SOCIETY OF ACTUARIES
Exam AFE
Advanced Finance/ERM

Exam AFE

MORNING SESSION

Date: Friday, April 27, 2012
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 120 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 60 points).

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

   b) The afternoon session consists of 6 questions numbered 7 through 12.

   The points for each question are indicated at the beginning of the question. Questions 1 - 4 pertain to the Case Study, which is enclosed inside the front cover of this exam booklet.

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

CASE STUDY INSTRUCTIONS

The case study will be used as a basis for some examination questions. Be sure to answer the question asked by referring to the case study. For example, when asked for advantages of a particular plan design to a company referenced in the case study, your response should be limited to that company. Other advantages should not be listed, as they are extraneous to the question and will result in no additional credit. Further, if they conflict with the applicable advantages, no credit will be given.

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

Questions 1-4 pertain to the Case Study.
Each question should be answered independently.

1. (*6 points*) As part of the ERM process, Bill Buck is classifying potential Operational Risk incidents into the following categories:

A. Near miss
B. Expected
C. Unexpected
D. Catastrophic

Bill is reviewing the following hypothetical scenarios:

I. Mark Peacock and several internal auditors resign. As a result, internal controls for Zoolander are weakened. After Zoolander files its Annual Statement, a material error is discovered which results in re-filing costs and regulatory fines amounting to $2.1 million.

II. Kelly downgrades Zoolander after identifying gaps in Zoolander's internal controls. This creates a "run on the bank" due to the downgrade put option on the GIC business.

III. Zoolander's Term Life sales are greatly reduced due to Periwinkle undercutting Zoolander on pricing.

IV. A flu pandemic causes millions in unexpected benefit payments, creating a significant surplus strain for Zoolander.

V. Zoolander's manual disability claims process results in numerous errors which are subsequently caught and fixed before payments are finalized.

(a) (*2 points*) Describe each of the categories A through D.

(b) (*4 points*) For each of the five scenarios:

(i) Indicate whether it is an operational risk incident or not. Justify your response.

(ii) If it is an operational risk incident, categorize it into one of the four categories A through D. Justify your response.

Questions 1-4 pertain to the Case Study.
Each question should be answered independently.

2. (*13 points*) Wanda Fox is preparing an economic capital calculation for the Variable Annuities (VA) line of business (LOB) and has asked for your assistance. She has provided you with the following information:

The market value of liabilities, defined as the expected present value of unhedged cash flows, is $3,000 million for the VA LOB.

Stress tests on the major risks of the VA LOB produce the present values of unhedged cash flows shown in Table 1. Each value for each risk reflects the independent impact of shocking that risk and is displayed in $ millions.

Table 1

	Market	**Insurance**	**Operational**
VaR 99	3,800	3,300	3,100
CTE 99	3,900	3,350	3,125

The correlation matrix for the three sources of risk is shown in Table 2.

Table 2

	Market	**Insurance**	**Operational**
Market	1	0.8	0.1
Insurance	0.8	1	0.1
Operational	0.1	0.1	1

All values in Tables 1 and 2 do not reflect the hedging program.

(a) (*2 points*) Risk can be decomposed into the following three key components: volatility, uncertainty, and extreme events.

(i) Describe each of these three components.

(ii) For each of these three risk components, state whether the VaR risk measure captures it. Justify your response.

(iii) For each of these three risk components, state whether the CTE risk measure captures it. Justify your response.

2. Continued

(b) (*1 point*) Define each of the following:

(i) Available Economic Capital

(ii) Required Economic Capital

(iii) Excess Capital

(c) (*2 points*) Describe each of the following approaches to determining aggregate capital levels.

Approach 1: The simple summation method, using VaR 99

Approach 2: The fixed diversification percentage method, using CTE 99 and a fixed diversification deduction of 10%

Approach 3: The correlation matrix method, using VaR 99

(d) (*4 points*) For each approach in part (c), calculate Zoolander's Excess Capital, assuming the market value of assets allocated to the VA LOB is $4,300 million. Do not reflect the hedging program in your calculation.

(e) (*2 points*) Assuming Approach 3 in part (c) is used to determine the aggregate capital level, qualitatively describe how each of the following may change for the VA LOB if Zoolander's hedging program is reflected in the analysis. Justify your response.

(i) Market Value of Liabilities

(ii) Required Economic Capital

(f) (*2 points*) Zoolander is considering whether to organically expand the VA product line. In addition to capital, state four risk management considerations mentioned in the case study that could impact Zoolander's decision. Justify your response.

Questions 1-4 pertain to the Case Study.
Each question should be answered independently.

3. (*9 points*) Zoolander is considering being rated by Standard & Poor's (S&P). S&P has scheduled a meeting to assess Zoolander's commitment to and execution of ERM processes, including:

I. ERM Culture

II. Risk Controls

III. Emerging Risk Management.

(a) (*2 points*) Describe why S&P believes I, II, and III are important.

With respect to S&P's criteria for I, II and III:

(b) (*2 points*) Identify ten criteria, which have direct or indirect supporting references within the Case Study, that Zoolander should be prepared to discuss with S&P.

(c) (*5 points)* Evaluate Zoolander with respect to the criteria chosen in part (b). Provide specific examples to support your evaluations.

Questions 1-4 pertain to the Case Study.
Each question should be answered independently.

4. (*10 points*) Tomas Lyon has asked for your input on the Consensus meeting which took place on April 11, 2011 and dealt with the topic of Risk Appetite Statements.

In particular, Lyon has asked for the following:

(a) (*3 points*)

(i) Define "Risk Appetite Statement."

(ii) Identify and describe the six key principles that should be considered when forming a Risk Appetite Statement.

(b) (*3 points*) Critique the preliminary Risk Appetite Statement discussed during the consensus meeting on April 11, 2011, based on the six key principles in part (a)(ii).

(c) (*4 points*) Regarding the Term Life block:

(i) Determine the initial risk exposure for Term Life.

(ii) Calculate the enterprise risk exposure for Term Life.

(iii) Calculate the risk limit for Term Life.

(iv) Recommend an appropriate action for Bill Buck given the results of the calculations above. Justify your recommendation.

Show your work.

5. (*11 points*) You are a consultant retained by the Board of Borah Corporation to evaluate its risk management function. You discover the following:

- Borah's revenue is heavily influenced by oil prices.
- Borah is divided geographically into three divisions: East, West, and Midwest. Each division currently has a market value of $300M.
- Each division is managed separately by a Vice President, who reports the division's independent risk management activity to the Chief Operating Officer, who then reports the activity to the Chief Executive Officer and to the Board.
- Each Vice President can independently decide to purchase, at the cost of $10M, a hedge on the price of oil at $39 per barrel, thereby stabilizing that division's market value at $285M.

Both the East and West Vice Presidents predict the following:

#	State of World	Price of Oil	Division's market value, in $M	Probability
1	Catastrophe	$100/barrel	30	30%
2	Paradise	$10/barrel	400	70%

However, the Midwest Vice President predicts that the price of oil will be $40 per barrel and the division's market value will be $280M with 100% probability.

(a) (*1 point*) Calculate the expected value of each division's market value based on its Vice President's prediction.

(b) (*3 points*) Each Vice President will decide whether to hedge the price of oil based on their individual prediction and their individual decision criteria below:

- East: division market value.
- West: the utility function $u(p) = \sqrt{p}$, where p is the division market value.
- Midwest: cost/benefit analysis of the hedge.

Determine whether each Vice President will hedge the price of oil. Justify your responses.

5. Continued

The Chairman of the Board believes creating a corporate ERM function will enable Borah to make better decisions.

(c) (*4 points*)

(i) Describe three of the roles and responsibilities of a corporate ERM function.

(ii) For each answer in part (i), explain how a corporate ERM function can improve Borah's current decision-making process.

(d) (*3 points*)

(i) Describe two of the major ERM roles for the Board of Directors.

(ii) Recommend how Borah's Board can fulfill each role identified in part (i).

6. (*11 points*) You are in charge of managing credit risk for a portfolio of fixed income assets. Mullan Industries, one of your largest bond holdings, was downgraded yesterday from High Quality (HQ) to Low Quality (LQ).

You are given the following information for the Mullan bond:

1-year Transition Matrix	HQ	LQ	DF
High Quality (HQ)	96%	3%	1%
Low Quality (LQ)	2%	95%	3%
Default (DF)	0%	0%	100%

Quality in 1 Year	Value in 1 Year
HQ	100
LQ	90
DF	50

You are also given the following values for the cumulative standard normal distribution:

x	0.000	1.282	1.645	1.960
$\Phi(x)$	0.500	0.900	0.950	0.975

(a) (*1 point*) Describe the implications of selling the Mullan bond if this asset is among several assets categorized as Held to Maturity for U.S. GAAP purposes.

(b) (*3 points*) Calculate VaR 95 of the Mullan bond value one year from today assuming:

(i) The normal distribution

(ii) The actual distribution

(c) (*4 points*) Using two uncorrelated bonds having characteristics identical to those of the Mullan bond today:

(i) Demonstrate that VaR is not subadditive, assuming the actual distribution.

(ii) Validate that CTE 95 is subadditive, assuming the actual distribution.

(d) (*3 points*) The CRO wants to purchase pure credit default swaps (CDS) to mitigate its credit risk.

(i) Describe how pure CDS work, including all possible cash flows.

(ii) Identify three additional risks the CRO should be aware of prior to purchasing the pure CDS.

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

USE THIS PAGE FOR YOUR SCRATCH WORK

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