

RET RPIRM Model Solutions

Fall 2016

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:

Fundamentals of Private Pensions, Chapter 28; RPIRM-131-14

Commentary on Question:

This was largely a recall question, and candidates did fair on it. The better prepared candidates were able to recall material specific to the question asked, as opposed to generic list responses that may not be entirely relevant and complete.

Solution:

- (a) Explain why Target-Date Funds (TDFs) may be a better default investment option than money market funds in a DC plan.

Commentary on Question:

Most candidates gave a good reason to prefer TDFs over money market funds, and most also provided a definition of what a TDF is. Fewer commented on certain potentially advantageous features of TDFs, such as the fact that they outsource the asset allocation decision for participants, and the empirical evidence of their efficacy.

TDFs systematically shift an investor's assets from the growth portfolio to the safe portfolio as the participant gets closer to the target retirement date.

TDFs offer the most effective result for passive participant populations or for a default investment alternative in conjunction with automatic enrollment

1. Continued

A target date fund may be a better option than a money market fund for the following reasons:

- A TDF has a higher expected return than a money market fund. A money market fund is not expected to earn much of a return. It will be hard for Company XYZ to meet replacement ratio and retirement income objectives without the higher expected return of a TDF.
 - A TDF outsources the asset allocation decision to a professional manager, while a money market fund is not well diversified.
- (b) State one advantage and one disadvantage of including a higher fixed income allocation in a TDF.

Commentary on Question:

Most candidates did well on this part

Advantage of higher fixed income allocation: helps to reduce some of the market risk of too high an equity exposure.

Disadvantage of higher fixed income allocation: fixed income, in general, has lower expected return than equities, and so the participant may be at risk of not meeting their retirement income objective

- (c) Describe four key characteristics or preferences of a DC plan participant that influence the proportion of assets the participant would allocate to equities.

Commentary on Question:

Most candidates did fairly well on this section, but a significant number of candidates confused the regression related to this question (which is about the varying asset allocation share to equities) with other regressions presented in the reading that related to factors that were associated with either no asset allocation to equities, or 100% allocation to equities. There was limited overlap in the factors between regressions, and not all factors shown in the relevant regression were significant. Candidates who were able to distinguish the significant factors from the relevant regression garnered more points.

1. Continued

Age: the younger a participant is, the more likely he is to have a higher equity allocation. Younger households have more time to recover from a poor equity return and thus are better equipped to handle a larger equity allocation.

Risk tolerance: the lower the risk aversion, the higher the share to equities.

Education: higher education leads to higher allocation to equities.

Investment choice – more investment choice leads to higher equity share.

- (d) Describe six actions that a plan sponsor can take to ensure a successful DC plan.

Commentary on Question:

Most candidates were able to identify at least 3 actions. Some other potential actions that merited credit for some candidates related to sponsors offering comprehensive risk profiling, encouraging participants to take responsibility for their financial future, and offering a limited number of financial building blocks that could meet the needs of most participants when mixed in different proportions.

1. Provide at least 3 diverse investment options with different risk and return characteristics. This helps participants (who have their own unique needs and circumstances) be able to have enough (but not too much) choice to find the option that is right for them.
2. Plan sponsors should protect participants from behavioral biases by including auto-enrollment and auto-escalation of contributions (with opt-out option). Helps ensure participants save enough to meet retirement income objectives.
3. Ensure fees and expenses for investments are reasonable and as low as possible. Helps ensure participants can meet retirement income objectives.
4. Provide appropriate information and education to participants about investments. Participants have different levels of investment knowledge. Plan sponsor should ensure they are provided with adequate information to make their investment decisions.
5. Reports to participants on their current positions should be easy to understand.
6. Well-defined governance: sponsor should monitor plan performance and investment managers (if used) to ensure they are properly diversified, acting in a prudent manner, and that fees stay reasonable. Plan sponsor should have a system in place for selecting and replacing investment managers and ongoing monitoring of their work.

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

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

Sources:

FSCO's IGN 001 – Buy in Annuities for Defined Benefit Plans; RPIRM-119-13; RPIRM-136-15; RPIRM-137-15

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Describe the due diligence XYZ Company should complete prior to entering into a buy-in annuity contract.

Commentary on Question:

Commentary on part a): The question is testing the candidates' knowledge of the issues that a company would need to consider when entering into a buy-in contract. To get full marks, candidates had to describe several of the due diligence items. For the most part, candidates only mentioned a few of these points.

- **Authority to Invest** – The Plan document and investment policy statement must allow for the investment
- **Pricing and Transaction Costs** – conduct appropriate due diligence when negotiating the pricing of buy-in.
 - Solicit bids from several insurers through RFP process

2. Continued

- **Counterparty Risk and Coverage** –
 - Consider the overall financial health of the insurer, which may involve assessing factors such as the insurer’s corporate governance practices, credit ratings and any applicable regulatory requirements including capital or solvency requirements.
 - Determine the extent of coverage available to the plan in respect of the buy-in annuity in the event that the insurer becomes insolvent
 - Consider whether it is reasonable and appropriate in the circumstances to diversify the investment by entering into separate buy-in annuity contracts with multiple insurers.
 - **Contract Terms** –
 - Ensure that the terms of any buy-in annuity contract are clear and permit the administrator in all circumstances to administer benefits in accordance with the plan terms and fully comply with all applicable statutory requirements, as they may change from time to time.
 - **Plan Wind Up** –
 - Confirm that the buy-in can be converted to a buy-out at any time.
 - Confirm that the contract can be terminated at the time of plan wind up
 - May need to select a safer insurer carrier at the time of plan wind up
- (b) Compare and contrast the two strategies in relation to XYZ Company’s objective.

Commentary on Question:

Commentary on part b): The question is testing the candidates’ understanding of buy-in contracts and duration matching strategies by asking their similarities and differences in relation to the company’s objective of limiting funded status volatility. To get full marks, a candidate had to identify several of the considerations involved in reducing funded status volatility and explain the similarities and/or differences in the two strategies for each consideration. Again, generally candidates only mentioned a portion of these points.

- **Compare**
 - **Default Risk** – Default risk is held by the plan sponsor
 - **Interest Rate Reduction** – Both are intended to reduce interest rate risk
 - **Balance Sheet** – Assets are still held on balance sheet.
 - **Benefit Payment Matching** – Both are intended to cover current and future benefit payments

2. Continued

- **Contrast**
 - **Longevity** – Buy-in contracts eliminate longevity risk. Duration matched fixed income does not address longevity risk.
 - **Counterparty Risk** – Counterparty risk is spread across more parties in a duration-matched fixed income portfolio.
 - **Monitoring/Rebalancing** - Do not have to continually monitor investments and liabilities/constant rebalancing.
 - **Cost** – There is an additional cost/margin to purchase buy-in annuities.
 - **Contract/Flexibility risk** – There is no contract in a fixed income portfolio and it is easier/less costly to unwind.
 - **Capacity Limits** – No limit on the number of annuity buy-ins versus only so many long-duration bonds issued.
 - **Experience** - The insurance industry has a long history of managing assets on the basis of matching liabilities and is therefore well-equipped to manage pension risk
 - **Reinvestment** – Annuity buy-ins are not subject to reinvestment rates.
 - **Assumptions** – Duration-matched fixed income is subject to assumption changes that predict future cash flows.

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:

- (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.
- (3b) Describe how the retirement plan financial and design risks integrate with the sponsor's risk management strategy.
- (3d) Compare the financial economics perspective to the traditional perspective on funding and accounting for retirement plans.

Sources:

RPIRM-121-13 – Kausch – The Case for Stock in Pension Funds

RPIRM-134-14 – Gannon and Collie – Liability Responsive Asset Allocation

Pension Actuary's Guide to Financial Economics

Commentary on Question:

This question considers glide paths generally, in a specific example, and from a Financial Economics perspective. Receiving high marks requires that students synthesize multiple syllabus readings.

Solution:

- (a) Describe the merits and risks of following a glide path strategy for XYZ Company's open pension plan.

Commentary on Question:

For full points, candidates needed to touch on a wide range of merits and risks in their descriptions. Most candidates adequately described a few items, but for full credit, a more thorough answer was required.

3. Continued

Merits

- Since the plan is open to new members and therefore still accruing benefits, investing in variable amounts of stock may be a better hedge for changes in pay or industry related variables than less risky bonds.
- Investment strategies involve risk management and capital allocation decisions, and the optimal asset allocation decision may involve investing in variable amounts of stock depending on the risk of the plan.
- If a plan is not 100% funded on an appropriate basis, then cash flows cannot be matched exactly. Higher equity allocations for lower funded statuses give the assets a chance of meeting liability needs.
- Glide paths are even more useful today with more and more plans maturing and becoming frozen: less need for asset earnings to cover new accruals.
- Helps avoid trapped capital: move assets out of riskier assets automatically when there is less shortfall to make up.
- Sets rules in advance leaving less room for interpretation by the trust's governing board.

Risks

- Basing the glide path on accounting funded status instead of plan termination funded status could leave the plan over or under exposed to riskier assets if they choose to ultimately terminate the plan.
 - Pension liabilities closely resemble debt (a series of nearly-riskless cash flows extending over a certain period), so a (very simple) financial economics argument suggests that assets matching the future liability cash flows perfectly would consist of 100% risk-free bonds with no equity exposure.
 - Transaction costs associated with frequent asset rebalancing.
 - Higher volatility portfolios at lower funded statuses leave open the possibility of asset losses reducing funded status further.
 - Data availability: might be difficult to calculate asset values frequently for illiquid classes; similarly may be difficult to get frequent liability values from actuaries performing only annual valuations.
 - Potentially requires a more complex governance and monitoring process.
- (b) Recommend changes to the glide path in light of the proposed plan closure and freeze. Justify your recommendation.

Commentary on Question:

Candidates answered this section very well overall, and many earned full marks. An explicit glide path was not required in the recommendation.

3. Continued

- Switch to a using plan termination liabilities and market value of assets as the funded ratio basis.
- Reduce equity allocation down to slightly above 0% at 100% funded (possibly leave some equity investment as a provision for adverse deviation and because perfect hedging of pension cash flows with fixed income is impossible).
- Allow re-risking: increasing equity allocation to re-introduce risk in the assets if funded status falls.

Why?

New benefits accruing provide a useful upside for equity returns, even if a plan is over fully funded. Without accruals, equity investment at high funded ratios causes unnecessary risk, especially if asset behavior can be matched closely to liability behavior.

- If liability and asset cash flows are closely matched in a fully funded situation, no more contributions should be required.
- But, trying to achieve higher returns with more equity investment can't make contributions go less than zero.
 - Trapped capital: if extra return arises in a fully funded frozen plan, extra return may be trapped and offer little benefit to the plan sponsor.

Since the plan is now frozen and closed to new entrants, it's clear that the sponsor is interested in reducing pension risk. It's reasonable that the sponsor could be considering plan termination by buying annuities from an insurance company, so using such liability as the basis for "100% funding" would be appropriate if the insurer prices that way.

- (c) Critique the concept of glide paths for pension plans from the perspective of financial economics.

Commentary on Question:

Candidate needed to present an effective critique, likely using arguments from Pension Actuary's Guide to Financial Economics. Very few points were awarded for supplying lists of points with no argument. Points were granted to the items listed below (and others) as long as the items are used to further a critique glide paths from a financial economics perspective.

3. Continued

A glide path approach like this one may not sit well with someone who believes in the Financial Economics (FE) approach to pension plan valuation and investing.

- **Liability:** Practitioners may rely on multiple definitions of liability including market, solvency, and budget, and it may not be clear which measure is best for a particular circumstance.
 - FE says that market liability of a pension plan should be determined by looking at how financial markets price similar cash flows (e.g. debt/fixed-income).
 - Accounting liability may be seen as deficient by financial economists (e.g. ABO vs. PBO, gain/loss smoothing)
- **Shareholder Value:** FE understands that firms exist to add economic value, and that all firm decisions should add value to the firm's owner-shareholders.
 - Shareholders are usually diversifiers investing a small portion of their personal portfolios into any one firm. The shareholder balances risk and return at the aggregate portfolio level.
 - A shareholder can manage his own risk by holding more or less risky assets depending on what the plan holds.
 - **100% Equity vs. 100 % Bond:** The current US personal tax system taxes bond earnings heavier than equity earnings favors 100% bond holdings for plans.
 - 100% bond allocation for the plan creates value for shareholders in this context (arbitrage).
 - Shareholders can take advantage of lower tax on equity earnings in personal investing.
 - **Opposing View:** Limited pension financial transparency, corporate valuation, and other factors that violate assumptions of the 100% bond model and may make it unrealistic.
- **PBGC:** Not all plans would make the same choices after considering tax, default, and PBGC. In fact, weak sponsors would invest entirely in stocks, whereas well-funded plans should invest entirely in bonds. Clearly a one-size-fits-all glide-path is not appropriate.
- **Funding as Corporate Finance:** Pension funding is a corporate finance decision and must not be considered independently.
 - Uncollateralized pension debt should be avoided => plans may want to fully fund by borrowing at the corporate level.

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

Learning Outcomes:

- (1b) Distinguish the various strategies, approaches and techniques used to manage retirement fund assets.
- (2b) Evaluate the interaction and relationship between plan investments and valuation assumptions/methods.
- (2d) Apply and evaluate strategies and techniques for asset/liability management.

Sources:

RPIRM-136-15 Longevity Risk Management

RPIRM-119-13 Accounting for Pension Buy-In Arrangements

Commentary on Question:

The intent of this question was to test candidates' knowledge on strategies used to address longevity risk. In general, candidates did fairly well on this question by recalling the basic strategies and describing the key implications of each one. Credit was also given for strategies (e.g. q-forwards, synthetic buy-ins, etc.) and other valid points (e.g. impact on PBGC premiums and ongoing accounting cost, etc.) not outlined in the model solution below.

Solution:

- (a) Describe how longevity swaps operate.
 - Exchanges actual pension benefit payments (based on realized longevity) for a fixed set of payments
 - It can be either a capital market derivative or an insurance contract
 - The hedger of the longevity risk (e.g. pension plan) receives from the longevity swap provider (Bank ABC) the actual payments that it must make to pensioners
 - In return, the hedger makes a series of fixed payments to the hedge provider
 - If pensioners live longer than expected, the higher pension amounts that the pension plan must pay are offset by the higher payments received from Bank ABC
 - The swap, therefore, provides the pension plan with a long-maturity, customized cash-flow hedge of its longevity risk.

4. Continued

(b) Describe three other approaches to mitigate longevity risk.

Buy-out or plan termination

- Removes liability from the plan sponsor's balance sheet by transferring assets and liabilities to an insurer
- Will include additional payment (higher than liability) to reflect insurer assumptions such as lower interest rates and compensation for taking on the risk
- Often involves settlement accounting

Buy-in

- Annuities become pension plan assets and the plan remains on the sponsor's balance sheet
- Avoids large one-time payment for plans that are underfunded
- Does not involve settlement accounting

Lump-sum offer

- Removes liability from the plan sponsor's balance sheet for those who elect
- May involve settlement accounting

5. 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:

- (1g) Solve for a measure of investment performance relevant to a given benchmark

Sources:

RPRIM 104-15

Commentary on Question:

Commentary listed underneath question component.

Solution:

- (a) Describe in words the differences between time-weighted and money-weighted rates of return.

Commentary on Question:

Commentary on part a): To get full marks, a candidate needed to describe each calculation method correctly. Candidates who did not do well in this section were those who were only able to describe the different methods but could not explain the differences.

- The money weighted return (MWR) represents the average growth rate of all money invested in an account, while the time weighted return (TWR) represents the growth of a single unit of money invested in the account.
- MWR is sensitive to size and timing of external cash flows. TWR is not.
- MWR and TWR will be the same if there are no cash flows during the period

- (b) Explain why using money-weighted rates of return may not be an appropriate method to compare fund returns to a benchmark.

Commentary on Question:

Commentary on part b): To get full marks a candidate needed to demonstrate that they understood the difference in the impact cash flows can have on MWR vs a benchmark not impacted by cash flows and that managers generally don't control cash flows. Candidates that only re-iterated the points in part (a) and were not able to provide it in the context of investment managers were not given full credit.

5. Continued

- Investment manager has little or no control over the size and timing of external cash flows. Since MWR is sensitive to cash flow size and timing, TWR and MWR could be different.
- Benchmark returns do not reflect cash flows. TWR and MWR are the same.
- Exception would be when managers have control over the timing and amount of cash flows in to the account

(c) Calculate the three sources of added value for each sector.

Show all work.

Commentary on Question:

To get full marks, a candidate needed to get all calculations correct and needed to label each source of return correctly. Candidates who did not do well in this section were those who could not identify each source of return.

$$r_v = \sum_{j=1}^S (w_{pj} - w_{Bj})(r_{Bj} - r_B) + \sum_{j=1}^S (w_{pj} - w_{Bj})(r_{pj} - r_{Bj}) + \sum_{j=1}^S w_{Bj}(r_{pj} - r_{Bj})$$

Pure Sector Allocation

$$\text{Sector A: } (0.20 - 0.25) * (0.04 - 0.076) = 0.18\%$$

$$\text{Sector B: } (0.30 - 0.35) * (0.12 - 0.076) = -0.22\%$$

$$\text{Sector C: } (0.50 - 0.40) * (0.06 - 0.076) = -0.16\%$$

Allocation/Selection Interaction

$$\text{Sector A: } (0.20 - 0.25) * (0.05 - 0.04) = -0.05\%$$

$$\text{Sector B: } (0.30 - 0.35) * (0.09 - 0.12) = 0.15\%$$

$$\text{Sector C: } (0.50 - 0.40) * (0.10 - 0.06) = 0.40\%$$

Within-Sector Selection

$$\text{Sector A: } 0.25 * (0.05 - 0.04) = 0.25\%$$

$$\text{Sector B: } 0.35 * (0.09 - 0.12) = -1.05\%$$

$$\text{Sector C: } 0.40 * (0.10 - 0.06) = 1.60\%$$

6. Learning Objectives:

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

Learning Outcomes:

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

Sources:

Corporate Pension Risk Management and Corporate Finance; Evolving Roles for Pension Regulations: Toward Better Risk Control?

Commentary on Question:

Most candidates were able to provide some sense of Value at Risk and Traditional sensitivity analysis, but most did not articulate the idea behind maintaining the same debt and equity beta as a risk budgeting approach.

Solution:

- (a) Value-at-Risk Approach.

Commentary on Question:

Most candidates provided a sense of Value at Risk, but a significant minority defined it in terms of a probability instead of a value. Some of those that defined it as a value erred by stating it was the maximum possible loss, rather than the minimum. No candidates stated anything about using market (-consistent) values for assets (and liabilities), and no candidates pointed out that VaR is the most frequently used risk measure for capital requirements under solvency.

Given a time horizon and a probability p , value at risk (VaR) is defined as the threshold loss level so that the probability that losses over this time horizon will exceed this threshold level is p .

In the context of a DB pension, VaR is a measure of what the funded status could be under the worst cases (such as the worst 5% of cases) in a given time period (usually 1 year). For VaR, a market-consistent value of pension liabilities and the market value of assets should be used in the VaR calculation. It uses stochastic (Monte Carlo) projection to generate many possible economic scenarios and their effect on the funded status. The risk budgeting approach would put in reserves enough to survive even the 5th percentile scenario, which means there is a 95% confidence that the DB plan will not go under.

VaR is the most frequently used risk measure and is the framework for capital requirements under solvency.

6. Continued

- (b) Traditional Sensitivity Analysis.

Commentary on Question:

Most candidates were able to provide a basic definition or sense of what sensitivity analysis is, or how it is performed. However, most did not elaborate from there. The best-prepared candidates provided more thorough descriptions and commented on the limitations and utility of sensitivity analysis.

Sensitivity analysis looks at assumptions that can affect pension plans significantly (e.g., interest rate, salary scale, inflation) and determines what impact a change in each of these assumptions would have on the plan. This method of risk budgeting tries to ensure the plan can survive adverse experience vs. assumptions.

While the modeling is not based on a market-consistent valuation of the pension plan, this approach can forecast the financial metrics most relevant to the corporation and most useful for corporate decision-makers. Pension strategies can be formulated to keep these financial metrics within a certain range, or within a certain level of volatility.

- (c) Maintaining the same Equity and Debt Beta.

Commentary on Question:

Candidates performed relatively poorly on this section. Many responses were not related to risk budgeting and simply described the meaning of beta in a CAPM context. Points were awarded for including the formula indicating what change in equity capital is required for a change in the beta of pension assets, under the assumption of not changing equity beta:

$$\Delta E = PA \times \Delta \beta_{PA} / \beta_E$$

In this approach to pension risk budgeting, a corporation can estimate the amount of equity capital needed to maintain the same equity beta based on an application of the CAPM. A corporation's beta is a measure of volatility and risk. Changing the pension plan's risk profile changes a corporation's equity beta. By targeting the same equity beta, one can solve for the relationship between pension asset and liability beta and the additional amount of required equity capital.

By reducing the equity allocation in pension assets, pension asset beta is reduced and the required equity capital is also reduced. The corporation can take more risk in its operating part of the business.