SOCIETY OF ACTUARIES
Advanced Portfolio Management

Exam APMV

MORNING SESSION

Date: Friday, April 30, 2010
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 12 questions numbered 1 through 12.

   b) The afternoon session consists of 11 questions numbered 13 through 23.

   The points for each question are indicated at the beginning of the question. Questions 1 through 6 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 – 6 pertain to the Case Study
Each question should be answered independently.

1. (*3 points*) LifeCo is looking to increase the number of foreign currency denominated funding agreements it sells in its Guaranteed Investment Contract business line. LifeCo reports its income in U.S. dollars. The portfolio manager for this line has suggested investing directly in high grade assets denominated in the respective currency for foreign currency funding agreements in order to hedge the currency risk exposure.

(a) (*1 point*) Explain how the portfolio manager's investment strategy exposes LifeCo to fluctuations in its Investment Income and Operating Income.

(b) (*1 point*) Evaluate how well the types of derivatives approved by LifeCo's Board of Directors would hedge potential fluctuations in Investment Income and Operating Income.

(c) (*1 point*) Describe how your evaluation in (b) might change, given a proposal to invest in high yield rather than high grade bonds.

Questions 1 – 6 pertain to the Case Study
Each question should be answered independently.

2. (*6 points*)

(a) (*2 points*) Explain why hedging with derivatives might be more beneficial for a firm with significant tax preference items than without.

(b) (*2 points*) Formulate a strategy to hedge the risks inherent in a mortgage-backed security using futures on two Treasuries with different maturities.

(c) (*2 points*) Evaluate your proposal of a 2-bond hedge in terms of its effectiveness and compliance with LifeCo's Operational Guidelines For Use of Derivatives (Case Study Appendix C).

Questions 1 – 6 pertain to the Case Study
Each question should be answered independently.

3. (*5 points*)

(a) (*1 point*) Describe the embedded option(s) in LifeCo's current variable annuity product.

(b) (*1 point*) Describe how LifeCo's earnings could be adversely impacted in the variable annuity line if market conditions deteriorate.

(c) (*1 point*) Recommend a risk management strategy for this business.

LifeCo is considering adding the following feature to its variable annuity product:

> "The policyholder will have the right to transfer funds at book value from the general account to a money market sub-account without any restrictions or any surrender charge."

(d) (*1 point*) Identify the type of embedded option inherent in this new feature.

(e) (*1 point*) Describe how the embedded option of this feature differs from the embedded option inherent in LifeCo's long-term disability product.

Questions 1 – 6 pertain to the Case Study
Each question should be answered independently.

4. (*5 points*) You are a newly appointed ALM actuary for LifeCo. Your first tasks are to review the current General Account portfolios backing LifeCo's pension business and recommend any changes to its investment policy.

(a) (*1 point*) Describe typical constraints on asset sales and how they could influence decisions about portfolio rebalancing.

(b) (*2 points*) Explain how each of the 4 strategies listed below can help the company mitigate risk and create value.

(i) Keeping required capital on assets under 3%.

(ii) Minimizing duration mismatch with asset sales.

(iii) Minimizing duration mismatch without asset sales.

(iv) Minimizing liquidity and marketability risk.

(c) (*2 points*) Recommend changes to asset allocations for LifeCo's Payout Annuity Portfolio separately for each of the 4 strategies in (b).

Questions 1 – 6 pertain to the Case Study
Each question should be answered independently.

5. (*4 points*) Using a new liability model, the calculated effective duration of the universal life liabilities of LifeCo increases from 4.0 years to 6.0 years. An actuarial student chooses to use duration of surplus (D_S) to measure the interest rate sensitivity of surplus for this line of business.

(a) (*1 point*) Explain how effective duration can be calculated for universal life liabilities.

(b) (*1 point*) Calculate the D_S for this line of business using the updated duration information.

(c) (*1 point*) Assess the limitation of using D_S as the risk metric in this context.

LifeCo's investment team is considering buying one of two corporate bullet bonds with exactly the same maturity and credit rating (AA by S&P), and plans to hold this bond to maturity. Bond A's current market price is 90.1 and Bond B's price is 90.6. The team uses the historical default probability provided by a rating agency and proposes to invest in Bond A because of the higher expected return.

(d) (*1 point*) Evaluate the adequacy and appropriateness of this decision.

Questions 1 – 6 pertain to the Case Study
Each question should be answered independently.

6. (*5 points*) LifeCo's ALM Committee is concerned about the interest rate risk inherent in the Company's institutional pension business. The Committee is considering using floating rate assets (floaters) as part of the ALM strategy for the floating rate liabilities in this block of business. The two floaters under consideration have 11% caps, and are payable in U.S. dollars.

Floater	Coupon Formula	Maturity Date	Price
A	LIBOR + 30 basis points	31/12/2013	$98
B	Fed Funds + 30 basis points	31/12/2013	$102

(a) (*1 point*) Discuss the major risks associated with ALM applications using floaters.

(b) (*1 point*) Explain how LifeCo could use floaters for ALM and the risks to be addressed.

(c) (*1 point*) List the factors that could explain the differing prices of the two floaters.

(d) (*2 points*) Describe 2 other strategies employing floaters that provide opportunities to add value.

7. (*7 points*) You are provided an analyst's report on a real estate investment as follows:

- The required rate of return (R) is based on the following multifactor model:

$$R = a + b_1 \times F_1 + b_2 \times F_2 + b_3 \times F_3 + b_4 \times F_4 + b_5 \times F_5 + e$$

a = constant term

b_i = sensitivity of the investment to factor i

F_i = value of factor i

e = error term

i	Content	b_i	F_i as of 12/31/2010
1	Inflation Rate	0.4983	3.00%
2	Credit Spread	0.29975	5.00%
3	Treasury Rate	0.3795	2.00%
4	GDP Index	0.000000198	47,000
5	Vacancy Rate	0.044825	80%

The b values above were estimated using historical data.
Calculated Return: 8%
R-squared: 30%

- The intrinsic value of the real estate investment is based on the pro forma below.

	Cash Flow Projections				
	Year 1	Year 2	Year 3	Year 4	Year 5
Potential Rent	20	20.6	21.2	21.9	22.5
Occupancy	82%	82%	82%	82%	82%
Net Rent	16.3	16.8	17.3	17.8	18.3
Operating Expenses:					
Variable expenses	-2.0	-2.1	-2.1	-2.2	-2.3
Fixed expenses	-3.1	-3.1	-3.1	-3.1	-3.1
Total Operating Expenses	-5.1	-5.2	-5.2	-5.3	-5.4
Net Operating Income	11.2	11.6	12.1	12.5	13.0
Capital Expenses:					
Leasing commissions	-1.0	-1.0	-1.0	-1.1	-1.1
Tenant improvements	-1.6	-1.7	-1.7	-1.8	-1.8
Others	-0.5	-0.5	-0.5	-0.5	-0.6
Total Capital Expenses	-3.1	-3.2	-3.3	-3.4	-3.5
Net Cash Flow	8.1	8.4	8.8	9.1	9.5

7. Continued

Required rate of return	8%
Reversionary capitalization rate	9%
PV of net cash flows	$35
Asking price	$120

- Conclusion
  The present value of the net cash flows from this pro forma using the discount rate equal to the required rate of return from the multifactor model is $35 million, which is much less than the asking pricing of $120 million. Therefore, it is not recommended to go with this real estate deal.

(a) (*1 point*) Describe any concerns in using real estate multifactor models.

(b) (*1.5 points*) Describe how you can improve this multifactor model.

(c) (*2 points*) Identify any concerns from using the PV of the net cash flows shown above to draw the reported conclusion, making any adjustments as needed.

(d) (*1.5 points*) Recommend other considerations relevant to a real estate acquisition.

(e) (*1 point*) Describe supplementary quantitative approaches that could enhance valuations of real estate investments.

8. (*5 points*) UpNorth Company has sold various insurance products including a sizable block of payout annuities with a cost of living adjustment. Its asset portfolio consists of only cash, equities, commercial mortgage loans, mortgage backed securities, and corporate bonds.

To diversify the asset portfolio and manage the inflation risk in its liabilities, you propose making new investments in commodities and inflation-linked bonds.

You have identified an inflation-linked bond with the following characteristics:

- Maturity 3 years from now
- Annual coupon payments
- Real yield: 3%
- Principal paid at maturity will be based on changes in the consumer price index (CPI) over the life of the bond.
- At issue: Original principal = \$1,000, and $CPI_0 = 100.00$.

You project that the CPI in the next two years will be: $CPI_1 = 102.00$, $CPI_2 = 106.00$.

(a) (*1.5 points*) Explain how the new assets might improve asset diversification and inflation risk management.

(b) (*1.5 points*) Describe the economic drivers of return for long-only commodity indexation.

(c) (*1 point*) Calculate the coupon payments in Year 1 and Year 2 for the inflation-linked bond.

(d) (*1 point*) Determine CPI_3 assuming the inflation-linked bond held to maturity would realize a nominal yield of 7%.

9. (*6 points*) LongCo is pricing a level premium Long Term Care Insurance (LTCi) policy. To reduce the risk associated with investing this product's future positive cash flows at lower rates than those assumed in pricing, LongCo has made arrangements to securitize the LTCi premiums, receiving a lump-sum at policy issuance. LongCo understands this securitization will not eliminate interest rate risk entirely, and is considering 3 strategies to mitigate the remaining interest rate risk:

(i) Select assets based on Single-period immunization

(ii) Select assets based on Multi-period immunization

(iii) Purchase offsetting derivatives

(a) (*1 point*) Describe, with respect to securitizing the premium stream for this product:

(i) the advantages of this process

(ii) and the risk inherent in this process and the factors that give rise to this risk

(b) (*1 point*) Describe general conditions to consider when creating an immunized portfolio.

(c) (*2 points*) Describe any additional considerations when executing a multi-period immunization as compared to a single period immunization.

(d) (*2 points*) Describe an interest rate hedge using derivatives such that the profit of the LTCi business could be locked in.

10. (*4 points*)

(a) (*1.5 point*) Compare and contrast cash flow CDOs and market value CDOs.

You are given the information below for an arbitrage-driven CDO:

Tranche	Par Value	Coupon Type	Coupon Rate
Senior	70,000,000.00	Floating	LIBOR + 50 bps
Mezzanine	20,000,000.00	Fixed	10-year Treasury Rate + 250 bps
Subordinate/equity	10,000,000.00		

Available market swap agreement:

- Receive LIBOR
- Pay fixed rate each year equal to the 10-year Treasury rate plus 150 bps

The underlying collateral of the CDO consists of bonds that all mature in 10 years and the coupon rate for every bond is the 10-year Treasury rate plus 400 bps.

(b) (*2.5 points*) Calculate how many basis points above Treasury rates the subordinate / equity tranche is expected to receive, assuming no defaults.

11. (*5 points*) Your company has just acquired a block of traditional life insurance policies from a competitor. The liabilities are backed by a fixed income portfolio of $250M. You are to establish the guidelines for its management. The effective duration of assets (D_A) is 8.1 and the effective duration of liabilities (D_L) is 12.5. The assets are as follows:

Asset	Actual Value	Benchmark	Benchmark return	Target Allocation
A1a Govt Bonds	$100M	Barclays	5.00%	17%
A1a Public corporate bonds	$65M	Barclays	5.75%	50%
A1f CMO's	$65M	Merrill Lynch	6.25%	25%
Policyholder loans	$20M			8%
Total Assets	$250M			100%

(a) (*1.5 points*) Describe why it may be appropriate to use a customized benchmark in measuring the investment performance of a portfolio.

(b) (*1.5 points*) Recommend and justify your recommendation of the use of either a market-based benchmark, a customized index, or a combination for your situation.

(c) (*1 point*) Recommend and justify your recommendation of a simple customized index using the data for your portfolio. Calculate its expected return.

(d) (*1 point*) Briefly describe two methods of taking into account duration or other characteristics of the assets and liabilities in constructing a benchmark.

12. (*5 points*)

(a) (*1 point*) Calculate the one month time-weighted rate of return (TWR) and market-weighted rate of return (MWR), given the information below.

	08/30/09	09/15/09	9/30/09
Account Value	500,000	900,000	1,500,000
Inflow (outflow)	0	600,000	0

(b) (*1 point*) Explain why TWR and MWR are different in the case above and describe the circumstances in which these two measures will be equal.

(c) (*1 point*) Calculate the four performance measures: Jensen's Alpha, Treynor Measure, Sharpe Ratio, and M^2, given the risk and return measures of the market and the fund manager below.

Risk-free rate (*Rf*)	2.0%
Expected market return (*Rm*)	7.0%
Standard Deviation of market return (σm)	12.0%
Expected portfolio return (*Ra*)	5.0%
Portfolio Beta (βa)	0.50
Standard Deviation of portfolio return (σa)	10.0%

(d) (*2 point*) Assess the fund manager's skill given the four measures above.

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