SOCIETY OF ACTUARIES
Advanced Portfolio Management

Exam APM

AFTERNOON SESSION

Date: Friday, April 29, 2011
Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 8 questions numbered 12 through 19 for a total of 60 points. The points for each question are indicated at the beginning of the question. There are no questions that pertain to the Case Study in the afternoon session.

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 APM.

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 APM-Front Cover

****BEGINNING OF EXAMINATION****
Afternoon Session
Beginning with Question 12

12. (*5 points*)

(a) (*0.5 points*) Define equity risk premium.

(b) (*1 point*) List the biases that exist in estimating the equity risk premium.

(c) (*1.5 points*) Critique the statement that the equity risk premium should be measured against the short term rate.

(d) (*2 points*) The following assumptions are used.

Risk-Free Rate	2.5%
Equity Return	8%
Volatility of Equity Return	20%

Calculate the following:

(i) The equity risk premium.

(ii) The Sharpe ratio based on a one year horizon.

(iii) The Sharpe ratio based on a five year horizon.

13. (*5 points*) You are given the following information about the components of an equity market segment:

Company	Share Price 12/31/2010	Share Price 12/31/2011	Market Value 12/31/2010	Market Value 12/31/2011	Free Float Factor
YourWay Airways	14	8	4,018	2,296	1.00
Snack International	15	25	19,035	31,726	1.00
RugWorth Retail	10	11	43,950	48,345	0.60
Import International	14	17	150,052	182,206	0.85
Total			217,055	264,573	

(a) (*2 points*) Describe the characteristics of four common index weighting methods for this equity market segment.

(b) (*2 points*) Calculate the return of this market segment for each of the four index weighting methods identified in part (a).

(c) (*1 point*) Recommend a benchmark that is consistent with a passive management strategy of investing in this market segment and justify your recommendation.

14. (*8 points*) You have been asked to develop a strategy to hedge the interest rate risk exposure of structured settlement liabilities under a non-parallel shift in the yield curve.

The Chief Actuary of the company has provided you with the liability interest rate risk exposure from shocking the yield curve at each key rate. The following data represents a shift of a basis point on the par yield curve:

	Value of Liability (in $million)	Key Rate DV01 (in $million)	Key Rate Duration	Contribution to Total Duration
Initial Value	$237,069			
After 2 year shift	$237,062	7	0.3	Z_1
After 10 year shift	$236,960	X	4.6	38%
After 30 year shift	$236,899	170	Y	Z_2
Total				100%

(a) (*2 points*) Calculate X, Y, Z_1, and Z_2. Show your work.

(b) (*1 point*) Briefly describe the factors that affect the pattern of key rate sensitivities across key rates.

Due to recent changes, the liability value and its interest rate exposure have changed. You are considering using derivative instruments A, B, and C to hedge the interest rate risk.

The key rate durations of the current asset portfolio, liability, and potential hedging instruments are now as follows:

		Key Rate DV01s (in $million)		
Instrument	Market Value (in $million)	2 year	10 year	30 year
A	0	2		
B	0		10	20
C	0		5	15
Current Asset Portfolio	300,000	10	40	20
Structured Settlement Liability	280,000	5	20	35

14. Continued

(c) (*2 points*) Assume that the 30-year rate decreases by 50 basis points and the 10-year rate increases by 50 basis points.

Estimate (ignoring convexity):

(i) The change in the liability value.

(ii) The change in value of the hedge instruments.

(d) (*3 points*) Describe a strategy using any of instruments A, B, and C to limit the 10 year and 30 year Key Rate DV01 of the surplus portfolio to 5 and -5 respectively, based on Table 2 without changing the current portfolio mix.

15. (*14 points*) You work in the risk management department modeling credit risk. You have been using several standard industry models for measuring credit risk (CreditMetrics, KMV and CreditRisk+). Last year your company's credit losses substantially exceeded the 99% VaR level.

(a) (*1.5 points*) Describe the two flawed critical assumptions underlying the CreditMetrics framework for modeling credit risk and the implications of these assumptions in determining a company's bond credit rating.

(b) (*1.5 points*)

(i) Describe the principal driving factors behind the KMV framework for modeling credit risk.

(ii) Describe how these address the flaws in the CreditMetrics model.

(c) (*1.5 points*) List the advantages and limitations of the CreditRisk+ model.

You are given the following information:

Possible Bond Ratings: AAA, BBB, CCC, Default

Transition Matrix				
Probabilities of Credit Rating Migration From One Rating Quality to Another Within One Year				
Initial Rating	**Rating at Year End (%)**			
	AAA	**BBB**	**CCC**	**Default**
AAA	99.82	0.18	0.00	0.00
BBB	6.30	92.60	0.92	0.18
CCC	0.44	14.92	64.86	19.79

Corporate Spreads				
Rating	**Year (basis points)**			
	1	**2**	**3**	**4**
AAA	50	60	70	80
BBB	100	110	120	130
CCC	500	510	520	530

15. Continued

Treasury Rates			
One year forward treasury spot curve			
Year (%)			
1	2	3	4
0.60%	0.70%	0.85%	0.95%

A portfolio consists of one BBB-rated, 4-year par bond, with a 6% coupon and a 40% expected recovery rate.

(d) (*3 points*) Calculate the forward prices for each of the possible states at the end of one year for the BBB bond.

(e) (*1 point*) Calculate the 99% Credit VaR for this bond using the CreditMetrics framework for a one-year time horizon.

(f) (*1.5 points*) Describe how the Credit VaR metric will be affected by the following situations:

(i) Default recovery rate increases.

(ii) Credit spreads increase from current levels.

(g) (*2 points*) Your supervisor suggests that since your portfolio losses exceeded the 99% VaR level last year, you are safe for the next 90+ years.

Critique this suggestion.

(h) (*2 points*) Your CEO has lost faith in these models and suggests eliminating the credit risk modeling function.

Outline your response.

16. (*10 points*) The fund manager of the Pennywise Pension Plan (a defined benefit pension plan) is choosing between Portfolio A and Portfolio B to back the liabilities of the Plan.

(a) (*0.5 points*) Explain the differences between the Asset/Liability Management (ALM) approach and the asset-only approach to the strategic asset allocation process.

(b) (*0.5 points*) Describe situations where an investor would favor the ALM approach.

(c) (*1 point*) Compare the appropriateness of the traditional Sharpe Ratio measure and the Risk Adjusted Change in Surplus (RACS) when managing the assets of this pension plan.

(d) (*4 points*) You are given the following information:

	Portfolio A	Portfolio B	Pension Liabilities
Expected Annual Rate of Growth	6%	5%	4%
Standard Deviation of the Rate of Growth	12%	11%	10%
Correlation Coefficient with Liabilities	0.2	0.9	1
Value at Year-End 2009	110	110	100

The risk-free rate is 3% per year.

(i) Calculate the RACS for each of Portfolio A and Portfolio B.

(ii) Recommend which of Portfolios A or B should be selected, based only on the RACS.

16. Continued

(e) (*4 points*) In addition to the information provided in (d), assume that the Pennywise Pension Plan has a payout rate of 8% per year.

(i) Calculate the funded ratio for the Pension Plan at year-end 2009.

(ii) Calculate the minimum excess return over liabilities that the fund must achieve in order to maintain the same funded ratio throughout 2010.

(iii) Recommend a strategic asset allocation strategy, given that the Pension Plan is overfunded, and justify your recommendation.

17. (*8 points*) ABC Company has decided to introduce a defined contribution (DC) pension plan. A member of ABC Company's pension committee has suggested making the following investment options available to plan members for their self-directed accounts:

(i) Money Market Fund

(ii) Large Cap Equity Fund

(iii) Venture Capital Fund

(iv) Commodity Index Fund

(a) (*1 point*) Describe the purpose of establishing a Statement of Investment Policy in the context of a DC pension plan.

(b) (1 *point*) Identify the responsibilities of ABC Company in developing the list of investment options for a DC pension plan.

(c) (*1 point*) Describe the behavioral biases facing DC plan members.

(d) (*2 points*) Assess the appropriateness of each of the investment options suggested by the committee member.

(e) (*2 points*) The Company wishes to offer only four investment options.

Recommend changes to the above list of investment options and justify your recommendation.

(f) (*1 point*) Recommend a default investment option for members who refrain from selecting any options and justify your recommendation.

18. (*5 points*)

(a) *(2 points*) Describe feedback models and explain how they relate to market inefficiency.

(b) *(3 points*) A new associate in your firm has been assigned to follow tropical fruit futures. She has observed that the price of plantains has shot up recently. Their price per pound now trades at 4 times the price per pound of bananas versus the traditional relationship of 1.5 times. Only 3-month futures contracts on plantains and bananas are liquid.

She believes that your firm can monetize this view going long banana futures and going short plantain futures.

Critique her strategy from the perspective of behavioral finance.

19. (*5 points*) You are preparing a report for the governors of Drummuck University on their endowment fund. The governors have very limited knowledge of finance and investments. The report will address the performance of the fund's investment manager.

Risk-adjusted performance measures for the Investment Manager relative to the benchmark over the last measurement period are provided in the table below:

Risk-Adjusted Performance Measures	Investment Manager	Benchmark
Ex-Post Alpha (Jensen's Alpha)	0.015	0.013
Sharpe Ratio	0.257	0.300
Treynor Ratio	0.060	0.058
M^2	0.081	0.090

Draft a section of the report that will:

(a) (*1 point*) Describe properties of a valid benchmark.

(b) (*3 points*) Explain in narrative form what these four Risk-Adjusted Performance Measures are used for and interpret the performance of the investment manager based on these measures.

(c) (*1 point*) Describe other criteria the governors should consider when assessing the Investment Manager.

****END OF EXAMINATION****
Afternoon Session

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