# SOCIETY OF ACTUARIES
## Retirement Plan Investment & Risk Management Exam

# Exam RETRPIRM

**Date:** Friday, April 28, 2017
**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.

Tournez le cahier d’examen pour la version française.


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****BEGINNING OF EXAMINATION****

**1.** (*4 points*)

(a) (*2 points*) Explain why a plan sponsor would invest pension funds in private equity.

(b) (*2 points*) Describe the challenges faced by a pension plan sponsor when investing in private equity.

**2.** (*8 points*) ABC Company sponsors a defined benefit (DB) pension plan that utilizes a liability-driven investment approach.

The plan currently invests only in the following two funds:

| | Fund duration | Current yield |
|---|---|---|
| Corporate bond fund | 10 | 4.0% |
| Federal government bond fund | 20 | 2.5% |

**<u>Additional information:</u>**

| | |
|---|---|
| Assets: | \$1,000 |
| Liabilities: | \$1,000 |
| Liability Duration: | 13 |
| Discount Rate: | 4.5% |
| Discount Rate Basis: | Corporate bond yield |

(a) (*2 points*) Explain how interest rate risk affects DB plan sponsors.

(b) (*1 point*) Calculate the allocation of assets to each of the two funds to match the liability duration of the plan.

Show all work.

Assume Federal government bond yields increase by 0.50% and credit spreads narrow by 0.75%.

(c) (*2 points*) Calculate the plan's new funded status using the asset allocation calculated in part (b).

Show all work.

(d) (*3 points*) Explain in words how the changes to Federal government bond yields and credit spreads affected the assets, liabilities, and funded status of the plan.

**3.** (*10 points*) XYZ Company, a publicly traded company which prepares its financial statements under US GAAP, sponsors a defined benefit pension plan.

You are given:

| | |
|---|---|
| Corporate assets ($ millions) | $5,000 |
| Corporate debt ($ millions) | $3,000 |
| Shareholder equity ($ millions) | $2,000 |
| CAPM beta for XYZ stock | 1.50 |
| Pension benefit obligation (PBO) ($ millions) | $2,250 |
| Pension trust assets ($ millions) | $2,000 |
| Asset allocation | 70% in diversified equities; 30% in bonds |
| Present value of future administrative expenses ($ millions) | $100 |
| Increase in PBO if measured under annuity pricing mortality and discount rate assumptions ($ millions) | $150 |
| Risk-free rate of return | 3.00% |
| Market risk premium | 4.00% |

(a) (*2 points*) Describe three disadvantages of using the PBO as the pension liability on a holistic balance sheet.

(b) (*1 point*) Describe the adjustments that should be made to the PBO to determine the pension liability under a holistic balance sheet approach.

XYZ has chosen an alternative measure for pension liability equal to $2,450 million. Assume that corporate debt, diversified bond investments and pension liabilities are not correlated with the equity market.

(c) (*2 points*) Calculate the Weighted Adjusted Cost of Capital (WACC) using:

(i) The accounting balance sheet; and

(ii) The holistic balance sheet.

Show all work.

(d) (*2 points*) Explain the implications of using the accounting balance sheet approach to determine WACC instead of the holistic balance sheet approach.

**3.** **Continued**

XYZ Company is interested in reducing its WACC. They have the opportunity to borrow \$500 million by issuing debt, which will be contributed to the pension fund. This issuance will have a beta of 0.2. The additional funding will be invested based on the same allocation as the current allocation of assets.

(e) (*3 points*) Recommend whether or not XYZ Company should borrow capital to fund the plan. Justify your response.

**4.** (*8 points*) XYZ Company sponsors a defined benefit pension plan.

You are given the following excerpts from the investment policy for XYZ's pension plan:

| | | | |
|---|---|---|---|
| Plan characteristics | The plan is closed to new entrants with no future accruals for current members.<br><br>The plan is 100% funded. | | |
| Investment manager selection | ABC Investing has been selected as the investment manager for the plan. ABC Investing may, at its discretion, delegate some of its duties to other investment managers. | | |
| Investment return objective | 8% per year | | |
| Risk tolerance | The determination of the risk tolerance is delegated to ABC Investing, who can assess the level of risk needed to achieve the investment return objective. | | |
| Asset allocation<br>Fixed income<br>Equities<br>Alternatives | Minimum<br>0%<br>0%<br>0% | Target<br>25%<br>35%<br>40% | Maximum<br>75%<br>75%<br>60% |
| Benchmark | As selected by the investment manager from time to time. | | |
| Investment performance monitoring | ABC Investing must provide regular quantitative and qualitative reporting to XYZ Company. | | |

Critique the above excerpts from the investment policy considering CAPSA Guideline No. 6 and XYZ Company's fiduciary duties.

**5.** (*4 points*) Governments are increasingly concerned about the various investment risks faced by defined contribution pension plan participants and plan sponsors. As a result, governments are establishing policies and regulations to help mitigate these risks.

Compare and contrast how quantitative asset restrictions (QAR) and the prudent person rule (PPR) approaches to regulation could address these risks.

**6.** (*6 points*) XYZ Company has recently frozen its defined benefit pension plan and intends to terminate it when the plan is fully funded.

You are given:

- The pension plan is currently invested in 70% equities and 30% fixed income
- The plan liabilities are $100 million on a termination basis
- The plan assets are $70 million
- The total plan asset duration is 4
- The plan liability duration is 16

XYZ Company has the following objectives:

- Reduce balance sheet volatility; and
- Minimize any increases to contributions.

(a) (*3 points*) XYZ Company has proposed maintaining the current asset allocation until the plan is terminated. Describe the merits and risks of XYZ's proposal.

(b) (*3 points*) Recommend an alternative investment strategy based on XYZ Company's objectives. Justify your response.

****END OF EXAMINATION****

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