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

Exam ILA LFVU

MORNING SESSION

Date: Thursday, October 31, 2013
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).

    a) The morning session consists of 6 questions numbered 1 through 6.

    b) The afternoon session consists of 5 questions numbered 7 through 11.

    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 ILA LFVU.

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

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****BEGINNING OF EXAMINATION****
Morning Session

1. (*9 points*) A five-year financial plan has been prepared for an insurer's current profit centers. You are given:

5-Year Financial Plan

Profit Center	Return on Equity	Beginning Equity	Ending Equity
A	15%	1,000	4,300
B	13%	2,000	2,500
C	8%	2,000	3,000
D	9%	1,000	800
Total Company	11%	6,000	10,600

- Risk Discount Rate = 12%
- No shareholder dividends

(a) (*4 points*)

(i) Determine whether each profit center creates or destroys embedded/economic value. Show all work.

(ii) Determine whether each profit center generates or consumes free cash flow. Show all work.

(iii) Rank the profit centers in the order of capital allocation to maximize the company's performance. Justify your answer.

(b) (*5 points*) A new profit center (Profit Center E) has been proposed with the following characteristics:

	Policy Year 1	Policy Year 2	Policy Year 3	Policy Year 4+
Profits per unit sold	-20	14	14	0

Year	2012	2013	2014	2015	2016
Expected Sales by Year (units)	100	300	0	0	0

1. Continued

You are given:

- All sales occur at the beginning of the year.
- All profits are calculated at end of the year.
- Profit Center E's equity growth rate = 0%
- There is a projected overhead expense of 1,446 which occurs at the end of 2012.

The following is a partially completed five-year financial plan:

Year	2012	2013	2014	2015	2016
Overhead expenses	-1,446	0	0	0	0
Profits from 2012 sales	-2,000				
Profits from 2013 sales	-				
Annual Profit	-3,446				

(i) Explain whether Profit Center E creates or destroys embedded/economic value. Show all work.

(ii) Explain whether Profit Center E generates or consumes free cash flow. Show all work.

(iii) Determine the maximum allowable 2012 overhead expenses to maintain the company's embedded/economic value when Profit Center E is added. Show all work.

2. (*8 points*)

(a) (*2 points*) You are given the following expected values (in millions) for a current in-force book of business:

Statutory Required Surplus	190
Statutory Benefit Reserve	100
Unamortized U. S. GAAP Deferred Acquisition Cost	7
U.S. GAAP Benefit Reserve	97
After Tax U.S. GAAP Earnings	22

(i) Calculate the after-tax U.S. GAAP return on equity (ROE).

(ii) Explain why the U.S. GAAP ROE may not correspond to the internal rate of return used in pricing.

(b) (*3 points*) Describe the components and uses of an actuarial appraisal.

(c) (*3 points*) Company ABC wishes to acquire Company DEF. You are provided with the following information of Company DEF:

	(in millions)
Solvency Reserves	1,950
Tax reserves	1,775
Pre-tax transaction costs	4
Required Capital	165
Assets transferred	1,860
Tax rate	30%

Calculate the embedded value for DEF as of the acquisition date assuming ABC will establish the same solvency reserves as DEF. Show all work.

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3. (*10 points*) Company BCD is implementing an Economic Capital (EC) framework to better assess the primary risk of its three business units (business's primary risk): investment products (equity), life insurance (mortality) and disability insurance (morbidity).

(a) (*4 points*) List and define the key aspects of Economic Capital.

(b) (*1 point*) Outline considerations for successfully implementing an Economic Capital framework as it pertains to the company's primary risks.

(c) (*2 points*) Its three main businesses are each recommending approaches to the framework, as follows:

		Business Unit Modeled Results		
	Recommendation	**CTE99 One Year**	**VaR 98 Lifetime**	**CTE95 Lifetime**
Investment Products with Equity Guarantees	CTE99 One-Year (stochastic)	950	350	600
Life Insurance	VaR 98 Lifetime (deterministic)	800	950	1200
Disability Insurance	CTE95 Lifetime (stochastic)	575	750	650

Outline the appropriateness of each approach from both a total company and business unit perspective.

(d) (*3 points*) Senior management decides to use the CTE99 One-Year EC calculations for its EC framework. Before communicating this decision to the businesses, the allocation method for post-diversified economic capital is to be finalized. Two allocation methods are being considered:

- Pro-rata: post-diversified EC is allocated proportionately to each business's pre-diversified EC.
- Marginal contribution: post-diversified EC is allocated proportionately to the marginal contribution of each business's EC to the total company's EC. For example, the increase in EC that Life Insurance generates when brought together with the combined post-diversified EC.

3. **Continued**

In addition to the information provided in part (c), you are provided the following information:

	Combined Diversified EC
Investment Products & Life Insurance	1,240
Investment Products & Disability Insurance	1,140
Life Insurance & Disability Insurance	1,280
Total Company	1,700

(i) Calculate the allocated post-diversified EC for each business using both allocation methods.

(ii) Using these results, provide a recommendation that takes into account the factors to consider in developing an EC Program.

4. (*10 points*) CDE Life is a large life insurance company that writes individual life and annuity products.

(a) (*2 points*) CDE Life built a stochastic model to capture the mortality risk in its businesses. Health care report is taking place in CDE's country of domicile and the following aspects are being discussed by their actuaries:

- Due to the health care report, more people are expected to be covered than in the past
- Some jurisdictions may be exempt from the new health care reform law

You are updating the stochastic mortality model to reflect the health care reform. Explain the impact on each of the stochastic mortality factors.

For the remaining parts of this question (i.e. (b), (c), and (d)), you are given the following information:

Sources of Earnings Analysis (in millions)		
	2011	2012
Premium Loading	2.15	2.75
Interest	3.30	4.00
Deaths	1.50	1.80
Persistency & Surrenders	-0.40	0.45
Expenses	-0.50	0.20
Earnings	6.05	9.20

Expected lapse rate of 0.082 and actual lapse rate of 0.090 were used for 2012 in the above analysis.

(b) (*4 points*) The year-end 2012 reserve was incorrectly understated by $1.8M due to a block of policies being erroneously excluded and counted as lapsed without a Cash Surrender Value (CSV).

(i) Describe the impact of the reserve correction on the earnings reported in the Source of Earnings for 2012.

(ii) Calculate the revised actual lapse rate assuming the only impact the reserve error has on the analysis is in gains from persistency & surrenders.

(c) (*2 points*) Describe methods which may be used in the reserve review to help identify any reserve errors.

(d) (*2 points*) List the key points to include in the report to the auditor regarding the error, based on "ASOP #21, Responding to the Auditor," if the reserve error was only found by an independent auditor.

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5. (*12 points*) You are an actuary working in the valuation department at Marmot Life Insurance Company. Marmot Life will soon implement valuation and financial reporting in accordance with U.S. GAAP.

(a) (*3 points*) You are given the task of researching various items the company must consider when implementing U.S. GAAP.

(i) List key considerations when selecting best estimate assumptions, according to ASOP #10.

(ii) State the sources of data that should be considered when developing best estimate assumptions, according to ASOP #10.

(iii) Similar to U.S. statutory reporting, reserves under U.S. GAAP reporting are subject to actuarial review. List the techniques that should be considered when reviewing actuarial reserves.

(b) (*5 points*) Marmot Life sells whole life (WL) and universal life (UL) insurance. You have asked your actuarial students to research how to set valuation assumptions under U.S. GAAP for these two products. After completing their research, the students make the following statements:

(i) Since mortality experience can vary, we should add a provision for adverse deviation (PAD) to the best estimate mortality assumption of both products.

(ii) According to our marketing department, Marmot pays high commissions on the WL product. Since these commissions are a significant expense, a PAD should be added to the commission assumption.

(iii) We must use an interest rate prescribed by law for our WL valuation.

(iv) According to our investment department, the likelihood of various investment return rates for UL business is as follows:

Rate	Likelihood	Resulting Net GAAP Liability
2%	40%	300,000
3%	40%	265,000
4%	20%	230,000

For our UL valuation, we should use the weighted-average rate of 2.8%.

5. Continued

(v) We must be as accurate as possible when setting assumptions for both products because we are only allowed to change our assumptions if there is a loss recognition event.

Critique each of the above statements.

(c) (*4 points*) You have been asked to determine how the UL business should be classified according to SOP 03-1.

(i) Explain the purpose of the mortality/morbidity significance test.

(ii) You are given the following present values for a block of UL policies at issue:

Premiums	1,600,000
Excess Payments	600,000
Cost of Insurance Charges	700,000
Interest Margins	600,000
Expense Charges	650,000

Assume a 25% significance threshold.

Determine if this block has significant mortality risk. Show all work.

6. (*11 points*)

(a) (*6 points*) The following reinsurance arrangements are considered for an inforce block of Whole Life business in an attempt to strengthen the company capital position:

- YRT
- Coinsurance
- Modified coinsurance

(i) Comment on the effectiveness of using the above reinsurance arrangements for capital relief.

(ii) For each of the reinsurance arrangements, discuss the appropriateness of having an Experience Refund feature as part of the terms of the treaty.

(iii) Discuss the advantages and disadvantages of using an un-authorized reinsurer.

(b) (*5 points*) You are given the following:

	Policy Year 1	**Policy Year 2**	**Policy Year 3**
Gross Premiums	1000	950	900
Reinsurance Premiums	200	320	400
Gross Death Benefits	300	420	450
Reinsurance Allowance	50%	10%	10%

Assume:

- 50% YRT reinsurance arrangement with no reserves
- Ceding company expense margin is 10%
- Reinsurer has no expense
- No taxes
- All transactions occur at end of year

Through the experience refund process, the reinsurer will:

- Return 20% of reinsurance gain, and
- Carry forward 20% of reinsurance loss at an interest rate of 4%

Calculate the ceding company's net income before experience refund and the amount of experience refund it will receive from the reinsurer in all years. Show all work.

****END OF EXAMINATION****
Morning Session

USE THIS PAGE FOR YOUR SCRATCH WORK

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