# RET RPIRM Model Solutions
# Spring 2020

## 1. Learning Objectives:

1. The candidate will understand how to analyze the issues facing retirement plan sponsors regarding investment of fund assets and make recommendations.

**Learning Outcomes:**

(1a) Assess the different types and combinations of investment vehicles for providing retirement benefits given the particulars of the stakeholders' financial circumstances, philosophy, industry, work force and benefit package.

(1d) Assess the potential effects of various investments and investment policies on all of the stakeholders, including tax implications.

(1f) Identify and assess the sources of investment risk applicable to retirement fund assets.

**Sources:**

Litterman Ch. 27, Managing a Portfolio of Hege Funds

RPIRM-132-14, Guideline No. 6, Pension Plan Prudent Investment Practices Guideline

RPIRM-104-15, Chapter 12 of Managing Investment Portfolios

RPIRM-103-15, Fiduciary Liability Issues for Selection of Investments

**Commentary on Question:**

*The first part of this question tests candidates' ability to identify the main characteristics of hedge funds in a general sense. The second part of the question asks candidates to evaluate the appropriateness of hedge funds as investments in both defined benefit plans and defined contribution plans.*

**Solution:**

(a) Describe the characteristics of hedge funds.

**Commentary on Question**:

*Most candidates scored well in part a.*

## 1. Continued

The characteristics of hedge funds include:

- **Constraints:**
  Hedge funds allow investment managers to engage in pure active management, with no consideration of a benchmark, and no constraints on the ability to use short selling, leverage, instruments and strategies.

- **Regulation:**
  In the United States, the SEC does not regulate hedge funds.

- **Fee structure**
  Fund fees include a fixed management fee, a proportional participation performance fee, and a high water mark.

- **Lack of Transparency**
  Most hedge funds will not reveal the assets held, and protect information on short positions.

- **Short lives**
  The half-life of hedge funds is about 2 ½ years

- **Illiquidity**
  Most funds allow redemption on a monthly basis or less often. Redeeming investors must notify the hedge fund manager well in advance of the redemption date, decreasing liquidity.

- **Capacity**
  High performing funds may be able to take in a limited amount of capital.

(b) Describe the advantages and disadvantages of including hedge funds in the assets of:

(i) Defined benefit plans; and

(ii) Defined contribution plans.

**Commentary on Question**:
*Most candidates scored well in part b also. Many mistakenly listed hedge funds generating superior returns as an advantage. This is not necessarily the case.*

**1.** **Continued**

**Defined Benefit plans**
**Advantages:**

- DB plans employ professional investment managers who are better equipped to evaluate a hedge fund's performance.
- **Duty to diversify:** One of the trustee's duties is the duty to diversify the investments of the plan so as to minimize the risk of large losses.
- Investing a portion of a DB plan's assets in hedge funds can create more diversification of assets, and many of the strategies employed (short positions, etc.) are designed to reduce the volatility of returns.
- **Duty to delegate:** One of the trustee's duties if the duty to delegate the selection of the investment manager. Investment of DB assets in a hedge fund is a form of delegation.

**Disadvantages:**

- **Monitoring:** The plan administrator needs to monitor the risks facing the plan and the performance of the fund and the manager. The lack of transparency of some funds would make this difficult to do. The plan administrator would prefer to understand the investment process and philosophy. The hedge fund managers would prefer less transparency to limit capacity in certain strategies. Since certain funds may be difficult to monitor, they may not be appropriate for DB plans.

- **Liquidity needs of the DB plan:** Hedge funds are much less liquid than other investments. The demographics of the plan need to be considered, as well as plan features. For example, plans that pay lump sums may demand a higher level of liquidity and hedge funds are not liquid.

**Defined Contribution plans**
**Advantages:**

- Hedge funds may be appropriate as part of a target date fund that the plans offer since risks can be hedged.

**Disadvantages:**

- **Designed for sophisticated investors.** Since hedge funds are unregulated and are designed for sophisticated investors, they are not appropriate for DC plans as a stand-alone investment, since some of the plan participants may have little understanding of investments.

- Hedge and private equity investments often impose strict redemption requirements and penalties, meaning that a DC plan can't simply exit a fund if the plan fiduciaries want out. In contrast, a plan can liquidate its mutual fund holdings in a matter of seconds if the fiduciaries decide that the fund is not prudent.

## 2. Learning Objectives:

2. The candidate will recognize and appropriately reflect the role of plan investments in retirement plan design and valuation.

**Learning Outcomes:**

(2d) Apply and evaluate strategies and techniques for asset/liability management.

**Sources:**

RPIRM-111-13, Mind the Gap: Using Derivatives Overlays to Hedge Pension Duration

RPIRM 139-16, Prudent Investment Practices for Derivatives

**Commentary on Question:**

*This question begins by testing candidates' ability to compute the notional principal of a swap overlay for a hypothetical scenario involving an asset-liability duration mismatch. It then goes on to ask candidates to describe how swaption strategies work in a general sense, and what kinds of practices should be undertaken to comply with applicable standards of prudence in an investment context.*

**Solution:**

(a) Construct an overlay strategy that minimizes interest rate risk.

Show all work.

**Commentary on Question**:

*Most candidates scored well on part a.*

First, we calculate effective duration of the liabilities:

Effective duration = - [(550 - 450) / (0.04 - 0.06)] * (1/500) = 10.0

Since the assets have duration of 2.5, there is a 7.5 year duration gap. To minimize interest rate risk, we must increase the asset duration toward 10.

A receive-fixed swap increases the asset duration; a pay-fixed swap reduces it. [Since a pay-fixed swap has negative duration, it cannot close the gap and thus cannot minimize interest rate risk].

So we want a receive-fixed swap with notional principal (NP) equal to:

$500 million * (10.0 – 2.5) / 15.0 = $250 million

Thus, a receive-fixed swap overlay of $250 million best minimizes interest risk.

## 2. Continued

(b) Describe swaption strategies that Company XYZ could consider for the purpose of managing interest rate risk.

**Commentary on Question**:
*Most candidates did well on part b also. The better candidates described how the payoff scenarios for swaptions varied based on the relation between the swap rate and the strike rate at exercise or expiration, and how that related to pension plan liabilities. Note, while the model solution below would earn full credit, there are additional valid points that could be made.*

I. Receiver Swaption

A receiver swaption requires an up-front premium.

At exercise date, if the swap rate is below the strike rate, the option is "in the money" and the plan can take delivery of the swap. The swap gain should offset the corresponding increase in pension liability.

II. Swaption collar

With a swaption collar, the plan buys a receiver swaption, and sells a payer swaption with a higher strike rate. This reduces or eliminates the up-front expense, making it (potentially) a “zero cost” collar.

At expiration date, if the swap rate is between the two strike rates, both swaptions expire “out of the money”.

At expiration date, if the swap rate is below the strike rate for the purchased receiver swaption, the gain on the swaption is offset by the increase in pension plan liability.

At expiration date, if the swap rate is above the strike rate for the sold payer swaption, the loss on the swaption is offset by the decrease in pension plan liability.

(c) Describe prudent investment practices for derivatives.

**Commentary on Question**:
*Candidate performance on part c was middling. Better-performing candidates probably noticed that the wording of the question is based off the title of an assigned study note. The note was organized in outline form, so a candidate familiar with its main points would have been well-prepared to answer this section.*

## 2. Continued

The Prudent Person Rule is a fiduciary standard for the administrator to exercise care, diligence, and skill of person of ordinary prudence.

With respect to investment policy documentation:

- the Statement of Investment Policies and Procedures (SIPP) should document the authorized use and overall objective of derivatives.
- Risk Management Practices (RMP) should document derivative uses, strategies, and risk tolerances.

Best practices for risk mitigation include:

- value derivatives regularly
- establishing a sufficient collateral requirement for each derivative
- limits on derivatives, based on their intended use, strategies, and risk

Risk monitoring is important, and should include:

- controlling and monitoring the plan's exposure to each source of market risk
- monitoring counterparty credit risk and exposure limits

## 3. Learning Objectives:

2. The candidate will recognize and appropriately reflect the role of plan investments in retirement plan design and valuation.

3. The candidate will understand how to evaluate the stakeholders' financial goals and risk management with respect to their plan.

**Learning Outcomes:**

(2d) Apply and evaluate strategies and techniques for asset/liability management.

(3a) Compare the interests of plan sponsors, employees, shareholders, taxpayers and other stakeholders related to the financial management of a retirement plan.

(3d) Understand and apply the principles of financial economics with respect to pension plan investing.

**Sources:**

134-14 Liability Responsive Asset Allocation

Pension Actuary's Guide to Financial Economics

**Commentary on Question:**

*Commentary listed underneath question component.*

**Solution:**

(a) Describe practical considerations for implementing a glide path investment strategy.

**Commentary on Question**:

*To achieve full credit successful candidates correctly identified and described at a minimum 5 practical considerations from the list below. No credit was given for listing or describing the actual development of a glide path strategy as that was not what the question was asking.*

| Consideration | Description |
|---|---|
| Data Availability | Approach is only possible if funded status data can be obtained in a timely matter. |
| Change Date | Reallocating at end of month can be easier for management and reporting cycle. |
| Contributions | Integrating contributions with rebalancing can reduce costs. |
| Rebalancing Policy | Policy must accommodate dynamic approach and allowances for illiquid assets. |
| Trading | Funded status ranges can cause excess trading costs if too small and difficulty with large trades if too large. |

| | |
|---|---|
| Governance | Predetermined strategy allows assets to be reallocated in a timely manner with approvals already granted. However, responsive approach involves additional costs and effort to monitor status and execute changes. |
| Reporting | Procedures must be well-defined (assets, liabilities, funded status). |
| Review Policy | Policy should be reviewed regularly to determine if still appropriate. |

(b) Describe arguments for and against a glide path investment strategy from a financial economics perspective.

**Commentary on Question**:
*To achieve full credit successful candidates described at a minimum 4 pros and 4 cons of a glide path from a financial economics perspective. Candidates who scored well laid out their responses in a clear manner. No credit was given for answers which defined and/or described financial economics without relating it to a glide path. Simply stating an item without describing how it is pro or con did not receive credit.*

| **Item** | **Description** |
|---|---|
| Bond Allocation | Pro: Glide path does eventually reach a 100% fixed income allocation and is fully de-risked once 100% funded. |
| | Con: Strategy could allow for re-risking if funded status declines. A 100% funded status is approached over time rather than immediately funded. |
| Fair Market Value | Pro: Accounting rate may be appropriate if risk of default aligns with bonds used to calculate rate. |
| | Con: An ABO measure (rather than PBO) is more representative of the liability on a fair market value basis. |
| Capital Structure | Pro: Company maintains option to fully fund at any point but would not maintain option to remove assets from trust for other business needs. |
| | Con: Underfunding plan equates to borrowing from plan participants. This is less efficient than borrowing funds elsewhere and receiving interest tax deduction. |
| Tax Arbitrage | Pro: Value is eventually optimized once 100% bond allocation is reached. High-tax bond returns are sheltered in an account with special tax treatment. |
| | Con: Shareholder value is being destroyed during path to full funding. |
| Debt/Equity Mix | Pro: Shareholders can adjust personal portfolio to reflect plan investments and own risk tolerance. |
| | Con: Transparent and timely information may not exist to allow shareholders to rebalance accordingly. |
| Surplus Ownership | Pro: Risk of trapped surplus is mitigated by full de-risking once fully funded. |
| | Con: Shareholder remain responsible for funding any losses from equity exposure. |
| Principal-Agent Costs | Pro: Full de-risking once fully funded could minimize potential for making decisions that don't optimize value. |

| | |
|---|---|
| | Con: Glide path utilizes company resources to manage investments rather than focus on the core competency of business. |
| Default | Pro: Equity exposure can be more valuable if sponsor is in poor financial situation. The value of the PBGC put could be realized. |
| | Con: Plan is a pass-through entity and funded status of plan may not represent financial standing of sponsor. This limits value of PBGC put. |

## 4. Learning Objectives:

1. The candidate will understand how to analyze the issues facing retirement plan sponsors regarding investment of fund assets and make recommendations.

**Learning Outcomes:**

(1a) Assess the different types and combinations of investment vehicles for providing retirement benefits given the particulars of the stakeholders' financial circumstances, philosophy, industry, work force and benefit package.

**Sources:**

Study Note : Factor Investing and Adaptive Skill: 10 Observations on Rules-Based Equity Strategies

**Commentary on Question:**

*The Question was trying to test if a candidate could explain each of the observations about rules-based equity investment. Most candidates did not do well and could not provide enough explanation for each of the observations.*

**Solution:**

Explain the following observations about rules-based equity investment strategies:

(i) Not all smart beta is created equal; carefully review the risk exposures of the specific strategies considered.

- The type and size of the exposures can vary by strategies and other factors.
- Strategies differ in rebalancing methodology, fees, trading costs, and other dimensions.
- Some portfolio construction rules may provide the manager some discretion, and may cross the line into traditional active management.
- Smart beta investors are buying a specific portfolio strategy, not the perceived skill of a team or a complex investment process.

(ii) Factor outperformance is driven by market mistakes and risk.

- Risk premiums are attractive only if they are big enough relative to their risk or sufficiently diversifying when combined with other sources of risk and return
- Inefficiencies are attractive because they potentially translate to extra returns if investors can exploit them.
- Investors become too optimistic about favored stock and bid up their prices too much only to see them later fall back toward fair value.
- Value-oriented investment strategies exploit this situation. Value stock might also have higher return because they are riskier, even though this is a market mistake or inefficiency. (e.g. the stock might be less liquid or more prone to financial distress). Compensation through higher expected return for taking on more risk is a risk premium.

## 4. Continued

(iii) Virtually all investments are active in some way.

- Investor's position in a market cap-weighted equity index fund is an active bet on the equity risk premium.
- A style index fund, or a smart beta portfolio, is an active bet on a collection of risk factors.
- Investors should measure the overall active risk in their investment programs, whatever the sources.

(iv) There are several possible approaches to factor investing; a typical institutional portfolio probably already employs at least some of them.

- Style index funds that focus on subsets of the market, but that are market cap-weighted, have been available for years.
- Quantitative active products often employ factor approaches through skill-based and adaptive model building;
- Many fundamental active products have significant factor exposures in their return patterns;
- Opportunistic deep-value investing allows investors to seek to exploit significant mispricing or certain assets.
- Entire asset classes can experience mispricing, from which investors can profit using tactical views.

## 5. Learning Objectives:

3. The candidate will understand how to evaluate the stakeholders' financial goals and risk management with respect to their plan.

**Learning Outcomes:**

(3d) Understand and apply the principles of financial economics with respect to pension plan investing.

(3f) Provide advice and analysis to plan sponsors and other stakeholders regarding the mitigation of pension plan risks.

**Sources:**

RPIRM-115-13: Pensions in the Public Sector, Ch. 9

RPIRM-123-13: Risk Management and Public Plan Retirement Systems (Appendices background only)

**Commentary on Question:**

*The question tested candidates on public pension plans and risk mitigation alternatives and techniques along with understanding factors which influence public pension plan ability to take on investment risk. Candidates performed equally well on both parts. Candidates that performed well in this question laid out their responses in a clear manner and were able to provide appropriate examples/descriptions of what was asked as related to public pension plans.*

**Solution:**

(a) Describe the following risk mitigation alternatives and techniques:

(i) System discipline;

(ii) Pricing discipline; and

(iii) Budgetary discipline.

- System Discipline:
  - Tight controls over how surplus can be used
  - Exceptional care if the plan is used to achieve purposes beyond ordinary retention and retirement
  - Additional controls when creating vested promises for future benefit accruals
  - Plan design features that introduce some blend of risk sharing/management options between investment results and benefits such as those that target benefit levels
  - Using risk budget to identify potential warning situations
  - Establishing a methodology for responding to yellow flag situations and red flag situations

Other valid descriptions were also given credit if appropriate

## 5. Continued

- Pricing discipline
  - Pricing discipline means a framework to measure the risk inherent in the promise about to be provided and the strategy used to fund those promises.
  - Use of market value or risk-adjusted assets and liabilities as well as actuarial values. It could include the cost of settling or hedging obligations for retirees.
  - Use stochastic measurements including use of fat tails and differences due to long run errors.
  - Use of stress and specific scenario testing
  - Having appropriate analytics and guidelines when negotiating the trade-off between additional benefits relative to current market conditions

  Other valid descriptions were also given credit if appropriate

- Budgetary discipline
  - Budgetary discipline means aligning revenue to cost.
  - For mature plans, care must be taken to ensure that cost variability can be supported by taxpayers
  - Risk mitigation by increasing contribution levels may have limitations

  Other valid descriptions were also given credit if appropriate

(b) Describe how the maturity of a defined benefit public pension plan influences the ability to take investment risk in the plan.

- A plan with few cash needs (i.e. a young plan) and much cash inflow can take more risk than a plan with greater cash needs a relatively lower cash inflow (mature plan)
- In the early years of a pension plan, assets of a plan are small relative to the pension contributions and a plan sponsor may choose to take significant risk with investments because a drop in assets can be made up over a few years with a relatively manageable increase in contributions.
- As the plan matures, asset shortfalls may drop the assets to a point where significant additional contributions are required.
- A mature plan needs liquidity to pay regular benefits. If excessive investment risk is taken, the plan may incur financial losses when having to settle assets at inopportune time when investments are down.
- Smaller base of active participants to deal with downside market and/or liability movements
- Aged workforce having less tax payer support

## 6. Learning Objectives:

2. The candidate will recognize and appropriately reflect the role of plan investments in retirement plan design and valuation.

**Learning Outcomes:**

(2d) Apply and evaluate strategies and techniques for asset/liability management.

**Sources:**

RPIRM-146-17: The Pension Risk Transfer Market at $260 Billion

RPIRM-147-17: Charting the Course: a framework to evaluate pension de-risking strategies

RPIRM-150-17: De-risking in a Low Interest Rate Environment

**Commentary on Question:**

*Commentary listed underneath question component.*

**Solution:**

(a) Describe three factors that are compelling private sector plan sponsors to implement de-risking strategies

**Commentary on Question**:

*On average participants got roughly ½ of the points available. This is centered on Study 150-17. Most all successful candidates correctly wrote on longevity increases and PBGC premium increases.*

The cost to manage a plan has continued to increase. The big issue is the increase in PBGC expense

The PBGC continues to increase the variable rate premium and flat rate premium to cover unfunded plans and these expenses are becoming too much for the plan sponsor who are now seeking derisking opportunities to reduce this expense.

People continue to live longer which is causing more strain on the plan's liabilities and funded status.

The SOA has consistently published updated mortality tables that are increasing plan liabilities and their expected cashflows.

With interest rates on the decline and the stabilization period coming to an end, the plan's liability continues to increase which results in lower funded status and higher contributions. If the plan sponsor is able to continue to de-risk the plan the funded status may level out and contributions could decline.

## 6. Continued

**Additional Commentary:** *There were also points given discussing borrowing-to-fund strategies. Few candidates wrote about this.*

(b) Company ABC sponsors a defined benefit pension plan. Company ABC would like to reduce the volatility of the plan's funded position.

Compare and contrast the following strategies in light of the Company's objective:

- Increasing the allocation to fixed income investments; and
- Purchasing a buy-in annuity for the pension liabilities

**Commentary on Question**:
*These answers come from Study Note 146-17 and 147-17. On average candidates scored 2/3$^{rd}$ of all available points, so seems candidates were really well prepared for this section.*

Increasing allocation to fixed income investments:

- This allows for the plan to no longer experience large swings in assets
- Would result in a reduced volatility to the funded status
- Longevity risk will still be in play but interest rate risk would be mitigated
- Does not cause settlement charges
- No risk of insurer default
- Participant expenses continue (none removed from the plan)

Purchasing a buy-in annuity for pension liabilities

- Removes interest rate risk of pensioners
- Removes mortality/longevity risk of pensioners
- Should result in reduced volatility to funded status as multiple risks have been removed
- Does not cause settlement charges
- Credit/Default risk if insurer stops paying benefits

**Additional Commentary:** *Also points for mentioning fixed income strategy keeps funds in the plan while buy-in requires large cash outflow.*