

Exam RETRPIRM

Date: Friday, May 3, 2019
Time: 2:00 p.m. – 4:15 p.m.

INSTRUCTIONS TO CANDIDATES

General Instructions

1. This examination has a total of 40 points.

This exam consists of 6 questions, numbered 1 through 6.

The points for each question are indicated at the beginning of the question.
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 because 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 Exam RETRPIRM.
6. Be sure your written-answer envelope is signed because if it is not, your examination will not be graded.

Recognized by the Canadian Institute of Actuaries.

Tournez le cahier d'examen pour la version française.

****BEGINNING OF EXAMINATION****

- 1.** (6 points) ABC Company is considering changing the asset allocation for its defined benefit pension plan as follows:

Asset Class	Current Asset Allocation	Proposed Asset Allocation
Equities	40% Global Equities	30% Global Low Volatility Equities
Fixed Income	60% Medium-term Bonds	60% Long-term Bonds
Alternatives	0%	10% Real Estate

- (a) (4 points) Describe the objectives that ABC may have that would justify the change.
- (b) (2 points) Describe what a plan sponsor should consider prior to adopting a low volatility equity strategy.

2. (8 points) XYZ Company sponsors a defined benefit pension plan and is reviewing its liability-driven investment strategy.

You are given:

	Value	Effective Duration	Key Rate Durations		
			Short-term D ₁	Medium-term D ₂	Long-term D ₃
Total plan liabilities	\$45,000,000	15	2	8	5

Current Portfolio	Market Value	Effective Duration	Key Rate Durations		
			Short-term D ₁	Medium-term D ₂	Long-term D ₃
Short-term bond fund	\$0	6	6	0	0
Medium-term bond fund	\$37,500,000	18	1	15	2
Long-term bond fund	\$0	25	0	0	25
Equities	\$10,000,000	0	0	0	0

- (a) (2 points) Describe four uses of key rate durations.
- (b) (4 points) Calculate the effect of the following yield curve shifts on the plan's financial position:

	Short-term D ₁	Medium-term D ₂	Long-term D ₃
Shift 1	+50 bps	+50 bps	+50 bps
Shift 2	-30 bps	+10 bps	-30 bps

Show all work.

- (c) (2 points) Recommend changes to the current portfolio that will minimize the impact of yield curve changes on the plan's financial position.

Justify your recommendation.

3. (8 points)

- (a) (3 points) Compare and contrast the priorities of taxpayers and plan members with respect to public pension plans.
- (b) (2 points) Describe two challenges that public pension plans face in effectively monitoring risk.

Below are three provisions in a risk management policy of a public pension plan:

- (i) The following funded statuses of the plan will be disclosed in an actuarial report issued once per year:
- ongoing (or going concern) basis using a best estimate discount rate
 - risk-free basis
- (ii) The impact on the plan's funded status and future contributions assuming either an immediate increase or decrease of 20% in the asset value will be disclosed once per year.
- (iii) If the plan falls below 70% funded on a risk-free basis, action is required to bring the funded percentage up to 70% within a 2-year period through a combination of increased contributions from taxpayers and/or lowering benefit amounts.
- (c) (3 points) Critique the three provisions described above.

4. (6 points)

- (a) (4 points) Compare and contrast the following pension risk transfer solutions
- (i) Annuity buy-in
 - (ii) Annuity buy-out
 - (iii) Longevity risk transfer
- (b) (2 points) Recommend an appropriate pension risk transfer solution for a defined benefit pension plan with the following characteristics:
- The plan has over 9,000 retired lives
 - 90% funded status
 - Asset allocation of 70% fixed income 30% equities
 - Objective is to de-risk the plan gradually as funded status improves
 - Increases in contributions in the short term are to be avoided

Justify your response.

5. (7 points)

- (a) (4 points) The financial economics viewpoint suggests that, in most cases, company-sponsored pension plans should only be invested in bonds.

Describe the four assumptions underlying this viewpoint.

- (b) (3 points) Critique the following statement from a financial economics perspective

“Pension plan liabilities should only be discounted at the risk-free rate.”

6. (5 points) You are given:

Asset Class	Asset Allocation of the Portfolio	Expected Total Return	Standard Deviation of Return
Domestic Equity	50%	6.5%	8%
International Equity	50%	6.0%	9%

The risk-free rate is 2.0%.

The correlation between domestic and international equity is 0.65.

- (a) (1 point) Calculate the standard deviation of the portfolio.
- (b) (2 points) Calculate the marginal contribution to portfolio risk of:
- (i) Domestic equities
 - (ii) International equities

The investor sells one unit of domestic equity.

- (c) (1 point) Calculate how many units of international equity the investor must purchase to retain the same level of risk in the portfolio.
- (d) (1 point) Calculate the change in the portfolio expected excess return.

Show all work.

****END OF EXAMINATION****

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