SOCIETY OF ACTUARIES
Strategic Decision Making Exam

Exam CFESDM

MORNING SESSION

Date: Thursday, October 30, 2014
Time: 8:30 a.m. – 11:45 a.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 100 points. It consists of a morning session (worth 60 points) and an afternoon session (worth 40 points).

   a) The morning session consists of 7 questions numbered 1 through 7.

   b) The afternoon session consists of 5 questions numbered 8 through 12.

   The points for each question are indicated at the beginning of the question. Questions 1, 4 – 5, 7, 8 – 12 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 because 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 CFESDM.

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.

475 N. Martingale Road
Schaumburg, IL 60173-2226

Printed in the U.S.A.

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

Question 1 pertains to the Case Study.   ***Each question should be answered independently.***

1. (*7 points*) Darwin plans to develop a single premium immediate annuity (SPIA) product, so Darwin's CFO examines various risks on SPIAs. He realizes that the Risk Based Capital (RBC) formula has short-comings in measuring the true risks associated with SPIAs. The CFO therefore recommends the following alternative economic reserve and capital measure to account for the SPIA risks:

- CTE 90

Measures were run and the following table was created.

	CTE 90 (millions)
Liability Value discounted at 5.0%	7.31
Liability Value discounted at 4.6%	8.92

The economic reserve which is equal to the average of all stochastic scenarios discounted at 5.0% is 6.71 million.

A liability value is discounted at the 5.0% expected earned rate to represent the alternative capital required because of the longevity risk. A liability value is discounted at the 4.6% earned rate after entering into a total return swap rate, which represents the alternative capital after reflecting longevity risk and asset risk.

The statutory reserve plus RBC amount for Darwin's SPIA business at the appropriate level of conservatism is 6.50 million.

(a) (*2 points*) Describe the shortcomings of utilizing a static RBC calculation for Darwin's SPIA business.

1. Continued

(b) (*2 points*) Calculate capital for the following risks utilizing a CTE 90 methodology.

(i) Longevity risk

(ii) Capital for asset risk

(iii) Total economic capital

(c) (*1 point*) List three challenges that Darwin currently faces in managing risk for existing business.

(d) (*2 points*) Identify one key consideration for Darwin in setting a capital standard for its introduction of the SPIA product. Justify your answer.

2. (*9 points*) First Balanced Triple B Portfolio is a multi-asset portfolio offered by First Bank.

First Bank's primary risk measures are standard deviation and VaR. The bank uses a mean-variance portfolio risk model. The bank uses these risk measures derived from the model to communicate the magnitude of the 2008 return to investors as a 1 out of X-year event.

You are given:

Table 1: First Balanced Triple B Portfolio as of 12/31/2008

Asset Class	Allocation	Year-To-Date Return
Cash & Equivalents	1%	0%
U.S. Treasuries	12%	6%
U.S. Investment Grade Corporate Bond	24%	−11%
Global Bonds (ex. U.S.)	6%	−16%
U.S. Large Cap Equity	16%	−35%
U.S. Small & Mid Cap Equity	21%	−42%
Emerging Market Equity	12%	−43%
Commodities	8%	−21%
Portfolio Total	100%	−24%

Table 2: Portfolio Risk Model Output

Expected Return	6.00%
Modeled Standard Deviation	8.50%
Value at Risk (VaR) at 99%	−13.77%
$\Phi(0.9900)$	1.96
$\Phi(0.9950)$	2.58
$\Phi(0.9998)$	3.54

(a) (*2 points*) Verify that X is approximately 5,000. Show your calculation.

(b) (*2 points*)

(i) Explain why it is inappropriate to assume that all risks can be measured by standard deviation under all circumstances.

(ii) Explain why standard deviation is an inappropriate risk measure for First Balanced Triple B Portfolio above.

2. Continued

First Bank decides to adopt a multi-factor risk model that was known to be employed by one of its competitors – J.P. Morgan Private Bank. First Bank replaces VaR with Estimated Tail Loss (ETL).

(c) (*3 points*)

(i) (*1 point*) Propose four factors that could be included in the risk model based on the asset classes in First Balanced Triple B Portfolio provided in Table 1.

(ii) (*2 points*) Describe four advantages of adopting a multi-factor risk model for the First Balanced Triple B Portfolio.

(d) (*2 points*)

(i) Identify flaws associated with VaR as a risk measure.

(ii) Identify two behavioral biases from the list below associated with comfortably relying on VaR to measure portfolio risk.

- Status Quo
- Representativeness
- Overconfidence
- Loss Aversion

3. (*12 points*) Given the following funds:

Information as of 12/31/2008				
Fund	**Investment Strategy**	**Maximum Leverage**	**YTD* Return**	**U.S. Equity YTD Return**
Duckworth Asset Management	U.S. Equity Market Neutral	$2x$	7.60%	−37.00%
Nephila Capital	Catastrophe Risk Transfer	$2x$	8.10%	−37.00%

*YTD – year to date

(a) (*2 points*)

(i) Describe the equity market neutral strategy as practiced by Duckworth Asset Management team.

(ii) Describe three types of instruments used by Nephilia Capital to transfer catastrophe risk.

(b) (*2 points*) Describe three risks associated with utilizing Nephila Capital's strategy. Justify your response.

After seeing the investment results above, a potential investor made the following comment:

"*Wow, if these managers could deliver these kinds of numbers in a bear market like 2008, they would easily beat the market again when stocks recover next year. I am going all-in with these guys*!"

(c) (*3 points*)

(i) (*1 point*) Explain which two behavioral biases from the list below pertain to the investor's performance expectations.

- Status Quo
- Representativeness
- Overconfidence
- Loss Aversion

(ii) (*2 points*) Critique the effectiveness of the two investment strategies with respect to the investor's comments.

3. Continued

Tables 1, 2, and 3 contain information pertaining to the two investment strategies.

Table 1: Fire-Sale Asset Price Divided by Fair Market Price Under all Scenarios

Funds	Current Asset Holdings			
	Asset Category 1	Asset Category 2	Asset Category 3	Asset Category 4
Duckworth Asset Management	1	1	1	1
Nephila Capital	0.20 − 0.45	0.80 − 1.00	0	0.60 − 0.70

Table 2: Position Allocation (% of total long position)

Funds	Percentage of Current Asset Holdings			
	Asset Category 1	Asset Category 2	Asset Category 3	Asset Category 4
Duckworth Asset Management	125%	−60%	82%	−47%
Nephila Capital	25%	25%	25%	25%

Table 3: Other Inputs

Funded	Expected Return	Volatility	Allocation (%)
Duckworth Asset Management	8%	10%	***x***
Nephila Capital	10%	6%	***y***

Assume the returns between these two funds are uncorrelated and the allocation is subject to the following constraints:

1. Liquidity index of the portfolio must be at least 0.85, even under the most stressed scenario.

2. Volatility of the portfolio does not exceed 10%.

3. No increase in leverage.

(d) (*5 points*) Determine *x* and *y* in Table 3 that maximizes portfolio return. Show your calculations.

Question 4 pertains to the Case Study.
Each question should be answered independently.

4. (*6 points*) The description of a potential Blue Jay Air acquisition is provided in Section 2.4 of the Case Study.

(a) (*1 point*) List three attributes that characterize a vertical market failure.

(b) (*3 points*) Assess why Blue Jay Air is considering the acquisition of aircraft manufacturers based on each attribute identified in part (a). Justify your answer.

(c) (*2 points*) Recommend an alternative to vertical integration assuming Blue Jay Air decides not to fully vertically integrate. Justify your answer.

Question 5 pertains to the Case Study.
Each question should be answered independently.

5. (*7 points*) Information on Blue Jay Air (BJA) is in Section 2 of the Case Study. BJA defines customer groups using the characteristics: Reason for Travel, Geographical and Segment.

Investment banks use a Sharpe ratio to identify customers that deliver superior risk adjusted return. When considering an investment portfolio, a Sharpe Ratio is defined as:

$$\text{Sharpe Ratio} = \frac{\text{Expected Portfolio Return} - \text{Risk Free Rate}}{\text{Portfolio Standard Deviation}}$$

1. Reason for Travel	Expected Revenue	Expected Profit	Variance	Sharpe Ratio
Business Traveler	250	25	16%	0.175
Leisure Traveler	100	6	4%	0.150

2. Geographical	Expected Revenue	Expected Profit	Variance	Sharpe Ratio
Regional Flight	155	8	4%	*X*
International Flight	1200	120	100%	0.070

3. Segment	Expected Revenue	Expected Profit	Variance	Sharpe Ratio
First Class Seat	400	32	400%	0.025
Business Class Seat	350	21	25%	*Y*
Economy Seat	200	8	4%	0.050

(a) (*1 point*) Calculate *X* and *Y*.

(b) (*1 point*) Identify the current best customer groups in BJA.

(c) (*2 points*) Evaluate how the current best customer groups identified in (b) align with BJA's long term strategies. Justify your answer.

(d) (*3 points*) Describe three activities BJA could adopt or enhance that would contribute to the success of BJA's long term strategies. Justify your answer.

6. (*8 points*) Orange Sky Air is purchasing New Airline, which had an overfunded frozen Pension Plan (NAFPP). Following the acquisition, Orange Sky Air plans to terminate NAFPP and use assets remaining after settlement of obligations to modernize its fleet.

The NAFPP termination liability is $89 million and market value of assets is $100 million. Assets are invested in units of Large Cap Index Fund (40%) and Corporate Bond Index Fund (60%).

The following are the Funds' characteristics:

	Unit Price for under 1,000 Units Transactions		**Bid Price Decrease for every additional 1,000 of Units Sold**	**Unit Price Volatility**
Fund	**Bid**	**Ask**		
Large Cap Equity Index Fund	$19,400	$20,600	5.00%	5.00%
Corporate bonds Index Fund	$25,800	$26,200	1.00%	0.50%
Correlation factor between returns of two Funds				0.10

(a) (*1 point*) List advantages and disadvantages of immediate liquidation (all positions are liquidated over a period of one day) and uniform liquidation (all positions are liquidated over in a series of installments over a period of few days) strategies.

Given the following liquidation strategies:

Liquidation methods	Original Market Value for 1,000 units	Proceed from sales for 1,000 units	Cost of liquidation for 1,000 units
Immediate liquidation	10,000,000	9,696,026	303,973
Uniform liquidation over 3 days	10,000,000	9,834,640	165,360

(b) (*3 points*) Calculate the volatility of proceeds from each of the two liquidation strategies. (Assume uncorrelated daily returns.)

6. **Continued**

Orange Sky Air estimates that modernization costs will be at least \$9 million. Three liquidation strategies for NAFPP assets were proposed:

Strategy	Expected Proceeds net of pension liabilities	Volatility of the Proceeds
A	\$9,100,000	\$100,000
B	\$9,500,000	\$1,100,000
C	\$9,800,000	\$1,400,000

(c) (*4 points*) Recommend liquidation strategy A, B or C. Justify your answer.

Question 7 pertains to the Case Study.
Each question should be answered independently.

7. (*11 points*) Information on Frenz is in Section 4 of the Case Study.

(a) (*1 point*) State the business strategy that Frenz currently practices within the retail food industry.

Consider the following categories:

- Tangible Resources
- Intangible Resources
- Capabilities

(b) (*3 points*)

(i) Identify an example for Frenz for each category.

(ii) Classify each example in part (i) as either a strength or weakness. Justify your answer.

Competitive advantages are characterized by the following attributes:

- Valuable
- Rare
- Costly to imitate
- Non-substitutable

(c) (*2 points*) Assess Frenz's competitive advantages resulting from investing in a Vietombia coffee bean production facility.

(d) (*2 points*) Explain the barriers to entry that Frenz's competitors would face that arise from a successful Vietombia coffee bean production facility.

7. **Continued**

Jiffy Java is a well-established brand that is rapidly gaining market share in the European coffee house market. Jiffy Java is expanding into the markets Frenz has targeted. Jiffy Java operates small stores with a limited menu comprised only of inexpensive options. A Frenz board director has determined that an investment to acquire Jiffy Java is possible but likely will mean foregoing the production facility in Vietombia. The board director has asked to meet with you to discuss the purchase of Jiffy Java.

(e) (*3 points*) Critique purchasing Jiffy Java versus investing in the Vietombia production facility based on Frenz's strategic goals.

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

USE THIS PAGE FOR YOUR SCRATCH WORK