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

Exam CSP-IU

AFTERNOON SESSION

Date: Friday, November 4, 2011
Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 9 questions numbered 9 through 17 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.

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

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Exam CSP-IU Front Cover

****BEGINNING OF EXAMINATION****
Afternoon Session
Beginning with Question 9

9. (*5 points*) An intern at your company is creating a model to perform asset adequacy analysis on the company's life and annuity businesses.

You are given the following information about the model:

- Policies are grouped by issue age, gender, underwriting class, and smoker status.
- Model results at $t = 0$ are compared to the company's balance sheet.
- Initial assets equal the initial liabilities.

(a) (*2 points*) Explain the modeling approach with respect to:

- Model simplification
- Model validation

(b) (*1 point*) List challenges of cash flow matching as an Asset Liability Management technique.

(c) (*2 points*) Interest rates fall below those guaranteed in the company's life and annuity contracts.

Identify modeling assumptions that may need to change due to this interest rate change.

10. (*6 points*) You are a pricing actuary for a reinsurance company. A direct company for which your company has had a reinsurance treaty for a number of years wants to negotiate a new treaty for future Universal Life (UL) policy issues. The direct company is selling an innovative UL product that has increasing market share. It is seeking reinsurance for capital relief.

The following summary information is available for the direct company:

	2007	2008	2009	2010
Assets	125	150	175	200
Liabilities	80	120	160	195
Surplus	45	30	15	5

The direct company has requested a reinsurance quote with the following treaty parameters:

- Funds Withheld Coinsurance
- 99% Coinsurance limit
- Automatic basis of reinsurance
- Bulk-administration on an annual basis
- Reinsurance premiums are guaranteed for the life of the reinsured policies

(a) (*2 points*) Evaluate the proposed treaty parameters from the perspective of the reinsurer.

(b) (*4 points*) Propose changes and additions to the requested treaty parameters that reduce the risk to the reinsurer of entering into this reinsurance transaction.

11. (*8 points*) You are a valuation actuary responsible for a variable annuity with an SOP 03-1 benefit rider. All policies will contractually lapse at the end of the 3rd policy year.

Assume:

- Discount Rate = 6.00%
- Benefit Ratio = 11.50%
- All cash flows occur at end of year

(a) (*6 points*) The best estimate experience when product was priced is shown below:

Time	Gross Assessments	Capitalized Expenses	Maintenance Expenses	Benefits	Unadjusted Estimate Gross Profits	Benefit Liability Increase	Estimated Gross Profits
0	0.00	1,606.46	0.00	0.00	0.00	0.00	0.00
1	1,561.00	0.00	30.00	0.00			
2	1,424.00	0.00	26.00	127.00			
3	1,184.00	0.00	23.00	376.83			
PV ($t = 0$)	3,734.11	1,606.46	70.75	429.42			

Calculate the following items for end of policy year 2.

(i) Benefit Liability Increase

(ii) DAC Balance

(b) (*2 points*) Assume that the best estimate gross assessments at time 2 and 3 increase compared to their initial best estimate experience with no change in rider benefits.

Explain the qualitative effect of this change on the following items at the end of policy year 2:

(i) Benefit Ratio

(ii) Benefit Liability

(iii) DAC Amortization Ratio

(iv) DAC Balance

12. (*6 points*)

(a) *(3 points*) The basic purpose of Risk Based Capital (RBC) as envisioned by regulators is to provide a metric for identifying weakly capitalized companies.

(i) List the guiding principles that were important in the design of the original RBC framework.

(ii) Assess how the RBC framework might be modified under the NAIC's Solvency Modernization Initiative.

(b) (*3 points*) You are developing interest rate risk economic capital for a company that sells universal life products. Economic capital is determined as follows:

- Modeling done stochastically
- One-year mark-to-market approach is used
- Risk tolerance level is determined at VaR (99.5)

Evaluate which aspects of the product and investments could cause interest rate risk economic capital to be higher than RBC.

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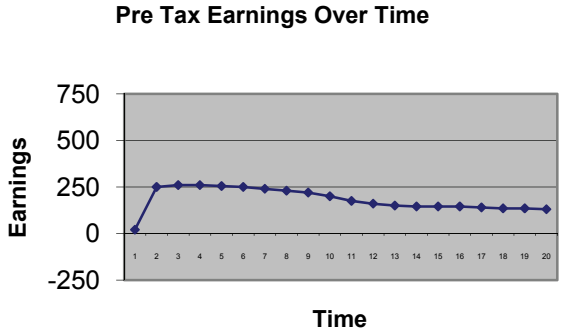
13. (*4 points*) The graphs below illustrate pre-tax earnings over time for a single issue year of non-par whole life business under various financial measurement bases.

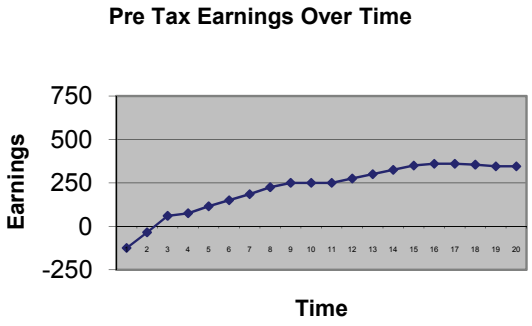
Assume:

- Actual experience is equal to expected experience in each graph.
- Graphs depict first 20 years of earnings only.

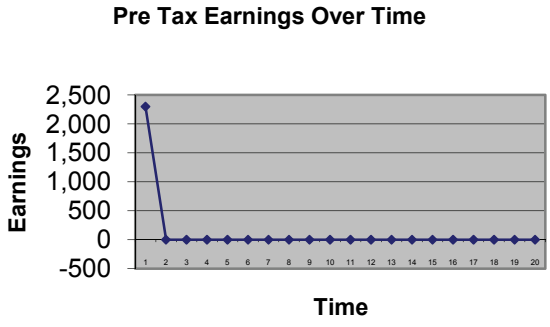
Measurement Basis A:



Measurement Basis B:



Measurement Basis C:



13. Continued

Based on the earnings patterns shown in each graph:

(a) (*1 point*) Determine the most likely financial measurement basis used for each of the three graphs.

(b) (*3 points*) Explain the aspects of the financial measurement bases that lead to the earnings patterns shown in each graph.

14. (*11 points*) Lifelong is a U.S. life insurance company whose sole product is single premium payout annuity contracts.

You are given the following information about the product:

- All contracts are single life contracts that provide fixed, guaranteed annual benefits.
- Benefits commence one year after purchase and continue until the annuitant dies.
- Lifelong issues a contract provided the applicant submits the single premium along with proof of the annuitant's age and gender. There are no other issue or underwriting restrictions.
- Lifelong began selling the product 5 years ago and has never repriced.

The annual benefit is determined as follows:

$$\text{Annual Benefit} = \left\{\left[\left(\text{Single Premium}\right)*\left(90\%\right)\right]/a_x\right\} - 55$$

where a_x is the present value of annual payments of 1 commencing one year from issue if the annuitant is still alive and continuing until the annuitant dies, calculated using the following assumptions:

- Annual interest rate: 4%
- Mortality rate: 90% of Annuity 2000 Table

Assume:

- Acquisition costs total 10% of premium and are not deferred.
- Benefit reserves are calculated using the following assumptions:
  - Annual interest rate: 4%
  - Mortality rates: 90% of Annuity 2000 Table
- In lieu of holding a separate maintenance expense reserve, maintenance expenses are included in the benefit reserves.
- There is no deferred profit liability.
- Best estimate assumptions at the time of pricing were as follows:
  - Annual earned interest rate: 6%
  - Experience mortality: 100% of Annuity 2000 Table
  - Annual maintenance experience: 50 per policy
- There are no income taxes.

14. Continued

(a) (*2 points*) Identify the margins that Lifelong has built into its benefit reserves and the risks that might prevent Lifelong from fully realizing those margins, relative to best estimate assumptions in effect at the time of pricing.

(b) (*3 points*) Explain, using U.S. GAAP:

(i) How the concept of loss recognition applies to Lifelong.

(ii) How Lifelong could use a gross premium valuation to test for loss recognition.

(c) (*2 points*) Once per year, Lifelong's valuation actuary uses a gross premium valuation to test for loss recognition. The test has always been done in the aggregate. Prior to the current year, the test had indicated that Lifelong's payout contracts were not in loss recognition.

Results for the current year test are as follows:

- Present value of benefits under current best estimate assumptions = 590
- Present value of maintenance expenses under current best estimate assumptions = 20
- Benefit reserve = 600

(i) Determine whether or not Lifelong is in loss recognition for the current year. Show all work.

(ii) Explain any changes that Lifelong would need to make to its benefit reserve for the current year, based on the results above.

(d) (*4 points*) When testing for loss recognition, Lifelong's valuation actuary sets the best estimate interest rate assumption by forecasting what Lifelong's asset portfolio will earn in the future, assuming current interest rates remain unchanged. Current interest rates are at historic lows, causing Lifelong's chief actuary to question whether or not the valuation actuary's assumption is really a best estimate.

Recommend ways that the valuation actuary might alter the assumption to address the chief actuary's concern, including the impact that this alteration would have on the loss recognition test, for the current year.

15. (*6 points*)

(a) (*4 points*) Explain whether the following types of insurance contracts are subject to SFAS 133. Justify your answer.

(i) Synthetic GIC

(ii) Traditional Variable Annuity without any Guarantees

(iii) Variable Immediate Annuity with a Guaranteed Minimum Payment

(iv) Market Value Annuity

(b) (*2 points*) A company is considering selling a "Currency Protector" fixed annuity to U.S. residents with premiums and surrender amounts paid in U.S. dollars. Surrender values are increased if the Euro has outperformed the dollar since policy issue.

Assess whether this type of insurance contract is subject to SFAS 133. Justify your answer.

16. (*7 points*)

(a) (*2 points*) List key differences between:

- GAAP income and statutory income
- Taxable income and statutory income

(b) (*2 points*) Determine whether each of the following are classified as temporary or permanent differences under SFAS 109. Justify your answer.

(i) Bond discount accrual

(ii) Policyholder dividend reserves

(iii) Tax-exempt interest

(iv) Post-retirement liability benefits

(c) (*3 points*) Assume the following:

- Deferred tax liability at the end of year 2009 = 280
- GAAP Income for year 2010 = 850
- Taxable Income for year 2010 = 640
- Statutory Income for year 2010 = 550
- The enacted tax rate for the 2010 and 2011 is 20%
- There are no permanent differences in the tax calculation
- Valuation allowance = 50

Calculate the net deferred tax asset or liability under SFAS 109 at end of year 2010. Show all work.

17. (*7 points*) LNZ Life, a U.S. company, introduced a variable annuity product in 2010 which provides minimum guaranteed death benefits and minimum guaranteed accumulation benefits. Currently, LNZ's reserves are calculated under SFAS 157.

(a) (*5 points*) LNZ purchased derivatives in 2010 to hedge the risk of falling equity markets.

(i) Review the criteria to have these derivatives qualify as hedges and outline the resulting accounting treatment under SFAS 133.

(ii) Distinguish the main differences in reporting for both guaranteed benefits and hedging derivatives under SFAS 133 as modified by SFAS 157.

(b) (*2 points*) The rating agencies have decided to upgrade LNZ's credit rating as part of an upgrade for the insurance sector as a whole.

Assess the impact on reserves. Justify your answer.

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

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