SOCIETY OF ACTUARIES
Exam AFE
Advanced Finance/ERM

Exam AFE

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 6 questions numbered 6 through 11 for a total of 60 points. The points for each question are indicated at the beginning of the question. There are no questions that pertain to the Case Study in the afternoon session.

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 AFE.

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

Tournez le cahier d'examen pour la version française.

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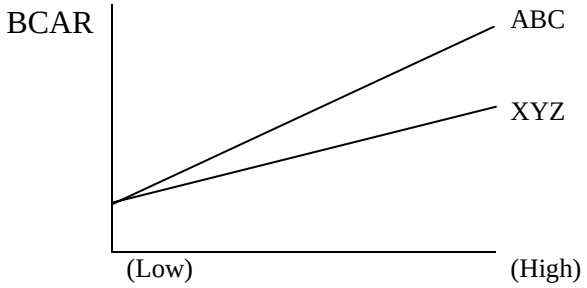
Exam AFE-Front Cover

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

6. (*5 points*) You are a rating analyst at A.M. Best. You will be taking responsibility for rating two companies, ABC and XYZ, which are both medium-sized insurance companies with nearly identical lines of business, assets, and liabilities. You are given the graph below of ABC's and XYZ's Best's Capital Adequacy Ratio (BCAR).



Exposure to Earnings and Capital Volatility

(a) Describe the BCAR tool and identify its strengths and weaknesses.

(b) Indicate the conclusions you can draw regarding the relative risk management practices and the relative A.M. Best ratings for ABC and XYZ based on their respective BCAR graphs.

(c) Describe the key risks A.M. Best expects companies to assess through an effective ERM program.

(d) Identify five future external events and trends that could affect a company's ERM strategy.

7. (*14 points*) You are employed by Marlin Life, a financial services company that sells traditional life products. Financial reporting at Marlin has been based on US GAAP accounting standards. Recently, there has been some concern expressed by senior management at Marlin about having to "report all liabilities at fair value because of SFAS157".

You have compiled information for one of the products sold by Marlin Life, a 3-year single premium term life product that is priced to provide a level 12% return on equity. The product has the following expected cash flows:

3-Year Single Premium Term Life Cash Flows

	$t=0$	$t=1$	$t=2$	$t=3$
Gross Premium	250	-	-	-
Expenses & Commissions	70	5	5	5
Claims	0	60	60	60

(a) (*1 point*) Provide an overview for the financial reporting team explaining the difference between fair value and US GAAP accounting (prior to the introduction of SFAS157) for the products offered by Marlin.

(b) (*1 point*) Explain to senior management the motivation behind SFAS157, including a description of the reporting impact for the types of products sold by Marlin.

(c) (*5 points*) In order to report on a fair value basis, Marlin must decide the following:

(i) a fair value methodology;

(ii) a methodology for the calibration for risk adjustment to the market;

(iii) whether to reflect own credit risk.

For each of (i), (ii), and (iii), explain the decision that needs to be made, identify available alternatives and outline the considerations in making the decision.

7. Continued

(d) (*5 points*) You have decided to use the cost of capital approach in computing fair value and to reflect the market price of risk using the following assumptions:

- The ratio of equity to liabilities is 7%
- There are no taxes
- Return on assets is 5%

Compute the following quantities for the 3-year term product described above:

(i) Fair Value of Liability;

(ii) Net Operating Gain.

Show your work.

(e) (*2 points*) Marlin is also considering using Embedded Value as a basis for senior management performance-based compensation.

Compare the advantages and disadvantages of using an Embedded Value approach as opposed to either GAAP or Fair Value based measures. Recommend one of these three approaches for Marlin.

8. *(14 points)* Adventure Life has recently acquired a bank subsidiary, Adventure Life Bank (ALB). You are the Risk Manager evaluating ALB's risk management practices.

Currently, ALB's derivatives risk management practices include the following:

- ALB has legally enforceable netting arrangements with each of its current counterparties.
- ALB uses a lognormal diffusion process in its Monte Carlo simulation model to estimate its exposures to derivatives.
- ALB imposes a current limit of $10 million at the 99% Potential Future Exposure (PFE) level for each counterparty.

You have gathered the following data on ALB's current derivative holdings:

Trans-action	Counter-party	Derivative Type	Residual Maturity	Notional Amount (millions)	Current Mark-to-Market (millions)	Add-on Factors (%)	Risk Weight
T1	JPO	US Interest Rate Swap	5 years	50	-2.0	0.5	20%
T2	JPO	US Equity Index Put Option	1 year	20	1.1	6.0	20%
T3	MN	USD/CAD FX Swap	2 years	20	2.1	5.0	20%
T4	MN	Emerging Market FX Swap	3 months	10	-1.5	1.0	20%
T5	GT	US Interest Rate Futures	6 months	20	1.7	0.0	50%

(a) Calculate the potential benefit to ALB of having enforceable netting arrangements in its derivative holdings. Show your work.

(b) Other than netting arrangements, identify other counterparty credit risk mitigants that MLB could employ to manage its derivative exposure.

(c) Describe the G-30 best-practice risk management recommendations for end-users of derivatives with respect to each of the following:

(i) Mark-to-Market Process

(ii) Credit Exposure and Aggregation

(iii) Credit Enhancement

8. Continued

(d) Assess the suitability or the shortcomings of ALB's simulation model as compared to other possible models for determining the PFE for each of ALB's derivative positions.

(e) Detail the steps involved in calculating the original BIS (Bank for International Settlements) risk-weighted amounts for derivatives, which ignores netting.

(f) Calculate the original BIS risk-weighted amount for ALB's derivative book, ignoring netting. Show your work.

(g) ALB's derivatives team has proposed another transaction with the counterparty JPO. A simulation of 1000 scenarios performed on total JPO counterparty exposure that included the proposed transaction produced the following partial results:

	1	2	3	4	5	6	7	8	9	10	11	12
Ordered PFEs	15.2	14.5	14.2	13.9	13.6	13.1	12.7	12.0	11.2	10.4	9.9	9.7

Assess whether the proposed transaction with JPO will fall within ALB's stated counterparty risk limits. Show your work.

(h) Identify and explain four major components in the G-12 Recommendations for the Improvement of Counterparty Risk Management Practices that should be incorporated in ALB's derivative risk management practices.

9. (*14 points*) As the product development actuary for Arsenal Life, you are proposing the addition of GMDB and GMAB features to make Arsenal's single premium variable annuity (SPVA) more attractive.

You are given the following additional information:

- The SPVA does not offer a fixed account investment option.
- The GMAB feature allows the annuitant to renew the contract at maturity with a guarantee value equal to 100% of the premium.
- The GMDB feature provides payment of a death benefit equal to 90% of the premium.
- Management Expense Ratio (MER) = 125 bp per annum (applied at the beginning of the year).
- $S_0 = 1$
- Risk free rate = 6%
- σ = 10%
- $\text{BSP}_0(t)$ is the cost at issue of a put option that matures in *t* years
- $\text{BSP}(t) = Ge^{-rt}\Phi(-d_2) - S_0(1-m)^t\,\Phi(-d_1)$

t	$\text{BSP}_0(t)$	$q_{x+[t-1]}$
1	0.001882	0.1
2	0.002976	0.2
3	$\text{BSP}_0(3)$	0.3
4	0.002871	1.0

x	$\Phi(x)$
0.80	0.788
0.85	0.802
0.90	0.816
0.95	0.829
1.00	0.841
1.05	0.853
1.10	0.864
1.15	0.875
1.20	0.885
1.25	0.894
1.30	0.903

x	$\Phi(x)$
1.35	0.911
1.40	0.919
1.45	0.926
1.50	0.933
1.55	0.939
1.60	0.945
1.65	0.951
1.70	0.955
1.75	0.960
1.80	0.964
1.85	0.968

9. Continued

(a) (*5 points*) You are considering the following potential approaches to managing the risks associated with the GMDB and GMAB:

- Funding the benefits using the actuarial method
- Dynamic hedging of the benefits
- Reinsuring the GMDB on a YRT basis
- Coinsuring 50% of the benefits only, where benefit charges and claims are shared proportionately with the reinsurer.

(i) Describe each of the approaches, and evaluate the strengths and weaknesses of each.

(ii) Recommend and justify the use of one of these approaches.

(b) (*2 points*) You are considering incorporating a voluntary reset feature for the GMAB.

(i) Provide arguments for including this feature.

(ii) Explain the effect of this feature on the risk profile and risk management of the SPVA product line.

(c) (*7 points*) Arsenal has decided to proceed with the GMDB only and to price for this benefit using the margin offset approach. Using the assumptions provided, calculate:

(i) $BSP_0(3)$, the value at issue of a three-year put option using Black-Scholes.

(ii) The annual margin offset rate to be assessed to policy holders that compensates Arsenal for offering the GMDB.

Show your work.

10. (*7 points*) You are an analyst for a credit rating agency reporting on Sunshine Life Co. (SLC). SLC has announced plans to demutualize and anticipates increased scrutiny of its corporate governance from shareholders. In response, SLC plans to introduce a number of organizational changes with respect to the Board of Directors and senior management compensation.

(a) Identify common governance strengths that are typically observable in U.S. insurance companies.

(b) Identify the advantages, from a ratings standpoint, of demutualizing.

(c) Outline and explain the key characteristics that should be considered when building a strong Board of Directors.

(d) Provide arguments for and against including each of these individuals on the Board of Directors:

(i) A policyholder representative
(ii) A retired, former senior executive of SLC
(iii) A senior executive of another life insurance company
(iv) An agent representative with an equity stake in the company
(v) An agent representative without an equity stake in the company.

(e) Identify the positive and negative consequences of using significant amounts of stock-based compensation to attract and retain senior management for a demutualized SLC.

11. (*6 points*) You are the head of a newly formed ERM department at Gator Life, a small life insurance company which sells a wide range of insurance products. Gator currently uses factor-based, deterministic methods to model risks. Gator does not have a hedging program and none of Gator's employees have expertise in the use of hedging to control risks.

You have proposed adopting an Economic Capital (EC) framework for the entire company as part of your risk management process.

(a) You have identified three major risks for Gator: equity risk, mortality risk, and credit risk. For each of these risks:

(i) Explain the nature of the risk in a company such as Gator with a broad product line and describe any particular features of the risk that Gator should consider.

(ii) Explain how each of these risks could be modeled within an EC framework.

(b) Two popular EC methodologies are the liability runoff approach and the one-year mark-to-market approach.

(i) Define and compare the advantages and disadvantages of these two approaches.

(ii) Recommend one of these approaches for Gator. Justify your recommendation.

(c) Identify five potential uses for EC in Gator's operations and briefly describe the requirements for implementing EC in each case.

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