

# RET RPIRM Model Solutions

## Spring 2015

### 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.
- (1b) Distinguish the various strategies, approaches and techniques used to manage retirement fund assets.

### Sources:

RPIRM-107-13: Reflections on the Efficient Market Hypothesis: 30 Years Later

RPIRM-100-13: Retirement Plans, 401(k)s, IRAs and Other Deferred Compensation Approaches

Handbook of Canadian Pension and Benefit Plans, 15th edition, Ch. 6

Fundamentals of Private Pensions, 9th Edition, Ch. 26

### Commentary on Question:

*Commentary listed underneath question component.*

### Solution:

- (a) Explain why actively managed funds could underperform market indices using the efficient market hypothesis.

### Commentary on Question:

*Candidates that did well did not just had to explain why actively managed funds could underperform the market.*

*Most candidates who did not do well on this part of the question only defined the efficient market hypothesis and actively managed funds. Very few points were given for just the definition.*

## 1. Continued

Financial economists have questioned the efficient market hypothesis (EMH); if EMH is incorrect, then actively managed funds should easily outperform passive index funds which are based on market indices.

But professional investors do not beat the market, supporting the EMH.

The average active manager underperforms since expense ratios are higher for actively managed funds than for index funds.

The EMH says equity prices adjust to new information without delay and as a result, no arbitrage opportunities exist to allow investors to achieve above-average returns without above-average risk.

Proponents of the passive strategy argue that as the stock market becomes increasingly efficient, it is more difficult for investment managers to consistently outperform the market.

Supporters of the efficient market hypothesis argue that security prices reflect all available public information.

Manager skill cannot generate additional returns.

- (b) Explain why plan sponsors continue to invest in actively managed funds.

**Commentary on Question:**

*Candidates who did well on this question had to specifically explain why actively managed funds are still used by plan sponsors despite the points made in part (a).*

*Most candidates who did not do well on this question only explained the disadvantages of actively managed funds in general.*

Financial economists question the EMH based on instances where market prices failed to reflect available information.

Periods of large-scale irrationality, such as the technology-internet “bubble”, convinced many analysts that the EMH should be rejected.

Behaviouralists contend markets are populated by participants who act irrationally. These irrational investors render markets inefficient. They create the opportunities for skillful managers to capture alpha.

High dollar minimums make index investing impractical for small-size pension funds

## 2. 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.
- (1e) Describe the regulatory restrictions on retirement plan assets.

### Sources:

Allen Chapter 29, RPIRM-103-13, CAPSA Guideline 6

### Commentary on Question:

*Commentary listed underneath question component.*

### Solution:

- (a) Describe four of the administrative issues to consider when structuring the investment options of a member-directed defined contribution pension plan.

#### Commentary on Question:

*Candidates generally did well on this part of the question.*

*Candidates who did not do well only listed but did not describe the issues.*

Frequency of valuation: Determine how often the assets will be valued

Default investment: Determine how assets will be allocated by default if the participant does not elect a particular allocation

Frequency of change: Determine how often participants will be allowed to switch their asset allocations

Negative elections: Determine if participants will be auto enrolled and if their contribution will increase automatically, unless they make a negative election

- (b) Critique the statement made by this Committee member.

#### Commentary on Question:

*Most candidates only listed the requirements of for safe harbor. The question required candidates to identify the flaws in the statement and critique the requirements in the context of XYZ.*

## 2. Continued

The fact that the employer provides choice to select investments does **limit** the fiduciary liability in terms of the fiduciary duty to diversify and the fiduciary duty of care. But fiduciary liability still exists.

Under the duty to diversify, the sponsor has the duty to ensure that the participant has the opportunity to diversify appropriately. XYZ's fund selection is not sufficient to allow participants to diversify appropriately since there are not enough different asset classes. In that regard, XYZ's fiduciary liability is not limited.

Also under the duty to diversify, the sponsor has the duty to ensure that individual funds offered are themselves sufficiently well diversified. XYZ still has the responsibility to ensure that the mutual funds offered are sufficiently diversified themselves. In that regard, XYZ's fiduciary liability is not limited.

Under the duty of care, the sponsor has the duty to ensure that the individual funds are prudent. XYZ still has the responsibility to ensure that the mutual funds offered are prudent investments. In that regard, XYZ's fiduciary liability is not limited.

- (c) Identify how XYZ could further limit its fiduciary liability with respect to the investment of the plan assets.

### **Commentary on Question:**

*Candidates generally did not do well on this part of the question because they did not discuss specific ways in which XYZ could reduce their fiduciary liability. Most candidates again only discussed the requirements of for safe harbor.*

XYZ investment options are very limited. Offering a wide range of investment options covering different asset classes with materially different risk/return characteristics would limit XYZ's fiduciary obligation.

XYZ can structure the plan in such a way that outside investment managers and trustees become responsible for plan assets. In this case, XYZ remains responsible for the selection of external advisors to whom they delegate the responsibilities.

XYZ could consider offering investment advice services through a provider. However, XYZ remains responsible for selecting prudently the investment advisors and monitoring their performance.

XYZ should provide sufficient information about the investment options available in the plan.



### 3. Continued

- (b) Using the effective duration calculated in (a):
- (i) Estimate the liability at a discount rate of 8.0% per annum.
  - (ii) Calculate the duration of the assets needed to minimize funded status volatility.
  - (iii) Calculate the change in funded status for a 1.0% per annum increase in discount rate using the asset duration calculated in (ii).

**Commentary on Question:**

*Most candidates performed reasonably well on this question. However, a number of candidates used incorrect signs (e.g. producing a higher liability when the interest rate increases, rather than a lower liability)*

- (i) Duration:  $770,280 \times ((1.0258)^{(5.0 - 8.0)}) = \$713,609$
  - (ii) Duration of Assets = (Duration of Liability) x (Liabilities / Assets)  
 $(2.58) \times (770,280 / 800,000) = 2.48$
  - (iii) Liability:  $770,280 \times ((1.0258)^{(5.0 - 6.0)}) = \$750,907$   
Assets:  $\$800,000 \times ((1.0248)^{(5.0 - 6.0)}) = \$780,640$   
Prior funded status =  $800,000 / 770,280 = 103.9\%$   
New funded status =  $780,640 / 750,907 = 104.0\%$   
Change in funded status = 0.1%
- (c) Explain the difference between discounting the cashflows at 8.0% per annum and using duration to estimate the impact of the discount rate change from 5.0% per annum to 8.0% per annum.

**Commentary on Question:**

*Most candidates correctly identified convexity and the limitation of duration to measuring the impact of only small interest rate changes.*

- PV of cash flows is the most accurate.
- The slope is a straight line intersecting at 5.0%.
- Duration does not take into convexity.
- Duration will be different along different points of the liability curve.
- The best estimate of duration is to measure two interest rate points close to each other on the curve.
- The further the your two estimate points, the more estimation error there will be.

#### **4. 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.
- (3b) Describe how the retirement plan financial and design risks integrate with the sponsor's risk management strategy.

#### **Sources:**

IRM 109-13

IRM 110-13

IRM 114-13

Full Circle

Embedded Options in Pension Plans

#### **Commentary on Question:**

*Comments listed underneath question component.*

#### **Solution:**

- (a) ABC's CFO makes the following statement:

“To completely eliminate interest rate risk from our plan, the duration of the plan's assets should match the duration of the plan's liabilities. The only way to accomplish this is to sell all of the plan's equities and purchase long-term fixed income products.”

Critique the CFO's statement.

#### **Commentary on Question:**

*Most candidates did well on part a. Some were quick to point out the errors in the CFO's statement, but failed to acknowledge what parts of the statement were correct. Some candidates went into great detail about derivative strategies; however, this was wasted effort since the question did not ask for a description of these strategies.*

## 4. Continued

In the first part of the statement, the CFO is correct that it is advantageous to match the plan's assets with the plan's liabilities. However, the CFO is not correct that the interest rate risk will be completely eliminated once the durations are made equal. Interest rate risk will still exist due to the shape of the yield curve, defaults, and ratings migration.

In the second part of the statement, the CFO is correct that selling all the equities and purchasing long-term bonds is one way to match the asset duration to the liability duration. However, that suggested method is not the only method. Other methods include increasing the duration of existing assets (i.e., exchanging short-term bonds for long-term bonds) and using fixed income derivatives to increase the duration.

- (b) Describe how inflation risk differs between ABC's two pension plans from ABC's perspective.

**Commentary on Question:**

*Most candidates received full credit for part b.*

Inflation risk exists in the large plan because it is an ongoing plan which has a liability influenced by salary scale (and therefore inflation).

Inflation risk exists in the small DB Plan since benefits receive post-retirement cost of living adjustments tied to CPI.

- (c) Assess which of ABC's two pension plans is a better candidate for an annuity purchase.

**Commentary on Question:**

*A number of answers were possible for part c. The most common responses are captured in the model solution below. Candidates also received credit for supportable answers that mentioned other plan features (e.g., plan size).*

Annuity purchase makes more sense for the small plan because it is frozen, so the benefits are known as of the current date. The post-retirement benefits are subject to inflation risk, and annuity purchase would eliminate this risk. However, the COLA will increase the cost of purchasing annuities.

The large plan could also purchase annuities, but only for the deferred vested and retired participants, as those are the only ones which have known amounts.

## 5. Learning Objectives:

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

### Learning Outcomes:

- (2a) Evaluate the interaction of plan investments with plan design, valuation, accounting and funding.
- (2c) Model the effect on setting investment strategy of factors including, cash flow requirements, various plan designs and various economic environments.
- (2d) Apply and evaluate strategies and techniques for asset/liability management.

### Sources:

Liability-responsive asset allocation

### Commentary on Question:

*The candidate must understand the key considerations of a liability-responsive asset allocation and be able to explain how it would apply to plans with different funded percentages. He or she must also know about practical issues related to implementation of this strategy.*

### Solution:

- (a) Describe the practical considerations in implementing a liability-responsive (dynamic) approach to asset allocation.

### Commentary on Question:

*Candidates generally provided lists and considerations that did not directly address this part of the question. While the information provided was often related to the question, it was from other materials in the syllabus. It was not necessary to provide all of the information below in order to get a full credit answer.*

#### Data availability

- Liability values are generally calculated once per year and often not until well after the valuation date.
- The interest rate is the largest factor affecting changes in the liability over short time periods.
- There are ways to estimate the funded status on a frequent and periodic basis.
- Asset values are generally easy to obtain.

#### Effective date of changes

- For ease of management, usually best to make changes in asset allocation policy effective at a month end.
- Could make sense to use a one-month lag to provide time to gather data, perform calculations, and execute changes.

## 5. Continued

### Contributions

- Allocation changes should be integrated with timing of contributions.
- Provides an opportunity to adjust the allocation at a lower cost than selling one asset and purchasing another.
- For example, make all of the contributions into one class (e.g. fixed income) rather than selling fixed income assets and buying equities

### Rebalancing policy

- The dynamic nature of this policy will require adjustment to current policies.
- If a plan has a material allocation to illiquid assets, then explicit allowance should be made in defining the rebalancing approach.

### Trading

- Dynamic policy can potentially lead to larger trades, especially if it involves substantial steps rather than smaller, more frequent adjustments.
- This could lead to less frequent trades and potentially lower trading costs.

### Governance process

- More complex process requires increased monitoring by more parties
- Procedures should be defined for execution of the policy without adding additional layers of approval from the governing board or others

### Reporting

- Procedures for reporting on the progress of the dynamic policy should be defined.
- Need to establish procedures for reporting on progress, assets and liabilities on each measurement point, the resulting asset allocation policy, and steps taken to move to that policy position

### Formal review of policy

- Revisit the policy regularly and review the policy annually
- Other aspects of the asset allocation decision (such as capital market assumptions) change over time, sometimes substantially

- (b) Evaluate the proposed dynamic asset allocation strategy for each plan.

### **Commentary on Question**

*Candidates generally did not provide the support outlined below that was in the syllabus material. However, credit was provided for relevant points that were supported in the candidate's answer.*

## 5. Continued

This type of strategy allows an appropriate level of equity investment at a particular funded status, while also allowing for automatic adjustment of that strategy if funded status changes materially.

OR

All else equal, the stronger the plan's funded status becomes, the more cautious the desired funding policy should be.

This strategy requires greater effort to implement than the traditional approach. This is true for both plans.

Potential benefits are greatest for plans with low rates of new benefit accruals, such as the frozen plan.

The extent to which benefits are accruing in the open plan also has an impact on the ratchet effect (whereby contributions have to go in during weak markets, but do not come out again in strong markets).

This is because new benefit accruals provide another use for the upside of equity returns, even if a plan is fully funded.

Once the frozen plan becomes fully funded, if asset behavior can be matched closely enough to liability behavior, then no further contributions to this plan should ever be required.

Once the frozen plan becomes fully funded, a return seeking strategy could actually lead to a shortfall; all risk and no reward.

The open plan does have a reward from the return-seeking strategy – the possibility of investment returns closing the funding shortfall.

The expected benefit of an equity-oriented investment strategy reduces as funded status improves because of the risk of trapped capital in the event of favorable investment experience.

OR

Concept of trapped capital – a dollar of investment return is not equally valuable in all circumstances. If it arises in a fully funded frozen plan, extra return may be trapped and offer little economic benefit to participant or sponsor.

## 6. 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:

- (1b) Distinguish the various strategies, approaches and techniques used to manage retirement fund assets.
- (1g) Solve for a measure of investment performance relevant to a given benchmark.

### Sources:

104-13 (Chapter 12 of Managing Investment Portfolios, 3rd Edition, by Maginn, Tuttle, Pinto, and McLeavey)

### Commentary on Question:

*This question had candidates demonstrate their general knowledge of risk-adjusted performance appraisal methods (applicability, pros and cons, etc.) specifically for evaluating manager performance. Furthermore, candidates were asked to perform a simple calculation of a particular risk-adjusted performance appraisal measure: the information ratio. Students performed well on part b, but they seemed less comfortable with part a.*

### Solution:

- (a) Describe the advantages and disadvantages of using risk-adjusted performance appraisal methods to evaluate manager performance.

### Commentary on Question:

*Many candidates defined or listed performance appraisal methods without discussing advantages or disadvantages to evaluating managers using performance appraisal methods. Many candidates did not respond with the appropriate depth/breadth for a question worth this many points.*

*Note: Additional credit was granted for other reasonable advantages and disadvantages, whether or not they were on the syllabus.*

### Risk-Adjusted Performance Appraisal Methods Advantages

- Take the volatility of returns into account when comparing portfolio returns, rather than just comparing rates
- Allow comparison of different managers on a level playing field
- Quantify the expected return needed to take on increased risk (either systemic risk or total risk – ex post alpha and Treynor ratio vs. Sharpe ratio)
- Demonstrate that a fund manager's results are based on skilled choices rather than picking a risky but lucky investment

## 6. Continued

### Risk-Adjusted Performance Appraisal Methods Disadvantages

- Some measures depend on the validity of CAPM, which has come under attack for its underlying assumptions and single-index nature
- May rely on the use of surrogates for the true market portfolio
- Stability: If the measures were calculated over different time periods, the results and potential conclusions might be different even for a stable risk-return relationship
- Even if the assumptions underlying the measures are true, the calculations that you performed are estimates of the true parameters of the actual risk-return relationships

- (b) Calculate the Information Ratio.

Show all work.

### Commentary on Question:

*Nearly all candidates received full points for this simple calculation. Many candidates offered conclusions for the plan sponsor based on the results, but these were not needed for full points.*

The Information Ratio is

$$IR = \frac{\overline{R}_P - \overline{R}_B}{\hat{\sigma}_{P-B}}$$

where  $\overline{R}_P$  = total actual portfolio return over the measurement period,  
 $\overline{R}_B$   
= total benchmark portfolio return over the measurement period, and  
 $\hat{\sigma}_{P-B}$  = standard deviation of the difference between  
the returns on the portfolio and the returns on the benchmark  
(often called tracking error)

Here,  $\overline{R}_P = 2.875\% = .5 * .03 + .25 * .04 + .25 * .015$ ;  
 $\overline{R}_B = 3.030\% = .6 * .035 + .25 * .03 + .15 * .012$ ;  
and  $\hat{\sigma}_{P-B} = 3\%$  (given).

Hence, IR = -5.17%.