SOCIETY OF ACTUARIES
Exam FETE
Financial Economic Theory and Engineering Exam (Finance/ERM/Investment)

Exam FETE

MORNING SESSION

Date: Thursday, November 3, 2011
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 9 questions numbered 1 through 9.

   b) The afternoon session consists of 9 questions numbered 10 through 18.

   The points for each question are indicated at the beginning of the question. Questions 1 – 2 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 FETE.

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 FETE-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 1-2 pertain to the Case Study.
Each question should be answered independently.

1. (*5 points*)

(a) (*2 points*) Describe the economic rationale and potential costs involved in securitizing financial instruments.

(b) (*3 points*) Evaluate which risks in Wonka Life's products could be successfully mitigated via securitization.

Questions 1-2 pertain to the Case Study.
Each question should be answered independently.

2. (*7 points*) As CFO of Wonka Life Insurance Company, you have been asked by Thomas Lyon, the company's CEO, to help develop Wonka Life's first dividend policy as a result of its recent initial public offering. Lyon is concerned that the company's shares are undervalued and he has heard from other CEOs that establishing a dividend can act as a "signal" to the market which could increase the company's share price.

(a) (*1 point*) List and explain characteristics of a market environment under which dividend policy is irrelevant.

(b) (*1 point*) Describe the information conveyed to the market by a company establishing a dividend policy.

(c) (*3 points*)

(i) Identify two other common favorable signals available to Wonka Life.

(ii) Compare these types of signals with the dividend signal.

(iii) Evaluate Wonka Life's ability to use these three signals.

Wonka Life has 10,000,000 outstanding shares, currently trading at $60 per share. As CFO, you have estimated that the intrinsic value of Wonka Life is $100 per share.

Wonka Life also has an opportunity to acquire LifeSaver Insurance Company for $300,000,000 by issuing additional stock at the current price. Analysis has shown that the intrinsic value of LifeSaver Insurance Company is $400,000,000, making the net present value of the acquisition $100,000,000.

Thomas Lyon believes the acquisition opportunity is "a good deal" and believes that Wonka Life should pursue the acquisition.

(d) (*2 points*) Recommend whether Wonka Life should acquire LifeSaver Insurance Company based on shareholder value.

3. (7 *points*) You are an actuary working for Fond Du Lac Insurance Company (FDL) which is contemplating a new model which could be used to dynamically hedge many of the different products in its Variable Annuity line. There will be variable revenue and costs linked to the amount of investment.

You have the choice of investing 1500, 3000 or declining to invest at time 0 only. If you choose to invest either amount, you plan to issue a bond for 500 payable with annual interest at 3% for 2 years. The rest of the funding would come from issuing equity. Below is some key data you will need to make the decision:

Invest first 1500
Revenue = 105%/year of the amount of investment
(i.e. 1500 investment = 1575 in annual revenue)
Invest more than 1500
Revenue = 105%/year of the amount first 1500 + 95% of the amount in excess of 1500
(i.e. for a 3000 investment = 3000 in annual revenue)

You can assume the cost of equity capital is 20%,
Taxes = 30%
Risk Free rate = 0%

Whether or not you invest you will incur fixed costs of 400/year.

Assume the investment will depreciate 60% in the first year and the remaining 40% in year 2.

You will also incur variable costs each year equal to 20% of the amount invested.
(i.e. 1500 investment = 300 in annual cost.)

(a) (*1 point*) Describe the aim of financial models.

(b) (*5 points*) Calculate the NPV of the project for each of the following:

(i) 1500 investment

(ii) 3000 investment

(c) (*1 point*) Recommend and justify a course of action.

4. (*5 points*) The Sheboygan Beer & Brat Corp. (SBBC) has a present value of future earnings of either $100 or $200, with equal probability. Current debt outstanding is $100 of bonds. The firm may choose between 2 projects which require the same capital cost of $200. Project A has a present value of $210 and is riskless. Project B has present value of earnings which could be $180 or $300 with equal probability. Either project could be financed by issuing bonds junior to the current debt.

(a) (*3 points*) Calculate for each of the current situation, Project A, and Project B:

(i) The value of the firm

(ii) The value of equity

(iii) The impact on bondholders

(b) (*1 point*) Recommend the project which maximizes shareholder value.

(c) (*1 point*) Propose incentives to the bondholders so they would accept the project recommended in (b).

5. (*7 points*) Kenosha Company and LaCrosse Company (K and L, respectively) are each independently considering acquiring the other.

(a) (*1 point*) Describe earnings dilution from a board of directors' perspective and explain how it is calculated.

(b) (*5 points*) Given:

After Tax Synergies	25
Acquisition Premium	50
Goodwill write off period	30 years
Interest – After Tax	10%
Transaction Cost (% of amount to be paid in stock)	1%

	K	L
Share Price to Fund Takeover	50	60
Anticipated Share Price After Successful Takeover	50	80
Net Income	300	50
Market Values	1,200	750
Outstanding Shares	65	40

EPS of takeover options	100% Cash Takeover	100% Stock Takeover
K buys L	4.51	*X*
L buys K	*Y*	5.91

(i) Calculate the Current EPS for each of K and L.

(ii) Calculate *X*, the EPS of K for a 100% stock takeover of L.

(iii) Calculate *Y*, the EPS of L for a 100% cash takeover of K.

(c) (*1 point*) Based on your answer to (b), describe what action the boards of K and L may take in the best interest of their current shareholders.

6. (*8 points*) You are a hedging strategist for Baraboo Life (BL). You have recently been promoted, and are now in charge of both the equity and fixed income hedging strategies at this firm.

(a) (*1 point*) Describe three reasons why interest rate derivatives may be more difficult to value than equity or foreign exchange derivatives.

You are analyzing a bond. The bond has:

Par value	$1,000
Current price	$975
Annual coupon rate	12%
Coupon payment frequency	semiannual
Term to maturity	10.75 years

Current risk-free interest rates per annum are:

Term	Interest Rate
3 month	8.0%
6 month	8.5%
9 month	9.0%
11 month	12.0%

(b) (*2 points*) Calculate the eleven month forward price of this bond.

You would like to purchase an eleven month European call option on this bond. The volatility of the forward bond price for a contract maturing in 11 months is 10.0% per annum. The strike price is $1000.

(c) (*3 points*) Calculate the price of the call option using Black's model.

Your boss has challenged the assumptions of the Black-Scholes-Merton model. He points out that volatility is not constant, so the option value will depend on the uncertainty about what the volatility will be at each point in the future.

(d) (*1 point*) Describe two measures of this uncertainty.

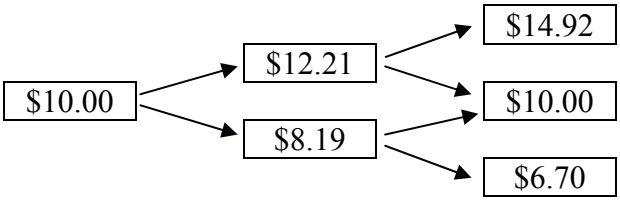
You expect that the volatility of this bond is going to rise but have no view on the future direction of the bond price.

(e) (*1 point*) Recommend a strategy other than buying just the call option that should perform well.

7. (*9 points*) The Ashwaubenon Company (Ash Co) needs to raise capital to support its rapidly growing business. One proposal is to publicly issue a certain number of equity units, each of which consists of one share of stock and a warrant to purchase one share of stock.

(a) (*1 point*) Describe the advantages and disadvantages of the "stock and warrant" issue compared with issuing only common stock.

Assume that the price of the underlying asset follows a binomial tree with 1-year time steps as follows:



The warrant provides the right to purchase one share of the stock for $9 at the first anniversary or, if not exercised, for $10 at the second anniversary.

Assume further that:

- The stock pays no dividend.
- The risk-free interest rate is 4% per annum.

(b) (*1 point*) Explain why the company would structure the warrant to have the exercise price change with the exercise date.

(c) (*4 points*) Calculate the value of the warrant using the binomial tree.

(d) (*2 points*) Estimate the delta and theta of the warrant at time 0.

(e) (*1 point*) Define gamma and explain how you could estimate the gamma of the warrant at time 0.

8. (*8 points*) Mequon Life Insurance Company (MLIC) has a block of equity-linked variable life insurance contracts in its portfolio. The liability value is mainly affected by the movement of the S&P 500 Index (the "S&P"). The chart below shows the liability values in $million under different S&P levels and volatilities. The increase in liability value means there is a loss to the company. Right now the S&P is at 1100. You are asked to set up a hedging position that minimizes the impact of movements in the S&P on the liability value.

	Liability Values		
	S&P Vol = 26%	S&P Vol = 25%	S&P Vol =24%
S&P increase 2%	76.9	70.8	62.3
S&P increase 1%	77.9	71.8	63.3
Current S&P = 1100	80.2	72.8	65.7
S&P decrease 1%	82.5	73.9	68.1
S&P decrease 2%	83.6	74.9	69.2

Two instruments are considered to set up the hedging position. Transaction costs and margin requirements can be ignored.

(i) S&P futures contracts:
- 3-month maturity
- Risk-free rate is 4% per annum
- Dividend yield is 2% per annum
- Each future contract is on 250 times the S&P index

(ii) S&P put option contracts:
- delta is −0.11
- gamma is 0.12
- vega is 0.75
- price is 0.18
- Each put option contract is on one times the S&P index

(a) (*2 points*) Calculate the number of S&P futures contracts you need to buy long or sell short to neutralize delta.

(b) (*3 points*) Determine the hedging positions required to neutralize both delta and vega, and calculate the initial cost to set up these positions.

After the hedging positions in (b) are set up the S&P suddenly drops 2% and its volatility increases 1% to 26%.

(c) (*1 point*) Estimate the gain or loss on the put position using the greek values provided.

(d) (*2 points*) Calculate the overall net gain or loss due to the market movements.

9. (*4 points*) Consider the following instruments and their values:

(i) A 1-year maturity option to pay fixed rate R_K and receive 3-month LIBOR on notional L (caplet); value of option is 2

(ii) A 1-year maturity option to receive fixed rate r_k and pay 3-month LIBOR on notional L (floorlet); value of option is 3

(iii) A 1-year forward rate contract to receive r_k and pay 3-month LIBOR on notional L; the value of this contract is 2

All three instruments have one cash settlement at their 1 year maturity date.

(a) (*2 points*) Describe the payoff of each instrument at time 12 months.

(b) (*1 point*) Indicate the put-call parity relationship for caps and floors.

(c) (*1 point*) Identify the arbitrage opportunity and recommend a trade to take advantage of it.

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

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