SOCIETY OF ACTUARIES
Exam ADVF
Advanced Finance

Exam ADVF

Date: Wednesday, October 31, 2012
Time: 2:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 40 points.

   This examination consists of 6 questions numbered 1 through 6.

   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.

1. (*6 points*) Vendavel Group is considering two potential one-year investments, Investment A and Investment B. The projected one-year outcome for each investment is simulated over 1000 stochastic scenarios using statistical distribution models calibrated to historical outcomes, with the following results:

Rank	Investment A		Investment B		Investment A + Investment B	
	Outcome*	Scenario #	Outcome*	Scenario #	Outcome*	Scenario #
1	−420	473	−356	720	−396	720
2	−200	5	−130	389	−395	473
3	−100	944	−55	468	−220	5
4	−70	168	−25	538	−111	389
5	−40	720	−20	5	−95	944
6	−38	879	−10	589	−73	168
7	−30	836	−5	861	−7	836
8	−27	429	−4	99	−7	879
9	−25	808	−4	660	−5	589
10	−21	899	−3	168	−1	468
…	…	…	…	…	…	…
500	38	638	33	574	73	481
…	…	…	…	…	…	…
1000	132	900	94	760	198	900
Mean	**39**		**34**		**74**	
Standard Deviation	**28**		**22**		**40**	

* negative numbers are losses

(a) (*1 point*) Describe two limitations of relying solely on historical outcomes in calibrating the statistical distribution models.

(b) (*1 point*) Determine whether using the standard deviation to quantify the risk of each of these investments is appropriate.

(c) (*2 points*) For each individual investment, using the simulated outcomes above:

   (i)   Calculate the 99.5% Value at Risk (VaR). Show your work.

   (ii) Calculate the 99.5% Tail Value at Risk (TVaR). Show your work.

1. Continued

The CFO of Vendavel states that the company can realize significant diversification benefits by pursuing both investments.

(d) (*2 points*) Demonstrate, using the simulated outcomes, whether each of the following supports the CFO's statement. Show your work.

(i) 99.5% VaR

(ii) 99.5% TVaR

2. (*6 points*) Avanti Corp., a small company selling term life and property/casualty insurance, is subject to fair value accounting.

    (a)   (*1 point*) Summarize the Joint Working Group Hierarchy of Valuation Methods.

    (b)   (*2 points*) Contrast fair value and U.S. GAAP accounting with regard to:

        (i)   treatment of life insurance acquisition costs

        (ii)   updating assumptions regarding future experience for term life insurance (term life falls under SFAS 60 for U.S. GAAP)

        (iii)   updating assumptions regarding future experience for property/casualty insurance

        (iv)   treatment of historical costs

Avanti has the following financial data, measured at fair value:

Assets	$200,000
Liabilities	$160,000
Risk-free Rate	4%
Return on Assets	5%
Return on Equity	10%
Tax Rate	30%

Included in its liabilities is a closed block of paid-up property/casualty insurance contracts maturing in one year. The expected value of claims and expenses for this block at the end of the year is $5000.

    (c)   (*2 points*) Calculate the liability fair value of the closed block. Assume the return on liabilities for the closed block equals that of the entire company. Show your work.

Avanti is considering selling the closed block.

    (d)   (*1 point*) Identify four obstacles Avanti may face in finding a potential buyer of the closed block.

3. (*7 points*) You are pricing a zero-coupon, A-rated bond maturing in two years with a face value of 100, using the following information:

- The risk-free interest rate curve is flat at 2%.
- The loss given default (LGD) is 60% of face value.
- There are 3 possible states: A rating, B rating, and default.
- The one-year, risk-neutral credit migration matrix, where credit migration probabilities are assumed to be constant over time, is:

	A	B	Default
A	90%	9%	1%
B	5%	90%	5%
Default	0%	0%	100%

(a)   (*2 points*) Calculate the price of the bond using a risk-neutral approach. Show your work.

(b)   (*1 point*) Calculate the implied credit spread of the bond over the risk-free rate using your result from part (a). Show your work.

(c)   (*2 points*) Describe the components, other than the credit spread, of a risky bond yield.

Shortly after you perform this analysis, a severe market crisis causes a large number of companies to collapse. The crisis is expected to be long-term in nature.

(d)   (*2 points*)

   (i)   Identify which components of a risky bond yield (including the credit spread) are likely to be materially impacted by this crisis.

   (ii)   Describe the impact for each component identified in part (i).

   (iii)   Evaluate the overall impact on the bond price. Support your response.

4. (*7 points*) Something Life, a large insurance company, sells life insurance and retirement products. One product, Something Special, is a single-premium, unit-linked retirement product with a Guaranteed Minimum Death Benefit (GMDB), paid upon death, which could be in excess of the account value.

The excess death benefits resulting from the GMDB are reinsured to Special Bank. Reinsurance premiums, equal to a percentage of the account value, are paid at the beginning of each calendar year. Reinsurance benefits are settled quarterly. Something Life does not have a relationship with Special Bank outside of Something Special.

(a) (*1 point*) Describe Something Life's counterparty risk from Something Special.

(b) (*2 points*) Something Life's management is evaluating the use of potential future exposure (PFE) models to quantify the counterparty risk for the purpose of calculating economic capital.

    (i) Describe the two methods for calibrating PFE model parameters.

    (ii) Identify the most important determinant of PFE for Something Life.

(c) (*2 points*) Something Life's management is also considering using the "Mean Exposure times Mean Loss Rate" method to calculate the market value of counterparty risk.

    (i) Describe the steps of this method.

    (ii) Describe a deficiency of this method.

After conducting their analysis, Something Life's management is worried about the counterparty exposure to Special Bank.

(d) (*2 points*) Describe how the following risk mitigants could reduce Something Life's counterparty risk:

    (i) Collateral Agreements

    (ii) Netting Rights

    (iii) Funds Withheld Reinsurance

5. (*7 points*) You are employed by Rocky, a large public company in the trail map industry. Management has shown interest in acquiring Smokey, a privately held corporation in the same industry. You are given the following:

	Rocky	Smokey
Number of Units Sold in Year 1	1,000	200
Price per Unit	10	10
Variable Cost per Unit	7	7
Annual Fixed Costs	2,000	400
Total Debt	10,000	2,000
Interest Rate on Debt	6%	6%
Tax Rate	35%	35%
Number of Shares	100	Privately Held
Price/Earnings Multiple	14	Privately Held

Industry sales are expected to increase 10% in year 2 without increases in either fixed costs or interest expenses.

(a)   (*2 points*) Calculate Rocky's share price at the ends of both year 1 and year 2. Show your work.

Rocky proposes acquiring Smokey at the end of year 1 at a price equal to 14 × Smokey's year 1 after-tax earnings.

(b)   (*3 points*) Calculate Rocky's share price at the end of year 2 for each of the following independent situations. Show your work.

    (i)   Rocky purchases Smokey by issuing 100% equity.

    (ii)   Rocky purchases Smokey by issuing 100% debt at 6%.

(c)   (*1 point*) Recommend, using the above calculations, whether Rocky should issue 100% stock or 100% debt to acquire Smokey at the end of year 1. Support your recommendation.

Smokey has rejected the acquisition offer based on 14 × earnings, yet Rocky's management is intent on acquiring Smokey.

(d)   (*1 point*) Provide three justifications to Rocky's management to support a higher offer.

6. (*7 points*)

    (a)   (*2 points*) Describe five strategies to manage stress liquidity risk arising from a life insurance portfolio.

    (b)   (*2 points*) Describe the liquidity risk from embedded options in the following products:

        (i)   Individual Universal Life (UL) insurance with surrender charges equaling 100% of account value in year 1, grading to 0% in year 6

        (ii)   Corporate-Owned Life Insurance (COLI)

        (iii)   Funding agreements permitting surrender at book value if the insurance company credit rating drops below a specified level

    (c)   (*3 points*) For each product in part (b), recommend the most effective risk management strategy from your answer in part (a). Justify your recommendations.

END OF EXAMINATION

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