

Exam CSP-IU

AFTERNOON SESSION

Date: Friday, May 1, 2009

Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 7 questions numbered 10 through 16 for a total of 60 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.
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-IU.

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.

****BEGINNING OF EXAMINATION****
AFTERNOON SESSION

10. (7 points) For a life annuity with a three year certain period, you are given:

Issue Age: 75
Premium: 150,000
Acquisition Expense: 5,000
Maintenance Expense: 0
Payment: 10,000 annually, first payment made one year after issue
Valuation Interest rate: 5.0%
Mortality: Assumed to improve by 1.0% per year
 ${}_2|a_{\overline{[75]+1}}$ 68,329 (including projected mortality improvements)

Current year mortality rates are:

Age (x)	$q_{[x]}$
75	0.020
76	0.025
77	0.030
78	0.035

Assume:

- This is an insurance contract.
 - Policy benefits are paid for 20 years.
- (a) Determine the U.S. Statutory Reserves for durations zero through four.
- (b) Calculate the deferred profit liability for the first policy year under U.S. GAAP, assuming emerging experience is the same as the valuation assumption. Show all work.

11. (8 points) ABC Insurance is a stock company.

You are given:

- Tier 1 capital: High-risk capital, Value-at-Risk
- Tier 2 capital: Low-risk capital, needed to maintain the ratings
- Tier 3 capital: Excess or Shortage capital, not allocated by business unit

Business Unit	After-tax Net Income	Tier 1 Capital	Tier 2 Capital	Tier 3 Capital
Life	14	93	50	0
Annuities	5	25	20	0
Investment Management	2	7	5	0

ROE requirement (business unit and total company level)	15% after-tax
Tier 2 Capital Charge	2%
Interest on Tier 2 Capital	5%
After-tax cost of Debt	8%

- (a) Explain the consequences of using debt, equity or reinsurance to raise capital.
- (b) ABC has decided to raise capital and is considering two capital structures:
- 20% debt, 80% equity
 - 50% debt, 50% equity

Recommend the preferred level of debt capital. Show all work.

- (c) ABC uses the Value at Risk method to allocate capital to each business line.

Evaluate the current allocation among these three business units.

- 12.** (12 points) You are given the following information for a 3 Year Level Benefit Non-Participating Term product:

Death Benefit	100,000
Gross Premium	2,000
Annual Policy Fee	500
Valuation interest rate	4.0%
Present Value of Future Benefits at issue	2,048

- Issued to a 57 year old
- Premiums are payable for 2 years
- Premiums are payable at the beginning of each policy year
- Deaths occur at the end of the policy year
- Assumed valuation mortality:

Age (x)	q_x
57	0.00683
58	0.00742
59	0.00810

- (a) (4 points) Compare GAAP accounting treatment of limited-payment contracts to contracts where premiums are payable over the entire benefit period.
- (b) (8 points) Calculate the reserves for year 1 and year 2 using:
- Net Level Premium method;
 - Full Preliminary Term method.

13. (7 points) Direct Co is seeking a coinsurance treaty proposal, and has provided Re Co with the following statutory income statement per thousand of gross premium.

	Direct Co Before Reinsurance	
	Year 1	Year 2
Gross Premium	1,000	1,000
<u>Ceded Premium</u>	<u>0</u>	<u>0</u>
Net Premium	1,000	1,000
Investment Income on Surplus	0	(5)
Investment Income on Reserves	0	85
Reinsurance Allowance	<u>0</u>	<u>0</u>
Total Revenue	1,000	1,080
Gross Reserve Increase	850	900
<u>Ceded Reserve Increase</u>	<u>0</u>	<u>0</u>
Net Reserve Increase	850	900
Claims and Surrenders	<u>0</u>	<u>0</u>
Total Benefits	850	900
First Year Expenses	150	0
All Year Expenses	<u>50</u>	<u>50</u>
Total Expenses	200	50
Gain (Loss) from Operations	(50)	130

Assume:

- Investment income is earned at a rate of 10%.
- Investment income is earned on assets present at the beginning of the year and not on cash flows.
- Policy and reinsurance premiums are paid annually at the beginning of the year.
- Expenses are incurred at the beginning of the year.
- No taxes.

Direct Co requirements:

- Surplus cannot drop below the initial level of 0.
- Coinsurance must not generate a Year 1 loss from operations.

Re Co requirements on reinsurance treaties:

- Surplus cannot drop below the initial level of 500.
- Minimum coinsurance percentage is 20%.
- Reinsurance allowance must not exceed 15% of direct company gross premium.
- There are no reinsurance expenses or commissions other than the reinsurance allowance.

13. Continued

- (a) Determine the range of coinsurance percentages that meet the requirements of both companies.
- (b) Restate Direct Co's Year 1 income statement assuming a coinsurance percentage of 50%.
- (c) Recommend actions Re Co might take to manage their exposure to the insolvency risk of Direct Co.

14. (6 points) You are given the following projected product cash flows:

Year	Premium	Maintenance Expenses	Benefits
2009	6,000	400	4,000
2010	6,000	400	4,500
2011	6,000	400	5,000
2012	6,000	400	5,500
2013	6,000	400	6,000

Present value of the projected cash flows discounted at the valuation rate of 5% are:

End of Year	Premium	Maintenance Expenses	Benefits
2008	27,276	1,732	21,436
2009	22,339	1,418	18,508
2010	17,156	1,089	14,934
2011	11,714	744	10,680
2012	6,000	381	5,714

Assume:

- Premiums are paid at the beginning of the year.
- Benefits and maintenance expenses are paid at the end of the year.
- 2009 actual experience is:

Maintenance expenses	250
Benefits paid	4,300
Interest earned	5.25%

- (a) (2 points) Identify the benefits of a source of earnings (SOE), and explain the challenges of presenting a SOE to an external audience.
- (b) (4 points) Construct, on a U.S. GAAP basis, a pre-tax SOE for 2009 and a projected SOE for 2010. Show all work.

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15. (10 points) Executive Life selected a one-year mark-to-market approach at 1% Value at Risk (VaR) to calculate Economic Capital.

(a) (3 points) Compare the risks covered by statutory capital and Economic Capital for the following categories:

- Underwriting Risk
- Credit Risk
- Market Risk
- Operational Risk

(b) (5 points) You are given:

- Non-adjustable, non-par, individual life insurance. There are no reinsurance arrangements for these products.

(millions)

Total face amount	800
Total reserve	450
Projected total death claims	45

- RBC Factors/Amounts

Net Amount At Risk (millions)	RBC C-2 Factors
First 500	0.0023
Next 4,500	0.0015
Next 20,000	0.0012
Over 25,000	0.0009

C-1 factor	0.0080
C-3 Amount	5.0000
C-4 factor	0.0308
Covariance Adjustment Amount	1.5000

- Economic capital distribution for mortality can be approximated by a Normal distribution with a mean of 11 and a standard deviation of 6.5.

15. Continued

- Standard Normal (z) table:

P	Z
0.950	1.645
0.975	1.960
0.990	2.326
0.999	3.090

Calculate the capital requirement under:

- (i) RBC basis;
 - (ii) Economic Capital.
- (c) (1 point) Recommend targets other than the one-year mark-to-market at 1% VaR approach.
- (d) (1 point) Outline the modeling issues you may encounter in calculating Economic Capital.

16. (10 points) ABC is a U.S. insurance company that sells term life and variable annuities.

- (a) Explain the importance of the risk margin and considerations in its determination under:
- (i) FAS 157;
 - (ii) International Accounting Standards.
- (b) Outline the steps to quantify the components of a framework for establishing minimum capital standards under fair value reporting.
- (c) You are given the following results of a simulation of the impact of mortality variability on a portfolio of 5-year term insurance policies:

Year	Expected Mortality	Worst Case Mortality (99.5 th Percentile)
1	8.3	10.1
2	7.7	9.3
3	6.8	8.2
4	5.8	7.0
5	4.2	5.1

Assume:

- Risk free yield curve is flat at 5% per year
- No interest rate volatility over the 5-year period
- Annual cost of capital is 6%

Calculate the market value margin under the cost of capital method. Show all work.

****END OF EXAMINATION****
AFTERNOON SESSION