assumptions to be used for the new UL product. Justify your answer.
- (b) (4 points) Describe additional non-economic assumptions that will be needed for the new UL product.

10. Continued

- (c) (4 points) You are given the following information regarding the mortality for a policy issued to a 50 year old:

Attained Age	Mortality Rate per 1000 (q_x)	Curtate Expectation of Life (e_x)
50	0.9	47
51	1.3	46
52	1.6	45
53	2.0	44
54	2.4	43
55	2.9	42

- The mortality improvement assumption, which grades between 0% and 2% based on attained age, is the same as the prescribed mortality improvement scale from the Actuarial Standards Board (ASB).
- The mortality MfAD is set at the midpoint of the low and high margins specified in the Canadian Standards of Practice.

Calculate the padded mortality rate to apply during the 5th policy year. Show all work.

- (d) (2 points)
- (i) List the advantages of using population data when developing mortality improvement rates.
 - (ii) List the advantages of using insurance data when developing mortality improvement rates.
 - (iii) Describe any specific considerations for setting margins on mortality improvement rates for the T100 and UL products above.

****END OF EXAMINATION****
Afternoon Session

USE THIS PAGE FOR YOUR SCRATCH WORK