RET RPIRM Model Solutions
Fall 2013

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.

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

Learning Outcomes:

(3d) Compare the financial economics perspective to the traditional perspective on funding and accounting for retirement plans.

Sources:

Can Pensions Be Valued as Marketed Securities, Bader, Pension Section News, June, 2009

Pension Forum: April, 2005, Entire Issue

Commentary on Question:

This question tested the candidate's ability to explain the key challenges in valuing pension liabilities using a bond model. Most candidates were able to describe one or two of the challenges, but few provided enough (four) to receive full credit. Some candidates also provided lists or concepts that were related, but did not address the specific question being asked.

Solution:

Describe the challenges in valuing pension liabilities using a bond model.

Pension cash flows differ from those of marketable bonds because they are contingent upon future events (such as pay increases and mortality) that do not affect ordinary bonds (which are contractually set).

The term of a pension plan is longer than a bond even without taking into account future participants.

There is no balloon payment date for a pension plan when all or a significant portion of liability comes due.

Liabilities behave differently from bonds in certain economic conditions such as rapid inflation.

1. Continued

Pensions do not trade in the financial markets and, therefore, should not be valued like traded securities.

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:

Sources:
Modern Investment Management, Litterman, Ch. 2, 3, 17, 22, 23, 24, 27 (pp. 501-505 only) and Ch. 28 (pp. 516-520 only)

Commentary on Question:
Candidates did well and for the most part understood the question. However, they struggled with (b)(iii) and did not make the connection between the different types of equity managers and the different types of equity.

Solution:

(a) Compare and contrast investing the pension assets in equities and fixed income with respect to the following:

(i) active management;

(ii) passive management;

(iii) interest rate risk; and

(iv) default risk.

(i) Active Management

- Active management is when a manager deviates from a benchmark in order to achieve a higher return than said benchmark or to create alpha
- Active management can be utilized in both equity and fixed income portfolios
- Active strategies utilize the different risk exposures inherent in equity or fixed income portfolios
  - Examples of risk exposures in fixed income are credit risk, interest rate risk, sector risk
  - Examples of risk exposures in equities are operational, liquidity risk, currency risk
- Active management in fixed income may be used to match duration to the pension liabilities

2. Continued

(ii) Passive Management

- Passive management is when funds are invested in a specific benchmark
- Passive management is less expensive than active management
- More difficult to duration match passive fixed income to pension liabilities

(iii) Interest Rate Risk

- Equities have little (or no) interest rate risk
- Fixed income is subject to the following interest rate risks
  - Yield curve shape
  - Risk-free rate
  - Credit spread

(iv) Default Risk

- Default risk in equities is the chance of bankruptcy and the stock is worthless
- Default risk in fixed income is the risk that debtor will not be able to make coupon payments
- Default risk is built into fixed income yield
- In bankruptcy, fixed income is before equity on payouts

(b) Compare and contrast investing the pension assets in public and private equities with respect to the following:

(i) liquidity;

(ii) transaction costs; and

(iii) valuation approaches.

(i) Liquidity

- Public equities have high liquidity and private equities are highly illiquid
- Private equity does not have an open market and usually requires a change in control
- Since private equity is not readily available to all investors a general partnership can be formed, these are not easily exited, usually last five years

2. Continued

(ii) Transaction Costs

- Public equities have low transaction costs and private equities have high transaction costs
- Information asymmetry (as found in private equities) makes transaction costs higher

(iii) Valuation Approaches

- There are two approaches to valuing public equity: traditional and quantitative, private equity is evaluated using the traditional approach.
- Traditional approach is based on stock/company specific analysis
- Quantitative approach is based on statistical models that map measurable assumptions into forecasts of risk, return, cost
- Investment risks are based on the type of evaluation: Traditional/PE approach is based on subjective analysis, quantitative is more formalized and objective

3. Learning Objectives:

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

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

Learning Outcomes:

Sources:
"Pension Funds: Company Manager's View," Exlely & Mehta

RPIRM-105-13: 20 Questions Directors Should Ask About Their Role In Pension Governance

RPIRM-103-13: Fiduciary Liability Issues for Selection Investments

Commentary on Question:
Candidates should identify the risk borne by the asset allocation from the perspective of all different stakeholders. Candidates receiving higher marks were those who could describe specific considerations for each stakeholder group as well as common disadvantages and advantages for all stakeholders.

Solution:
The assets of a defined benefit pension plan are invested in a portfolio which is invested 70% in equities and 30% in fixed income.

Describe the advantages and disadvantages of the current asset allocation in respect of the following stakeholders:

(i) shareholders;

(ii) plan participants; and

(iii) the company.

Advantages for shareholders

- Signaling/Inertia - switching to something more conservative than a 70/30 allocation may signal negative experience or results. Not changing anything suggest nothing wrong to change and avoids erosion of the value of holdings
- May reduce cost of benefit by equity risk premium
- Shareholders become indirectly large institutional investors, which tends to empower shareholders
- Pension risk put: Insurance on pension plans (e.g. the PBGC in the United States) could cover losses. Investors become exposed to the potential to earn equity risk premium, while having the risk being covered by an insurance company

3. Continued

Disadvantages for shareholders

- Asymmetric risk: Equity gains can turn into unrecoverable surplus
- Taking into account second order considerations (mainly, tax and cost effectiveness of equity v. debt in a pension trust AND exposure to default risk with probably no adjustment to compensation for the risk) investment in bonds may be preferable
- Exposure for risk of litigation, if fund underperforms affecting stakeholders
- Shareholders invest in the company, not as a pass-through to other companies.
- Shareholders would prefer risks being taken in the company's core business and not in the pension trust
- Reward for taking equity risk may be passed to participants through larger benefits.

Advantages for participants

- Participants are exposed to potential surplus (which can translate to increased benefit)
- Participants gain exposure to equity in a cost efficient way, which probably in their personal portfolios would not be able to afford

Disadvantages for participants

- Participants bear "default risk" (Risk the plan will default on their pensions due to poor asset returns)
- Taking into account second order considerations (mainly, tax and cost effectiveness of equity v. debt in a pension trust AND exposure to default risk with probably no adjustment to compensation for the risk) investment in bonds may be preferable

Advantages for the company

- Fiduciary duty requires to make property productive (high reliance on equity "favors" higher return)
- Management themselves may be participants of the plan. Hence, they may have the same advantages as participants (exposure to surplus, transfer exposure to equities)
- Reduces pension expense

Disadvantages for the company

- High equity allocation increases funded status volatility and contribution volatility
- Fiduciary duty requires to invest with care and diversify (high asset allocation may be too risky)
- Exposure for risk of litigation, if fund underperforms affecting stakeholders
- Requires management to act as an institutional investor (increased work around defining investment goals and beliefs, risk tolerance, proxy voting procedures, fund management and overview)
- Management themselves may be participants of the plan. Hence, they may have the disadvantages as participants (default risk, 2nd order costs)
- Provides door for "creative" accounting

4. 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

Commentary on Question:

Commentary listed underneath question component.

Solution:

(a) Describe the characteristics of an interest rate swap.

Commentary on Question:

The aim of part (a) was to describe the basic features of an interest rate swap without regard to how it applied to pension plan funds. Most candidates understood the concept of trading fixed cash flows for floating cash flows but neglected to mention counterparty risk and how to calculate the duration of the swap which would have provided additional points.

- Exchange cash flows equal to Net interest amount that is periodic and over a defined period of time
- Creditworthiness of counterparties is very important
- One party pays fixed interest and other party paying a floating rate of interest
- For most swaps, the floating rate is tied to an index
- Duration of the swap is the difference between the duration of the fixed-rate bond and the duration of the floating-rate bond

(b) Explain how interest rate swaps are used to hedge interest rate risk in pension plans.

Commentary on Question:

Candidates needed to explain the underlying reasons why swaps would be a good option for pension plans. Most candidates got the first and last bullets below.

In addition, discussion of the types of risk inherent in interest rate swaps would earn points:

- *Basis risk – imperfect correlation between cash bond market interest rates and swap market rates*
- *Counterparty risk – your swap partner will not fulfill their obligations*

Another source of points would be if the candidate provided details of how the management of interest rate swaps works day-to-day.

4. Continued

- Typically investment bank pays a fixed rate of interest and the pension fund pays a floating rate
- As a result, interest rate sensitivity of pension fund becomes more closely aligned with the rate sensitivity of the liabilities
- Very long-dated bonds are in scarce supply, so can't match duration of the plan with conventional bonds
- Interest rate swaps can be used to lengthen a portfolio's duration without committing much capital

(c) You are given:

- Asset duration of the pension asset portfolio: 2.0
- Liability duration of the pension plan: 8.4
- Duration of the fixed-rate bond: 10.2
- Duration of the floating-rate bond: 0.2
- Market value of assets: $690,000

Calculate the notional principal of the interest rate swaps required to reduce the asset/liability duration gap to zero.
Show all work.

Commentary on Question:
This is a basic formula from the study note to further test candidates' numerical understanding of swaps in addition to the explanations above. Partial credit was given for (i) even if the final answer was incorrect.

Points were also given if the candidate explained how the formula for calculating the notional principal is derived.

(i) Duration of swap = 10.2 – 0.2 = 10.0

(ii) Notional principal = 690,000 x (8.4 – 2.0)/ 10.0 = $441,600

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:

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

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

(3c) Analyze how the retirement plan integrates with the sponsor's overall financial position.

Sources:

IRM 115-13: Mitchell & Hustead Pensions in the Public Sector, Ch. 9

IRM 123-13: Risk Management & Public Plan Retirement Systems

Commentary on Question:

This question tested the candidate's knowledge of the various stakeholders in a public pension plan. The candidate was asked about the stakeholders' objectives, the methods each use to achieve those objectives, and the consequences that poor funded levels have on each group.

Solution:

(a) Compare and contrast the objectives of the following stakeholders in the context of a public pension plan:

(i) taxpayers versus elected officials

(ii) public employee unions versus government body administering the plan

Commentary on Question:

Many candidates simply listed the objectives of the stakeholders, but to achieve maximum points, he or she must point out where those objectives were similar and where they were different.

Both taxpayers and elected officials want to provide the best public services at the lowest cost. They also both generally have a short-term outlook rather than a long-term. Taxpayers often want the lowest taxes now, and elected officials are focused on the short-term because re-election is often their primary goal.
The two groups differ in how they want pension assets to be used. Taxpayers want the assets to stay in the plan, which will reduce their future tax burden. Elected officials often want to raid pension assets to use for other projects.

5. Continued

Both unions and the government body administrating the plan want secure benefits with adequate plan assets. However, they differ in how they expect the plan to be funded. Unions are concerned with the greatest benefit at the lowest participant cost, so they seek low employee contributions. The administrating body seeks a "fair" benefit funded by "reasonable" contributions.

(b) Describe how each of the four stakeholders in part (a) can achieve their objectives.

Commentary on Question:
After describing some objectives in part (a), the candidate was asked to explain HOW those objectives were achieved. The roles of each stakeholder must be clearly understood in order to have success on this part (b). For example, many candidates said that taxpayers could achieve their objective by changing the funding policy of the public pension plan. However, taxpayers don't have this authority. They DO have the authority to vote in officials who will represent their interests.

Taxpayers must rely on agents to represent them, so their main way to achieve their objective is to elect officials who share their interests.
Elected officials may achieve their objectives by negotiating with unions in order to change benefit and/or contribution levels.
Unions can negotiate for higher benefits or lower contributions to achieve their main objective. They can also campaign for elected officials that will help them achieve their goals.
The authority of the governing body differs widely. Some have control over benefit levels, contribution levels, and funding policy.

(c) Describe how annual changes in the funded status of a public defined benefit plan affect the stakeholders in part (a).

Commentary on Question:
The study note from which this question was pulled was arranged in a similar way to the model solution below. Many candidates arranged their answer by stakeholder (i.e., a change in funded status affects TAXPAYERS by …). Full marks could be achieved using either approach.

A change in funded status could result in a change in **cash flow**. This affects taxpayers because they are the ones that ultimately fund the plan through taxes.
A change in funded status could result in a change in **expense**. Since the accounting cost of a plan is often used for budgeting purposes, a higher expense could affect elected officials because they would now have less of a budget for other projects.

5. Continued

A change in funded status could result in changes in **benefit security** and **borrowing cost**. This affects unions because their members have less secure benefits. It also affects the governing body because they are ultimately responsible for the security of the retirement system.
A change in funded status could result in a change in **participant promises**. Lower funded statuses often lead to reductions in benefits or elimination of COLAs.

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Sources:
Can Pensions Be Valued as Marketed Securities, Bader, Pension Section News, June 2009

Pension Forum: April, 2005, Entire Issue

RPIRM-128-13: The Impact of the Financial Crisis on defined benefit Plans and the Need for Counter-Cyclical Funding Regulations, excluding appendices

Embedded Options and Pension Plans, pgs. 1 - 17

Commentary on Question:
Candidates generally did well on the question and were able to list specific plan provisions for NOC that are difficult to hedge. Very few points were given if candidates were not able to focus their answer on the case study and only discussed frozen plans in general. Where candidates did poorly was when they simply listed the provision and failed to justify their answer.

Solution:
Indentify the provisions of NOC's newly frozen pension plan that are difficult to hedge. Provide justification for your answer.

Early retirement option
- Difficult for NOC to determine the probability of the option being exercised
- Exposure is unknown since the reduction depends on status at retirement and the fund will need to determine the amount of funds they need to hold in order to pay out the exercised option with a high level of probability

COLA (minimum of 1% or CPI)
- The variability of this feature makes it difficult for NOC to immunize the liabilities with matching assets
- Because this feature will change due to the economic climate, valuation techniques will also have to change reflect the current economic climate

Subsidized normal form of payment (no reduction for 60% Joint and Survivor form if the participant is married)
- Likelihood is unknown of participants being married at retirement
- Need to hedge the additional costs of this benefit since fully subsidized