
SOCIETY OF ACTUARIES
Life Finance & Valuation – U.S.

Exam ILALFVU

AFTERNOON SESSION

Date: Thursday, April 30, 2015

Time: 1:30 p.m. – 3:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 5 questions numbered 8 through 12 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 ILALFVU.
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
Beginning with Question 8

- 8.** (8 points) You are the GAAP valuation actuary for a U.S. life insurance company whose only product line consists of individual fixed annuities.
- (a) (3 points) Describe the expense categories stipulated by U.S. GAAP and their impact on the calculation of the DAC asset.
 - (b) (2 points) Your company is developing a new deferred annuity product with a policyholder persistency bonus feature. Describe how this feature would impact the following:
 - (i) Estimated gross profit (EGP)
 - (ii) k-factor
 - (iii) DAC amortization
 - (c) (3 points) Describe the impact on the DAC asset with respect to SOP 05-1 for each of the following scenarios:
 - (i) A policyholder persistency bonus is added to in-force deferred annuity policies.
 - (ii) An upgrade to the administration system requires that inforce policies be treated as if they are cancelled and reissued on the new system.
 - (iii) A group of policyholders convert their deferred annuity policies to fixed payout annuities.

9. (7 points) ABC Life Insurance Company currently offers a 5-year term life insurance product with level benefits and nonlevel premiums. Statutory reserves are determined in accordance with the *Valuation of Life Insurance Policies Model Regulation*.

(a) (2 points) Explain why the NAIC adopted the *Valuation of Life Insurance Policies Model Regulation*.

(b) (5 points) Assume the following for a policy issued to a 45-year-old female:

- Face amount is 1,000,000
- Annual premium
 - Policy years 1 – 3: 3,500
 - Policy years 4 – 5: 5,000
- Premium is paid at the beginning of the policy year
- Deaths occur at the end of the policy year
- No cash value
- The company uses the same valuation mortality table and interest rate for basic reserves and deficiency reserves
- Valuation mortality rates

$1000q_{45}$	3.00
$1000q_{46}$	3.45
$1000q_{47}$	3.97
$1000q_{48}$	4.57
$1000q_{49}$	5.26

- Valuation net single premium factors

$1000A_{46:\overline{4} }^1$	17.14
$1000A_{46:\overline{2} }^1$	7.41
$1000A_{47:\overline{3} }^1$	13.74
$1000A_{47:\overline{1} }^1$	3.97
$1000A_{48:\overline{2} }^1$	9.81

9. Continued

- Valuation annuity factors

$\ddot{a}_{46:\overline{4} }$	3.98
$\ddot{a}_{46:\overline{2} }$	2.00
$\ddot{a}_{47:\overline{3} }$	2.99
$\ddot{a}_{48:\overline{2} }$	2.00

- (4 points) Calculate the statutory basic and deficiency reserves at the end of policy year 2. Show all work.
- (1 point) Explain how different valuation mortality assumptions might be used to reduce deficiency reserves for term policies.

- 10.** (10 points) SLC Life Insurance Company in the U.S. has developed a non-participating 3-year term life insurance product. You are given:

Policy Year	1	2	3
Gross premiums per 1000 of insurance	1.32	1.35	1.39
Commissions as % of premium	50%	5%	5%
Premium tax as % of premium	2%	2%	2%
Maintenance expense per policy	30	30	30

GAAP assumptions:

Policy Year	1	2	3
Valuation interest rate	5%	5%	5%
Mortality per 1000	0.62	0.655	0.695
Lapse rates	15%	5%	100%

In addition:

- Premiums are paid annually at the beginning of the policy year
- Deaths and lapses occur at the end of the policy year, with deaths occurring just before lapses
- Expenses occur at beginning of year

- (a) (5 points) Calculate the following as of December 31, 2014, for a 100,000 policy issued on July 1, 2014:
- (i) Mean GAAP maintenance expense reserves
 - (ii) Mean GAAP DAC asset
- (b) (5 points) For a single 100,000 policy, you are given the following information for the end of its first policy year:

Statutory reserve	0
GAAP benefit reserve	2.16
GAAP maintenance expense reserve	-0.82
DAC asset	45.16

Assume that expected results are consistent with GAAP assumptions.

- (i) Calculate the expected pre-tax statutory income for the first policy year.
- (ii) Calculate the expected pre-tax GAAP income for the first policy year.
- (iii) Describe how the expected earnings emerge over the life of the policy on statutory and GAAP bases.

Show all work.

11. (6 points) LVD Insurance is a U.S. company that sells only term insurance and single premium variable annuity products. You are given:

- The term insurance product has no cash values
- The variable annuity product has the following characteristics:
 - It has an investment account where the policyholder's premium is invested in a mix of stocks and bonds
 - Guaranteed Minimum Death Benefit (GMDB): the policyholder will receive a guaranteed value of 100% of the single premium if death occurs in the first ten years
 - Guaranteed Minimum Maturity Benefit (GMMB): the policyholder will receive a guaranteed value of 100% of the single premium at the tenth anniversary
 - Surrender charge is 10% of the account value in the first 5 years and 0% thereafter
 - GMDB and GMMB guarantee risks are hedged

(a) (1 point) LVD calculates economic capital (EC) for the variable annuity product to recognize the risks of the product and uses a multiple of the Risk Based Capital requirement for the term business.

Critique LVD's economic capital framework. Justify your answer.

(b) (5 points) For the variable annuity product:

- (i) Describe the key risks that LVD should address in the economic capital model.
- (ii) Identify a plausible catastrophic event for each of these key risks.

12. (9 points) DEF Company, a U.S. insurer, plans to reinsure a new universal life product that is expected to sell well. This product will be backed by long term investment grade bonds that DEF has an expert track record of managing. A reinsurer that is not licensed or admitted in DEF's state of domicile has offered to reinsure DEF's universal life business under either a YRT reinsurance treaty or a mod-co reinsurance treaty. You are given:

YRT reinsurance treaty:

- Type of treaty: automatic
- Amount reinsured: 75% of net amount at risk up to 2,000,000
- YRT premiums per 1,000: 75% of 2001 CSO Smoker Mortality Table
- Annual cession fee: 50
- YRT reserve basis: 2001 CSO Smoker Mortality, 3.5% interest

Mod-co reinsurance treaty:

- Type of treaty: automatic
- Amount reinsured: 75% of face amount up to 2,000,000
- Mod-co premiums: 75% of gross premium paid to ceding company
- Expense allowances:

Years	% of Ceded Premium
1	100%
2 – 10	10%
11+	0%

- Premium tax: 2%
- Mod-co interest rate: 6.5%

- (a) (2 points) Describe three possible treaty provisions DEF should include to ensure the reinsurance arrangement provides legitimate risk transfer.
- (b) (7 points) From DEF's perspective:
- (i) (5.5 points) List the advantages and disadvantages of the two reinsurance proposals.
- (ii) (1.5 points) Recommend the treaty DEF should elect. Justify your answer.

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

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