
SOCIETY OF ACTUARIES
Individual Life & Annuities Canada – Company/Sponsor Perspective

Exam CSP-IC

AFTERNOON SESSION

Date: Friday, April 30, 2010

Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 7 questions numbered 8 through 14 for a total of 60 points. The points for each question are indicated at the beginning of the question. Question 12 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.
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 since 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 CSP-IC.

Written-Answer Instructions

1. Write your candidate number at the top of each sheet. Your name must not appear.
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.

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 ****
Afternoon Session
Beginning with Question 8

- 8.** (5 points) Worldwide Insurance, a U.S. company, has entered the Canadian insurance market by acquiring a large Canadian block of business.
- (a) (2 points) The U.S. valuation actuary, who has no Canadian working experience, has signed the following opinion to be submitted to OSFI as part of the MCCSR filing.

Evaluate the appropriateness of this signed actuarial opinion.

“I have reviewed the calculation of the Minimum Continuing Capital and Surplus Requirement ratios of Worldwide Insurance as at 31st December, 2009. The policy liability is being modeled using a simple spreadsheet valuation model because seriatim records are not available at this time. The calculations of the components of the required and available capital have been determined in accordance with the regulatory guidelines. In my opinion, even with the approximation used in the policy liability calculation, the capital is at a sufficient level due to the inherent conservatism in the MCCSR factors.”

- (b) (3 points) Recommend controls related to the audit of policy liabilities that Worldwide should implement in order to satisfy the requirements of AuG-43: Audit of Policy Liabilities of Insurance Companies.

9. (10 points) The Chief Financial Officer of your company, ZYX Life Insurance Company, has asked for a report that compares several capital frameworks.
- (a) (3 points) Outline the significant elements of the Solvency II risk capital approach.
 - (b) (4 points) Assess the appropriateness of ZYX using the following capital approaches for measuring economic capital.
 - (i) MCCSR approach
 - (ii) Solvency IIJustify your answer.
 - (c) (3 points) ZYX has a large block of recently issued single premium immediate annuity policies. Explain how the risk of a long-term mortality improvement trend might be reflected in:
 - (i) MCCSR
 - (ii) Solvency II risk capital
 - (iii) Economic capital using the “Cash Balance” method

- 10.** (7 points) Globalized is a diversified life insurance company with operations in many countries and has been negatively impacted by the recession.
- (a) (3 points) Evaluate the validity of the following statements made by Globalized's CEO. Justify your response.
- (i) "As long as we have sufficient capital backed by quality assets we should be all right."
 - (ii) "Models have taken a lot of the judgment out of setting adequate reserves."
 - (iii) "This is not the right time for the industry to move to market-consistent valuation."
- (b) (3 points) Globalized has been planning to implement Enterprise Risk Management (ERM) in the organization.
- (i) Because of the recession, Globalized is now thinking of limiting the implementation of ERM to branches in those countries considered more risky.

Evaluate the appropriateness of this approach.
 - (ii) Explain why the emerging environment of increasingly sophisticated markets and distribution systems makes ERM important in the design and pricing of new products.
- (c) (1 point) Explain the responsibilities of the appointed actuary under the Canadian Institute of Actuaries Consolidated Standards of Practice if she finds serious problems in the ERM implementation.

11. (8 points) LNZ Direct uses YRT reinsurance for their Term to 100 product, with 90% of a level net amount at risk ceded.

LNZ Direct calculates CALM reserves semi-annually and uses a seriatim discount calculator as an approximation to CALM for its monthly reporting.

You are given the following results for various mortality and discount rate tests:

| Test | Assumptions | | | Net Reserve | |
|------|-----------------------------|----------------|--------------------------------|-------------------|---------------------|
| | Best Estimate Mortality | Mortality MfAD | Discount Rate | No Mortality MfAD | With Mortality MfAD |
| 1 | No mortality improvement | +10/ e_x | 4.41% | (620) | (678) |
| 2 | No mortality improvement | -10/ e_x | 4.41% | (620) | (558) |
| 3 | No mortality improvement | +10/ e_x | 6% grading to 4% over 20 years | (624) | (682) |
| 4 | No mortality improvement | -10/ e_x | 6% grading to 4% over 20 years | (624) | (563) |
| 5 | 1% improvement for 10 years | +10/ e_x | 4.41% | (298) | (678) |
| 6 | 1% improvement for 10 years | -10/ e_x | 4.41% | (298) | (224) |
| 7 | 1% improvement for 10 years | +10/ e_x | 6% grading to 4% over 20 years | (306) | (682) |
| 8 | 1% improvement for 10 years | -10/ e_x | 6% grading to 4% over 20 years | (306) | (233) |

- (a) (2 points) Identify considerations for setting the margins for adverse deviations (MfAD) for mortality.
- (b) (2 points) Identify approaches for setting the discount rate needed for approximating CALM reserves.
- (c) (4 points)
- (i) Interpret the reserve results you are seeing in the above table, with respect to each assumption:
 - Best estimate mortality
 - Mortality MfAD
 - Discount rate
 - (ii) Recommend appropriate mortality basis and discount rate assumptions. Justify your answer.

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Question 12 pertains to the Case Study.
Each question should be answered independently.

12. (12 points) You are the Appointed Actuary of Peanut, the Canadian subsidiary of M&M Global Insurance. Peanut sells segregated funds with the following features:

- Funds available are money market fund, bond fund, US equity fund and Canadian equity fund
- Management expense ratios (MERs) are a percentage of the account value
- Guaranteed minimum death benefit (GMDB) returns the maximum of 100% of deposits (net of withdrawals) or the account value upon death
- Guaranteed minimum maturity benefit (GMMB) returns the maximum of 90% of deposits (net of withdrawals) or the account value after 10 years
- Surrender charges apply in the first 5 years
- Automatic and elective resets are available

You are given the December 2007 financial statements and the preliminary financial statements for 2008 for Peanut. The reserves are set at the CTE 75 level.

Income Statement

| | Reported December 2007 | Preliminary December 2008 |
|------------------------------|---------------------------|------------------------------|
| Segregated fund MERs | 8,500 | 5,700 |
| Surrender charges | 5 | 380 |
| Commission & expenses | 3,400 | 1,500 |
| GMDB payment | 880 | 2,200 |
| GMMB payment | 65 | 1,250 |
| Change in policy liabilities | 2,500 | 4,345 |
| Profit/Loss | 1,660 | (3,215) |

Balance Sheet

| | Reported December 2007 | Preliminary December 2008 |
|-------------------------------|---------------------------|------------------------------|
| <u>Assets</u> | | |
| General fund | 29,904 | 31,034 |
| Segregated fund | 388,000 | 285,000 |
| <u>Liabilities</u> | | |
| Segregated fund account value | 388,000 | 285,000 |
| Policy liabilities | 14,304 | 18,649 |
| Available Capital | 15,600 | 12,386 |

12. Continued

- (a) (6 points) Peanut experienced the economic conditions discussed in pages 3 and 4 of the case study.

Assess the change in each of the income statement items from the December 2007 to the preliminary December 2008 results.

Show all work.

- (b) (6 points) You are given the following additional information:

- The policy liabilities and required capital for the guarantees are determined using an OSFI approved stochastic model.
- The December 2007 MCCR ratio is 178%.
- The company's minimum target MCCR ratio for Peanut is 160%.
- When the MCCR ratio falls below 160%, M&M will transfer capital to Peanut
- Profit from each year is included in Available Capital before the MCCR ratio is determined.
- The stochastic model provided the following results for the guarantees:

| | December 2007 | December 2008 |
|----------|---------------|---------------|
| CTE (0) | 8,000 | 9,500 |
| CTE (60) | 11,392 | 14,467 |
| CTE (65) | 12,168 | 15,504 |
| CTE (70) | 13,088 | 17,053 |
| CTE (75) | 14,304 | 18,649 |
| CTE (80) | 15,143 | 20,166 |
| CTE (85) | 16,336 | 21,708 |
| CTE (90) | 17,733 | 24,172 |
| CTE (95) | 23,072 | 28,020 |
| CTE (99) | 26,048 | 40,489 |

Recommend a CTE level for the policy liabilities that meets the following conditions:

- complies with the Consolidated Standards of Practice,
- minimizes any capital infusion, and
- satisfies the company's target minimum.

Justify your answer.

13. (8 points) KSV Life, a Canadian company, has been selling Term to 100 for over 20 years. The company plans to launch a new Universal Life (UL) product next year with the following features:

- Level cost of insurance
- Minimum premium requirement per year to keep the policy inforce
- Death Benefit is face amount plus account value
- Partial withdrawals are allowed
- There are 3 index linked funds and 2 fixed income funds
- Surrender charges apply for the first 10 policy years
- Persistency bonus starting on the 15th policy anniversary

You are preparing the valuation model for this UL product.

(a) (6 points) The following assumptions are used for the existing Term-to-100 product.

| Assumption | Best Estimate | MfAD |
|-------------------|--|---|
| Mortality | 100% of company experience for the first 15 years, blended to industry mortality table in the ultimate durations | $3.75/e_x$ |
| Lapse | 100% of company experience | 5% |
| Interest Rate | Base interest rate scenario under CALM | The difference between reported policy liabilities and policy liability generated by the base scenario. |

Recommend mortality, lapse, and interest valuation assumptions for this new product. Justify your answer.

(b) (2 points) Identify the policyholder behaviour assumptions that you would need to consider in the valuation of the UL product.

14. (10 points)

- (a) (1 point) List the conditions in OSFI Guideline D-10 under which a life insurer may use the Fair Value Option (FVO) for valuing assets.
- (b) (3 points) Evaluate the use of the FVO for the following asset classes:
 - (i) Private placement bonds
 - (ii) Equities traded on the Toronto Stock Exchange
- (c) (2 points) Explain the implications of using the FVO for valuing assets under CALM.
- (d) (4 points) A Canadian life insurance company backs its insurance liabilities with the following bond portfolio:

(in 000's)

| Category | Value at Year End | | | | 2009 Investment Income |
|--------------------|-------------------|--------|------------|--------|------------------------|
| | Amortized Cost | | Fair value | | |
| | 2009 | 2008 | 2009 | 2008 | |
| Held to maturity | 1,050 | 1,055 | 1,210 | 1,030 | 5 |
| Held for trading | 26,500 | 26,800 | 27,300 | 26,900 | 65 |
| Available for sale | 75,300 | 75,100 | 77,350 | 76,000 | 250 |

Calculate the following for 2009:

- (i) Net Income
- (ii) Other Comprehensive Income

Show all work.

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

