SOCIETY OF ACTUARIES
Advanced Portfolio Management

Exam APMV

MORNING SESSION

Date: Friday, May 1, 2009
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 10 questions numbered 1 through 10.

   b) The afternoon session consists of 10 questions numbered 11 through 20.

   The points for each question are indicated at the beginning of the question. Questions 1 through 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 APMV.

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 APMV-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

1. (*6 points*) LifeCo management is concerned about the dollar duration mismatch in the traditional line of business. It has been suggested that the company increase its exposure to non-agency Collateralized Mortgage Obligations (CMO) as a means of closing the duration gap. You have been assigned to study this strategy.

(a) Describe non-agency CMOs.

(b) Compare agency and non-agency CMOs.

(c) Assess the appropriateness of this new investment strategy.

(d) Determine whether this strategy complies with LifeCo's investment policy for the traditional line.

Questions 1 – 4 pertain to the case study

2. (*8 points*) As the Chief Investment Officer for LifeCo, you are looking to implement benchmarks for the fixed income portfolios.

(a) List and describe the basic steps in developing quantitative portfolio management techniques relative to an index.

In order to better analyze and manage the portfolio risk and performance of LifeCo's fixed income assets backing the $1.5 billion of accumulation annuities, you are reviewing the following XYZ Index:

XYZ Index Composition	% in Index	Effective Duration
Investment Grade AA	15%	6.0
Investment Grade A	32%	7.0
Below Investment Grade BB	5%	6.0
Below Investment Grade B	3%	4.0
Mortgage Products (including structured)	25%	7.0
Equity	20%	6.0
Total	100%	6.5

(b) Compare the XYZ Index to the ALM guidelines in Section V of LifeCo's ALM Policy Statement.

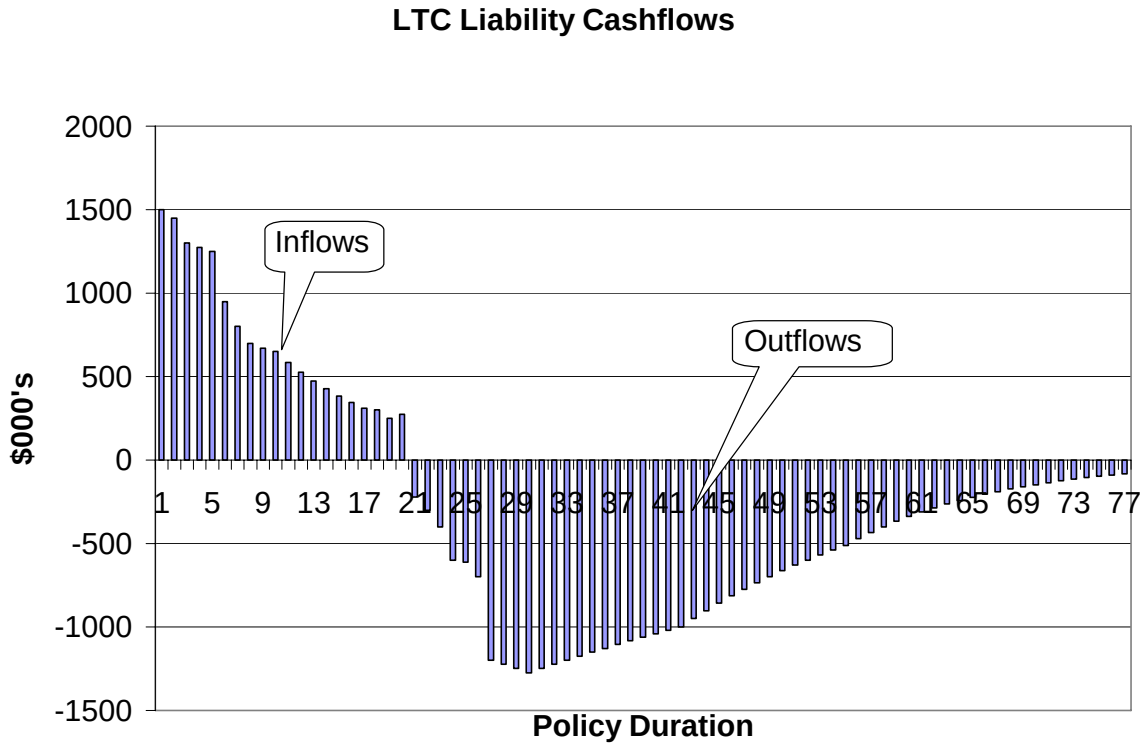
(c) Evaluate the appropriateness of the XYZ index, given LifeCo's investment constraints:

(i) With respect to the current asset composition.
(ii) As a benchmark.

(d) Describe the complexities arising as a result of the fact that, in general, fixed income benchmarks are capitalization weighted and all-inclusive.

Questions 1 – 4 pertain to the case study

3. (*7 points*) LifeCo wishes to enter the long term care (LTC) market but is concerned about the investment risk associated with this type of product. The chart below shows the typical LTC product's early cash inflows vs. later cash outflows by policy duration.



(a) Describe the key components of an investment policy statement for this new line of business.

LifeCo management does not want to create a separate segment for this block and is considering combining the LTC block of business with a segment backing one of the existing blocks of business:

(1) Closed block of traditional life business

(2) UL block

(3) Accumulation annuity block

(b) Analyze the appropriateness of each of these three possibilities with respect to investment strategy.

(c) Describe the investment strategy considerations that must be addressed for a separate segment for LTC.

Questions 1 – 4 pertain to the case study

4. (*8 points*) LifeCo is considering entering into the credit default swap (CDS) below to generate additional income and to enhance its risk management. LifeCo management does not want to have more than 19% of the Non-Traditional Life segment invested in below investment grade bonds. The CDS protects the purchaser against a rating downgrade to below investment grade.

Equivalent Annual Premium	130bps
Notional	$10 million
Asset-Backed Securities	Residential Mortgages

(a) List and describe the key components of the derivative policy for this initiative.

(b) Describe how LifeCo could use this CDS to increase the yield on assets.

(c) Calculate the amount of the CDS needed to increase the segment yield to 7.25% to support crediting rates in its Non-Traditional Life segment.

(d) Describe the losses that the LifeCo's Non-Traditional Life segment may realize from the arrangement described in (c) due to recent downgrades in the mortgage sector.

(e) Explain whether this strategy is consistent with LifeCo management's fiduciary obligations.

5. (*9 points*) Due to a recent credit market crash, JAR Insurance would like to enhance its credit risk management. The details of JAR's bond portfolio are described below:

Company	Exposure	Band	Default probability
A	250,000	3	0.02%
B	620,000	6	0.12%
C	323,000	3	0.50%
D	643,000	6	0.09%
X	120,000	1	1.20%

Company X's asset value follows Brownian motion with the following data:

Asset(V_0):	120,000
volatility of asset (σ):	30%
mean(μ):	15%
risk free rate:	4%
company debt:	
short term	120,000
long term	0

Assume all bonds are short term with one year maturity.

(a) Calculate the real world and the risk neutral default probabilities of company X using the KMV approach.

(b) Calculate the expected recovery and the expected loss given default for company X using the KMV approach in a risk neutral world.

(c) Calculate the expected number of defaults in band 6 using the CreditRisk+ model. Assume that an exposure unit equals $100,000 and the recovery rate is 0%.

(d) Compare and contrast the KMV approach and the CreditRisk+ model.

6. (*4 points*)

(a) Describe the risks embedded in Collateralized Mortgage Obligations.

(b) Describe the special considerations of mortgage passthroughs with coupons above current market rates.

(c) Recommend approaches to hedge each risk identified in (a).

7. (*5 points*) A portfolio has the following credit rating profile:

Rating	Percentage
Aaa	5%
Aa	10%
A	30%
Baa	50%
Ba	5%

Given the following 12 month credit transition frequency matrix:

	12 Month Transition (percent)							
Initial Rating	Aaa	Aa	A	Baa	Ba	B	Caa-C	Default
Aaa	85	10	5					
Aa		80	10	5	5			
A			75	10	10	5		
Baa				75	10	10	5	
Ba				5	65	15	10	5
B					5	60	20	15
Caa-C						10	65	25

(a) Calculate the expected credit rating profile of the portfolio at the end of 12 months.

(b) Describe how a credit default swap (CDS) works.

(c) Assess how CDS can be used to hedge credit risk in the portfolio.

8. (*5 points*) You are using the mean variance approach for asset allocation optimization.

(a) Describe the reverse optimization procedure for setting inputs.

(b) Explain the motivations for using the reverse optimization procedure.

(c) Calculate the expected return for each asset using the reverse optimization procedure. Assume that:

- the current riskless rate of interest is 3%;
- the market risk premium is 4%;
- the relative values for the assets are as follows:

Cash	10%
Bonds	40%
Stocks	50%

- the covariance matrix is:

	Cash	Bonds	Stocks
Cash	0	0	0
Bonds	0	0.003	0.006
Stocks	0	0.006	0.031

9. (*4 points*) Behavioral biases among different group dynamics can impact the overall investment performance of a corporation.

(a) Discuss the different behavioral biases facing investors today.

(b) Explain how these biases are impacted by different social groups.

(c) Describe the impact this can have on the Efficient Market Hypothesis.

10. (*4 points*) You manage an equity portfolio that is benchmarked to the Mud & Poors 500 index (M&P 500). You are concerned about downside market volatility and want to maintain past gains achieved by the portfolio. You also want to ensure that you will be able to keep some future appreciation in the index, although you do not expect large (in excess of 10%) increases in the value of the index over the next 30 days.

You have been presented with the following statistics on two M&P 500 European options:

	Call Option	Put Option
Strike	920	835
Price	61.00	122.00
Delta	0.42	–0.51
Option Expiration	30 days	30 days

The current level of the M&P 500 is 875.

(a) Recommend a costless option strategy that can be implemented to address your concerns, given your expectations.

(b) Describe the total payoffs of your recommended option strategy stated in (a).

(c) Calculate the index level at which the portfolio (including option positions) would experience losses.

Assume there are no transaction costs.

****END OF EXAMINATION****
MORNING SESSION