SOCIETY OF ACTUARIES
Exam ADVF
Advanced Finance

Exam ADVF

Date: Wednesday, May 1, 2013
Time: 2:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 40 points.

   This exam consists of 7 questions, numbered 1 through 7.

   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 Exam ADVF.

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 ADVF-Front Cover

****BEGINNING OF EXAMINATION****

1. (*4 points*)

(a) (*1 point*) Describe Market Value Margin (MVM).

(b) (*1 point*)

(i) Sketch the three main components of the Economic Balance Sheet.

(ii) Identify which of the components in part (i) includes the MVM.

(c) (*2 points*)

(i) Define Solvency Capital Requirement (SCR).

(ii) Explain how SCR is calculated under Solvency II.

(iii) Provide the general formula used to combine capital requirements for component risks at each aggregation level.

2. (*6 points*) You are currently working for Zirkel Bank, which has the following liabilities:

	Liability Value
Short-term unsecured bank deposits	100
40-year payout annuities with no cash surrender value	50
Core long-term non-bank deposits	30
Insured 3-year CD deposits	20

(a) (*2 points*) Rank the liquidity risk of the liabilities from highest to lowest. Justify your ranking.

Zirkel has the following assets, which are held at market value:

	Market Value	Haircut
Cash	10	0%
Long-term public bonds	100	15%
Private placement equity	100	60%

(b) (*1 point*) Calculate Moody's cash capital position for Zirkel.

(c) (*1 point*) Describe two additional liquidity risk measures Zirkel can use to evaluate its liquidity risk.

(d) (*2 points*) Evaluate the short-term and long-term liquidity risk Zirkel currently faces.

3. (*5 points*) You are given the following market values for Ouray, Inc.:

Equity	15
Short-term liabilities	35
Long-term debt	20
Volatility of assets (σ_A)	10

Ouray has no other liabilities. The book value and market value of the long-term debt are equal.

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

z	$\Phi(z)$
1.4	0.9192
1.5	0.9332
1.6	0.9452
1.7	0.9554
1.8	0.9641
1.9	0.9713

z	$\Phi(z)$
2.0	0.9772
2.1	0.9821
2.2	0.9861
2.3	0.9893
2.4	0.9918
2.5	0.9938

(a) (*2 points*) Calculate Ouray's theoretical expected default frequency (EDF™), according to the Moody's KMV model of credit risk, assuming future asset values are normally distributed around the firm's current asset value. Show your work.

(b) (*1 point*) Describe the Altman Z-score model.

(c) (*2 points*) Compare and contrast the Moody's KMV and Altman Z-score models.

4. (*7 points*) The current capital of Eolus, a publicly held firm, has an expected present value of 1000, derived from values of 400 and 1600 in the Bad and Good scenarios respectively. The Bad and Good scenarios have an equal probability of occurring. The expected value of risky debt, which has a face value of 600, is 500, and the expected value of equity is also 500. This is summarized in the table below:

	Bad Scenario	Good Scenario	Expected Value
Value of Capital	400	1600	1000
Value of Debt	400	600	500
Value of Equity	0	1000	500

Eolus is considering Project A and Project B. Each costs 100 and would be funded without issuing additional debt. The projects have the following present values of future cash flows:

	Bad Scenario	Good Scenario	Expected Value
Project A	200	200	200
Project B	−200	600	200

Eolus can only invest in one of the projects.

(a) (*3 points*)

(i) Complete the table below assuming Eolus invests in Project A.

	Value after Investing in Project A		
	Bad Scenario	Good Scenario	Expected Value
Value of Capital			1100
Value of Debt			
Value of Equity			

(ii) Complete the table below assuming Eolus invests in Project B.

	Value after Investing in Project B		
	Bad Scenario	Good Scenario	Expected Value
Value of Capital			1100
Value of Debt			
Value of Equity			

4. Continued

(b) (*4 points*)

(i) Explain why Eolus may reject the guaranteed return of Project A in favor of the uncertain return of Project B.

(ii) Explain how the selection of Project B could ultimately reduce shareholder value.

5. (*6 points*) You are the Chief Actuary for Long Life. Your CEO has asked you to evaluate the possible acquisition of Half Life.

You are given the following information:

- Risk-free rate = 3%
- Expected equity market return = 10%
- Equity beta for Long = 1.2
- Long is entirely equity financed.
- Long's surplus earns no investment income.

You are given the following information regarding Half's in-force business:

Year	**1**	**2**	**3**	**4+**
After-tax statutory profits	15	10	5	0
Required surplus (beginning of year)	3	2	1	0

The total initial surplus for Half is 6.

(a) (*1 point*) Calculate an appropriate discount rate for use in this acquisition appraisal using the Capital Asset Pricing Model (CAPM). Show your work.

(b) (*1 point*) Describe two other methods for selecting a discount rate for use in valuing an acquisition.

(c) (*2 points*) Calculate an Actuarial Appraisal Value of Half using the projected values above and the CEO's prescribed discount rate of 12%. Show your work.

(d) (*2 points*) Half's investment bank is evaluating the acquisition using the Comparable Transaction Analysis method.

(i) Describe the Comparable Transaction Analysis method.

(ii) Contrast the Comparable Transaction Analysis method with the Actuarial Appraisal Value method.

6. (*5 points*) As portfolio manager of the Bogle Company Pension Plan, you are considering investing in an equity fund. You are given the following historical daily returns over the past 1000 trading days, with key statistics:

Historical daily return (worst to best)

#	Daily return
1	−14.70%
…	…
9	−12.50%
10	−11.70%
11	−10.88%
…	…
99	−1.94%
100	−1.93%
101	−1.93%
…	…
1000	9.63%

Key statistics

Mean	0.06%
Standard Deviation	2.57%
Skewness	−1.79

Standard normal cumulative distribution values

z	Φ(z)
1.282	90.0%
1.645	95.0%
2.326	99.0%
2.576	99.5%

(a) (*1 point*) Calculate the daily Value at Risk (VaR) at both 99% and 90% for this equity fund, using each of the approaches below. Show your work.

(i) Empirical approach

(ii) Parametric approach, assuming that daily returns are normally distributed

(b) (*2 points*) Describe the advantages and disadvantages of each of the two approaches used in part (a).

(c) (*1 point*) Describe two disadvantages of VaR as a risk measure, regardless of the approach used in part (a).

In order to enhance your view of tail risk, you develop a Monte Carlo model based on historical returns.

(d) (*1 point*) Critique the use of this model to estimate tail risk.

7. (*7 points*) You are a stock analyst reporting on Huge Life Insurance Company.

(a) (*3 points*) In the context of analyzing and comparing corporations, describe the components, uses, and limitations of each of the types of financial statements by completing the table below:

	Balance Sheet	Income Statement	Statement of Cash Flows
Components			
Uses			
Limitations			

(b) (*1 point*) Describe two techniques for defining a peer group for the purposes of comparative ratio analysis.

7. Continued

Select information from the annual financial statements of Huge Life is shown below (in millions):

Sales and Net Income

Premiums written	16,500
Net income	4,200

Assets

Total assets excluding Separate Accounts	168,000
Separate Account assets	80,000
Total assets	248,000

Liabilities

Short-term debt	700
Long-term debt	5,000

Total liabilities excluding Separate Accounts	140,000
Separate Account liabilities	80,000
Total liabilities	220,000

Total Shareholders' Equity	28,000

(c) (*1 point*) Calculate the following financial statement ratios for Huge Life. Show your work.

(i) Debt-to-equity ratio

(ii) Net profit margin

(iii) Return on equity

Select annual financial statement ratios of Huge Life's peer group are shown below:

Huge Life's Peer Group Financial Statement Ratios	**Low**	**Median**	**High**
Debt-to-equity ratio	25%	40%	50%
Net profit margin	11%	15%	22%
Return on equity	7%	10%	15%

(d) (*2 points*) Assess possible strategic opportunities for Huge Life relative to its peer group.

****END OF EXAMINATION****

USE THIS PAGE FOR YOUR SCRATCH WORK