SOCIETY OF ACTUARIES
Advanced Portfolio Management

Exam APM

MORNING SESSION

Date: Friday, November 2, 2012
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 8 questions numbered 1 through 8.

   b) The afternoon session consists of 9 questions numbered 9 through 17.

   The points for each question are indicated at the beginning of the question. Questions 1-4 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 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.

475 N. Martingale Road
Schaumburg, IL 60173-2226

Printed in the U.S.A.
Exam APM-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 1-4 pertain to the Case Study.
Each question should be answered independently.

1. (*4 points*) Tom Lyon is reviewing Wonka Life's December 31, 2009 Asset Liability Management Report. He is pleased to see how well matched the Accumulation Annuity line's asset and liability effective durations are. He comments that the minimal duration difference implies that the Accumulation Annuity asset portfolio must be a dedicated bond portfolio.

(a) (*0.5 points*) Describe how a dedicated bond portfolio strategy achieves its objectives.

(b) (*1 point*) Critique Tom Lyon's comments and describe what data you reviewed in forming your response.

Tom Lyon is concerned about how many of Wonka Life's product lines have dollar duration profiles outside their tolerance limits. You suggest that some lines may be able to reduce their dollar duration exposures by trading interest rate exposure between the lines.

You suggest that the Traditional Life Products line and the Non-Traditional Life Products line execute offsetting positions of a 20-year swap. Assume that 20-year swaps currently have an effective duration of 13.7.

(c) (*2.5 points*) Determine the minimum and maximum amounts of 20-year swap notional that the lines can trade so that both lines are within dollar duration guidelines.

Questions 1-4 pertain to the Case Study.
Each question should be answered independently.

2. (*8 points*) Regulatory capital is one of Wonka Life's considerations in determining its risk tolerance in the investment policy statement. In recent years, Wonka Life is considering moving towards a realistic economic capital framework for business decisions.

(a) (*1 point*) Explain how a realistic economic capital framework can be used to determine risk tolerance and constraints.

(b) (*1.5 points*) Critique Wonka's aggregation approach for economic capital.

(c) (*1.5 points*) Recommend an alternative aggregation approach and discuss its strengths and weaknesses.

As a result of the analysis, the economic capital turns out to be significantly lower than the current target capital. The Chief Actuary is asked to evaluate the situation and determine the impact on the investment policy.

(d) (*1 point*) Explain why economic capital is preferred over regulatory capital in determining target capital.

(e) (*1.5 points*) Explain why economic capital might be less than the current target capital for Wonka.

(f) (*1.5 points*) Evaluate how the lower minimum level of target capital based on an economic capital approach might affect the investment strategy, given the current level of actual capital held by Wonka.

Questions 1-4 pertain to the Case Study.
Each question should be answered independently.

3. (*11 points*) The following table shows the current asset portfolio for Wonka's Universal Life (UL) business:

Assets	Allocation
2-year Treasury notes	40%
10-year investment grade corporate bonds	30%
10-year high-yield bonds	10%
Private placements	10%
Real estate	10%

(a) (*2 points*) Describe the potential sources of liquidity risks for Wonka's UL business line.

(b) (*2 points*) Critique Wonka's proposed liquidity management approach of calculating the liquidity ratio under a normal and panic scenario.

The new CFO wants to consider other approaches to liquidity management.

(c) (*3 points*) Explain how the following approaches might be used to measure liquidity risk for the UL business line:

(i) Historical based (VaR/CTE/Extreme Value)
(ii) Deterministic scenario testing
(iii) Stochastic scenario testing

(d) (*1 point*) List five qualitative considerations in determining the UL business line's exposure to a liquidity shortfall.

The new CFO is concerned that there is little basis for setting the assumptions used in scenario and stress testing.

(e) (*1 point*) Explain the advantages and disadvantages of using hypothetical assumptions in stress testing.

(f) (*2 points*) Recommend a liquidity measurement approach and explain why you think it best addresses the risks in the UL business line.

Questions 1-4 pertain to the Case Study.
Each question should be answered independently.

4. (*7 points*) One year ago, Wonka Life agreed to issue a 10-year separate account institutional GIC denominated in U.S. dollars. At that time a single deposit of $100 million was made. The negotiated administration fee was 50 bps.

The separate account was initially invested in bonds as follows:

- 50% in U.S. government bonds denominated in U.S. dollars
- 20% in European sovereign bonds denominated in Euros
- 30% in U.S. corporate bonds denominated in U.S. dollars
- All were ten-year maturity zero-coupon bonds

Time	Book Value $ Millions	Market Value $ Millions	Book Yield
One year ago (T−1)	100	100	3%
Now (T)	103	98	3%
One year from now (T+1)	106	To be determined	

(a) (*1 point*) Compute the credited rate for the separate account GIC for the past year.

(b) (*1 point*) Describe the embedded option in the 80% of book value guarantee.

(c) (*1 point*) Identify possible market scenarios where the 80% of book value guarantee would be in-the-money.

(d) (*2 points*) Recommend a strategy to hedge the embedded option considering that scenarios assumed in (c) could reverse.

(e) (*2 points*) Analyze the weakness(es) associated with the crediting strategy and propose a way to improve the crediting formula.

5. (*8 points*) John Doe is a portfolio manager at Deer Capital Management, Inc (DCM). At the end of 2010, a wealthy client engaged DCM to manage $10,000,000 for one year in an active equity style. The client prefers to overweight small cap stocks but has not selected an index weighting method for the performance benchmark.

The contract leaves open the method by which the benchmark index will be calculated. DCM invests in shares of Apple, Orange and Banana. The portfolio return as of 12/31/2011 was 16.50%.

	Share Price, Dec 31, 2010 in $	Share Price, Dec 31, 2011 in $	Market Value of Shares, Dec 31, 2010 (millions)	Market Value of Shares, Dec 31, 2011 (millions)	Free Float Factor
Apple	322.56	381.32	299,013	353,483	1.0
Orange	55.31	51.83	15,985	14,979	0.6
Banana	7.79	2.96	2,611	992	0.8
Total			317,609	369,454	

(a) (*1 point*) Define the following index weighting methods:

(i) Price-Weighted index

(ii) Value-Weighted index

(iii) Float-Weighted index

(iv) Equal-Weighted index

(b) (*2.5 points*) Calculate the index return for the 3 stocks under each method.

(c) (*2 points*) Recommend the appropriate benchmark index weighting method based on the client's investment objective.

(d) (*1 point*) Describe the advantages and disadvantages of using an investment style index as a benchmark.

Individual investment managers at DCM such as John Doe have historically outperformed their individual benchmarks. However, DCM has seen its returns on investments to be lower than the rest of its competitors.

(e) (*1.5 points*) Explain possible reasons for the deficiency in returns.

6. (*8 points*) William Write is a fixed income portfolio manager at Deer Capital Management (DCM). His portfolio performance is evaluated against a benchmark with the following characteristics:

- Average quality: A
- Duration: 5 years
- Sectors (equally weighted): Industrials, Finance, Utilities and Sovereign.

William currently selects bonds such that the fund's characteristics closely match those of the benchmark bond index. The target tracking risk of the fund is 55 bps.

(a) (*0.5 points*) Define tracking risk and interpret the meaning of the above target.

(b) (*1 point*) Recommend ways to achieve a lower tracking risk.

William now wants to engage in active portfolio management. The table below represents the probability of picking the correct active strategy to beat the benchmark under duration, sector and quality. He only has the ability to implement one of the following active strategies.

Active Strategy	Probability of Perfect Foresight	Probability of Random Decision
Duration Long/Short	40%	60%
Choose the Best Sector	10%	90%
Choose Quality Higher/Lower	20%	80%

6. Continued

Below is his expected performance versus the benchmark under each active strategy.

Duration Strategy	Performance vs. Benchmark
'Correct' Duration Call	30 bps
'Wrong' Duration Call	–20 bps

Sector Strategy	Performance vs. Benchmark
Choose Best Sector	100 bps
Choose Second Best Sector	10 bps
Choose Second Worst Sector	–25 bps
Choose Worst Sector	–30 bps

Quality Strategy	Performance vs. Benchmark
'Correct' Quality Call	100 bps
'Wrong' Quality Call	–150 bps

The following statistics have been calculated for each strategy:

Strategy	Mean Outperformance	Tracking Error
Duration Long/Short	?	0.23%
Choose the Best Sector	?	0.56%
Choose Quality Higher/Lower	0.00%	?

(c) (*4 points*) Calculate the missing statistics in the table above.

(d) (*1.5 points*) Calculate the information ratio for each active strategy.

(e) (*1 point*) Recommend the strategy that William Write should pursue based on the above analysis.

7. (*9 points*) Company XYZ is considering the following two classes of fixed income securities in which to invest the assets supporting their traditional life and fixed deferred annuity insurance liabilities:

Investment Security	Value ($M)	Modified Duration	Basis Risk Adjustment Factor
Class AA	50	8	0.97
Class BB	50	8	0.92

Assume the following:

- Class AA is composed of bonds with sinking fund features
- Class BB is composed of callable bonds that are non-callable for the first 5 years then callable with a make-whole feature
- Liabilities of $93M
- Effective liability duration of 8

(a) (*1 point*) Explain how bonds with sinking fund provisions work.

(b) (*1 point*) Describe the make-whole call feature and explain why it's attractive to borrowers and lenders.

One problem with the modified duration values shown in the table above is that each is derived with respect to a different reference rate of interest.

(c) (*1 point*) List two benefits of having the effective duration of assets based on changes in the same reference yield.

7. Continued

Basis risk refers to the risk attributable to uncertain movements in the spread between yields associated with a particular financial instrument or class of instruments and a reference interest rate over time.

(d) (*1 point*) List some examples of basis risk.

(e) (*3 points*) Recommend a re-allocation of investments within the two available asset classes to achieve surplus immunization.

(f) (*2 points*) Describe financial market conditions and XYZ insurance product features that create an interest rate risk profile known as a "short-straddle".

8. (*5 points*) You work for the endowment office at Big Bucks University. The office wishes to support the inflation-sensitive costs of operating Big Bucks and is considering investing in commodities.

(a) (*1 point*) Contrast the two approaches to investing in commodities as described in Maginn and Tuttle.

(b) (*1 point*) Describe components of commodity index return.

The university president believes that all commodities would work as an effective inflation hedge. You test this premise and derive the following table of factor correlations where the proxy for unexpected inflation is the monthly change in inflation beyond one standard deviation of the average.

Factor correlations 1990 - 2010

Index	Unexpected Inflation
Commodity – Overall	0.45
Commodity – Agricultural	−0.28
Commodity – Energy	0.49
Commodity – Industrial Metal	0.13
Commodity – Livestock	−0.13
Commodity – Non-Energy	−0.24
Commodity – Precious Metal	0.16
S&P 500	−0.23
Barclay Gov/Corp	−0.07

(c) (*1.5 points*) Critique the university president's belief.

The president also noted that the recent spike in commodity prices could not be justified because supply and demand have been steady and are expected to continue to be steady into the near future.

(d) (*1.5 points*) Explain this spike in commodity prices using behavioral finance theory, assuming the president is right.

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

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