SOCIETY OF ACTUARIES
Advanced Portfolio Management

Exam APM

AFTERNOON SESSION

Date: Friday, November 2, 2012
Time: 1:30 p.m. – 4:45 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This afternoon session consists of 9 questions numbered 9 through 17 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 9

9. (*7 points*) In the first situation, a wealthy donor establishes a new foundation with a gift of $200 million. The foundation intends to provide scholarships to foreign students attending universities in the United States. The donor would like the foundation to last for a long time. Additional donations are not anticipated.

(a) (*2.5 points*) Develop an outline of your recommended investment policy statement for this foundation.

In the second situation, a defined benefit pension plan closed to new entrants has $250 million of assets.

(b) (*2 points*) Describe how your recommendation in (a) would change in the case of this defined benefit plan.

Two rebalancing strategies have been proposed for the defined benefit plan: calendar rebalancing and the Constant-Proportion strategy.

(c) (*1.5 points*) Compare and contrast the two strategies.

(d) (*1 point*) Recommend a rebalancing strategy for the defined benefit plan and justify your recommendation.

10. (*7 points*)

(a) (*4.5 points*) Describe the types of psychological pitfalls that may be present in the following three scenarios:

(i) At the risk of losing deals, rating agency XYZ has been strongly lobbied by financial institutions to apply less stringent requirements on concentration of risks for mortgage backed securities.

(ii) An insurance company is facing financial distress and an increasing probability of bankruptcy due to low interest rates and volatile returns in stock markets. Its CFO strongly believes that low interest rates will persist and the only way to survive is to invest in alternative high yield assets coupled with equity linked derivatives.

(iii) The financial institution, MyGold, has hired external consultants to analyze their competitive position. The report shows that MyGold is trailing all of their competitors. MyGold has decided to close the gap by selectively investing in new types of Collateralized Debt Obligations (CDOs), believing that it would provide significant revenue growth opportunities. However, little independent risk analysis has been performed because CDOs are believed to behave the same way as corporate bonds.

(b) (*2.5 points*) Explain possible violations of the law of one price for the following:

(i) Closed-end fund

(ii) American deposit receipts

(iii) Twin Share

(iv) Dual share classes

11. (*8 points*) ABC Life plans to sell $1M of accumulation annuities with an embedded option equivalent to a European call option on a particular 7-year bond with the following characteristics:

Rate Level (Bond Equivalent Yield)	Option Price (per 100 of Face Value)
4.75%	4.71
5.00%	3.96
5.25%	3.28

ABC Life's Asset Liability Management area is considering two investment strategies to hedge interest rate exposure on the embedded option:

(i) Strategy A: 100% invested in 7-year zero coupon bonds

(ii) Strategy B: 1/3 invested in 3-year and 2/3 invested in 9-year zero coupon bonds

Assume the yield curve is flat at 5%.

(a) (*2 points*) Calculate, using DV01, the amount of face value that would need to be purchased under Strategy A.

(b) (*4 points*) Evaluate the two investment strategies being considered by comparing the modified duration and convexity of each strategy to that of the embedded option. Assume the modified duration of the embedded call option is 6.8293 and the convexity is 49.9703.

At the end of year 1, the value of the hedge assets has increased.

(c) (*2 points*) Describe how to attribute this change to the duration and time components of a factor performance attribution model.

12. (*5 points*) Bank A is in the lending business and is subject to the Basel II capital regime. It issues a loan to the company XYZ at LIBOR + 50 basis points.

Here is other information on Bank A's funding cost and capital requirement.

- LIBOR = 5.2%
- Funding cost is LIBOR −20 basis points
- XYZ's risk weight is 100%
- The capital requirement is 8% of the loan principal

(a) (*2 points*) Calculate the expected return on capital for Bank A when it lends $100 to XYZ Corporation. Assume XYZ does not default.

To reduce the risk of the loan to XYZ, Bank A is considering entering into a Credit Default Swap (CDS) with Bank B. These are the CDS terms:

- Bank A buys protection on XYZ and pays Bank B 55 basis points
- Bank B posts $50 of collateral with Bank A to secure Bank A's exposure to the CDS
- Bank B's risk weight is 20%
- The capital requirement is 8% for CDS

(b) (*1 point*) Compare Bank A entering into either a CDS or a total return swap to hedge the risk on this loan.

(c) (*2 points*) Show how much Bank A can improve its return on capital by buying the CDS from Bank B. Assume XYZ does not default and that Basel II capital requirements are in effect.

13. (*6 points*) You are working in the risk management department and analyzing your guaranteed income benefit product.

- Liability: Annual payment of 20 at year-end for five years
- Bond A: 2% annual coupon, five-year
- Bond B: 15% annual coupon, five-year
- All have a Z-spread of 7%
- All have a face value of 100 and are option free
- Risk-free rate is 5% effective annual
- Running spread of Credit Default Swap (CDS) is 5%
- Investors can borrow at the risk-free rate

You are considering buying back your liability in the market.

(a) (*1 point*) Compute the market value of the liability.

(b) (*2 points*) Describe each of the following bond-CDS trading strategies:

(i) Lock-in risk-free spread

(ii) Trade the basis

(iii) Profit from default

13. Continued

Assume bond A did not default, and B did default at the third coupon date, recovering 60%.

(c) (*3 points*) Determine the amount and timing of cash flows for each of the following strategies:

(i) Buy Bond A and buy CDS protection with 5-year maturity under the lock-in the risk-free spread strategy.

(ii) Buy Bond B and buy CDS protection with 3-year maturity under the profit from default strategy.

14. (*8 points*) The following information is given concerning a portfolio and its benchmark. There are no derivative assets in the benchmark.

Portfolio Data

Sub-group	Allocation	Risk Measure	Return
Mortgages	21%	0.15	4.10%
Real Estate	−5%	0.10	−5.50%
Equity	20%	1.00	8.00%
Government Bonds	24%	0.01	2.20%
Public Utilities Bonds	15%	0.01	1.30%
Junk Bonds	25%	0.10	−3.20%

Benchmark Data

Sub-group	Allocation	Risk Measure	Return
Mortgages	20%	0.15	4.10%
Real Estate	5%	0.10	5.50%
Equity	20%	0.25	5.00%
Government Bonds	40%	0.01	2.20%
Public Utilities Bonds	15%	0.01	1.30%

We are also given the following Tracking Error Variance (TEV) for the past five years for the current benchmark and three other possible benchmarks:

Current Benchmark TEV:	40.3%
Harry's Benchmark Index TEV:	40.0%
Felix's Benchmark Index TEV:	45.5%
Toro's Benchmark Index TEV:	25.5%

(a) (*1 point*) Explain the importance to investors of having a good benchmark in performance measurement.

(b) (*2 points*) Verify with benchmark testing that the current benchmark is not suitable. Explain your response.

A portfolio manager has stated that a good benchmark must be specified in advance, and therefore the benchmark should not be modified during the performance evaluation period.

(c) (*2 points*) Explain whether you agree or disagree with the portfolio manager.

14. **Continued**

The investment manager has proposed tracking the benchmark very closely.

(d) (*1 point*) Propose reasons for and against this investment strategy.

There are very many securities in the benchmark.

(e) (*1 point*) Describe methods that can be used to track such a benchmark cost effectively.

(f) (*1 point*) Recommend a method to track the benchmark if management is concerned about matching the risk profile of the benchmark and justify the recommendation.

15. (*8 points*) The Ocoee Teacher's Pension Plan (OTPP) is a defined-benefit plan in Canada. The plan is fully indexed to the Canadian Consumer Price Index (CPI). Due to regulation changes, OTPP was tapped out of the Canadian real return bonds market. To hedge its inflation risk, OTPP recently purchased a zero coupon U.S. Treasury Inflation Protected Security (TIPS). You are given the following:

Trade date:	July 17, 2011
Settlement date:	July 22, 2011
Maturity date:	December 31, 2021
Base index:	U.S. CPI, January 2001
Day-count convention:	30/360
Number of days to maturity:	3,759
Nominal rate:	2.50%
Face value:	$100,000,000
Settlement price:	$115,000,000

U.S. Non-Seasonally Adjusted, All-Urban CPI (CPI-U) Series

Date	Price
8/1/2011	226.268
7/1/2011	225.425
6/1/2011	217.235
5/1/2011	215.304
4/1/2011	214.118
1/1/2011	175.600

Note that the reference CPI-U for any valuation date incorporates a three-month lag.

(a) (*1 point*) List the tactical and strategic advantages of TIPS for investors.

(b) (*3 points*) Calculate the break-even inflation rate priced into the zero coupon TIPS.

(c) (*1 point*) Outline the challenges and concerns this inflation hedging strategy might face.

(d) (*1 point*) Assess how the inflation hedging strategy would perform if both U.S. and Canada experience deflation over a decade.

(e) (*2 points*) Describe the advantages and disadvantages of investing in each of the following asset classes to hedge against unexpected changes in inflation.

(i) Infrastructure

(ii) Timberland

16. (*6 points*) ABC Life decided to invest in the equity tranches of collateralized debt obligations (CDOs). ABC Life has a leverage ratio of 30 to 1. ABC Life also invested in mezzanine and distressed debt.

(a) (*2 points*) Explain what a CDO is and describe the potential "borrower's balance sheet effects" for ABC Life.

(b) (*1.5 points*) Describe the risks inherent in mezzanine and distressed debt.

ABC Life has now bought protection with numerous credit default swaps (CDS) from firms that trade heavily with each other.

(c) (*1.5 points*) Explain what a CDS is and describe the potential "network risk" inherent in these arrangements.

(d) (*1 point*) Describe economic mechanism(s) that contributed to the financial market turmoil in 2007-08 other than those noted in the above examples.

17. (*5 points*) Your company's asset portfolio consists of fixed income assets and traditional actively managed equity funds. Recently the market has been highly volatile and your company fears a double dip recession. The investment committee is considering allocating part of the portfolio to hedge funds. You are assigned to conduct research to find out if adding hedge funds is a plausible strategy and to propose a way to implement a hedge fund allocation.

(a) (*1.5 points*) Explain the advantages and disadvantages of adding hedge funds to the existing investment portfolio.

(b) (*1.5 points*) Describe the following two hedge fund strategies and how they can help the overall portfolio performance under the current economic expectations.

(i) Long-short equity

(ii) Event-driven

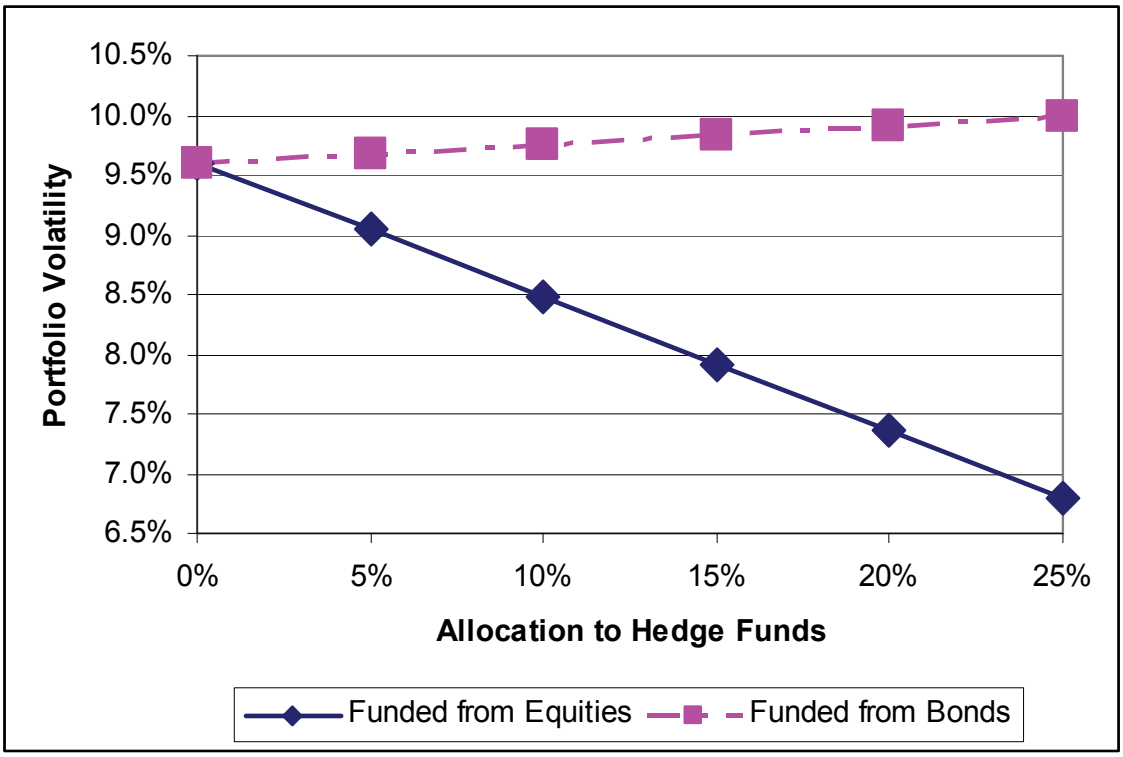
The company has a volatility risk tolerance of 8.5%. Your goal is to recommend an allocation strategy that will reduce the overall portfolio volatility to be more in-line with the company's risk tolerance. You are considering allocating a portion of the portfolio into a long/short equity hedge fund by using one of the following funding options:

(i) Substitute away from equity holdings and into the hedge fund

(ii) Substitute away from bonds and into the hedge fund

Based on your team's analysis, the following graph shows the impact on the total portfolio volatility of each funding alternative.

17. Continued



(c) (*0.5 points*) Identify the funding options viable to the company based on the chart.

(d) (*1.5 points*) Discuss the considerations in selecting a hedge fund allocation strategy.

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

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