RET RPIRM Model Solutions
Spring 2014

1. **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:

(2b) Evaluate the interaction and relationship between plan investments and valuation assumptions/methods.

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

(3e) Provide advice and analysis to stakeholders regarding the economic assumptions used in the valuation of their retirement plans.

Sources:

SN1 Pension Forum: April, 2005, entire issue.
http://www.soa.org/library/newsletters/the-pension-forum/2005april/pfn0504.pdf

SN2 R-C105-07: "Pension Actuary's Guide to Financial Economics and Pension Arbitrage (w/example Worksheet)

SN3 R-C130-07: Bader/Gold "Reinventing Pension Actuarial Science" with discussion

SN4 R-C142-10: Bader and gold's Rebuttal to The Case for Stock in Pension Funds, Contingencies March/April, 2008, pp. 12 & 14

SN5 R-D109-07 Financial Economics and Canadian Pension Valuation, September 2006 paper by CIA Task Force on B

SN6 Can pensions Be Valued as Marketed Securities, Bader, Pension Section News, June, 2009

SN7 Financial Economics and Actuarial Practice", Tony Day, NAAJ Jul 01, 2004 (Vol. 8, No.3)

1. Continued

Commentary on Question:
Candidate should provide statement of basics behind each method and criticisms of each method from the opposing side.

Solution:
(a) Compare and contrast the traditional and financial economics methodologies for determining the discount rate for a pension plan valuation.

Commentary on Question:

Most candidates explained the basics of each method and the financial economics criticism of the traditional method. However, few candidates provided criticism of the financial economics perspective.

- Financial economics says that a liability is valued at the price at which a reference security trades in a liquid and deep market.
- The reference security (or portfolio) has cash flows that match the liability in amount, timing, and probability of payment.
- The company's pension liabilities are similar to debt.
- Financial economists argue that the traditional model (including a risk charge) could be used as a budget liability but is not a market liability.
- The expected return on assets held to fund a debt does not affect the value of the debt and in fact invites underpricing of pension liabilities so traditional method not appropriate.
- A plan cannot recognize equity risk premiums not yet earned for risks not yet weathered so traditional method not appropriate.
- Financial economics says the individual bears the risk and not the institution so equity premium should not be reflected so traditional method not appropriate.
- The traditional actuarial model uses expected return on assets to value the liability
- The traditional model assumes the company does bear the risks and rewards of a discount rate assumption based on expected returns, and the plan sponsor takes the long-term view of what is best for the company.
- If a return reflecting equity premium produces costs that are roughly level on average, it is a reasonable assumption to use in computing the liabilities of the plan.
- The financial economics debt model is wrong because:
    - There is not enough debt with terms long enough to replicate ongoing pension plan liability
    - Debt moves in opposite direction of pension liability when there is inflation
    - Pension payments are not fixed and are more variable than debt

1. Continued

- The plan sponsor cares about costs, not liabilities
- The fund plays a key role of risk reduction as it can wait out bad markets

(b) Critique the use of a salary increase assumption in determining pension plan liabilities from a financial economics perspective.

Commentary on Question:
Candidate should provide statement of what is recommended in financial economics followed by details supporting this claim. Most candidates responded sufficiently to receive full credit in this section.

- Including pay projection in liabilities is not consistent with the financial economics view.
- Financial economics treats the accrued benefit obligation as the economic pension liability.
- Future pay increases are not part of the current economic liability so resulting pension benefit increases from them should not be included.
- In support of this view is the observation that no liability is held for expected future cash compensation increases.
- The roll-up of accrued benefits under a final pay plan should be understood as part of the cost of those pay increases.

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

Full Circle, Purchasing Annuities in DB Plans

Case Study

Commentary on Question:

The goal of the question is to test whether the candidate understands two types of risk transfer strategies, called buy-in and buy-out annuities, and to test how well the candidate would be able to advise a client on the process of choosing a risk transfer strategy.
For the potential impact on NOC's investment policy, points can be given for any reasonable explanation of how a buy-in or buy-out might change the policy.
Candidates who did well in part (a) defined buy-ins and buy-outs, in addition to comparing and contrasting them.Many candidates did not take the time to define buy-ins and/or buy-outs.
Candidates who did well in part (b) systematically outlined a process an employer can follow in deciding whether to enter into a risk transfer arrangement, and used NOC's existing investment policy as a framework for analyzing what might need to change if such an arrangement is entered into.
Most candidates did not do well in part (b). The Ruloff/Tauber study note contained much of the information we were looking for in part (b).

Solution:

(a) Compare and contrast buy-in and buy-out annuities from both NOC's and the plan participants' perspectives.

- Buy-out: a plan transfers future responsibility for promised employee retirement benefits to an insurance company.
- Buy-in: plan remains responsible for paying promised retirement benefits, but purchase a contract from the insurer that generates returns designed to equal all future benefit payments to covered participants.

2. Continued

Plan sponsor perspective:

- Buy-out generally triggers settlement accounting, buy-in typically doesn't.
- Buy-out relieves the employer of obligations and assets, buy-in keeps the assets with the employer, minus the contract purchase, and keeps the obligation but virtually eliminates future volatility.
- Buy-out and buy-in are priced similarly because insurer taking on responsibility for covering benefits.
- Buy-in generally also allows the employer to convert the arrangement to buy-out for no additional cost.
- Buy-out completely takes the responsibility for paying benefits off the sponsor, buy-in does not, because if the insurer fails, the sponsor still has to pay benefits.

Plan participant perspective:

- Buy-in should be largely transparent to the participant because the check is still coming from the employer, buy-out directly affects the participant if his/her check is coming from elsewhere.
- The confidence of the participant in the employer's ability to pay benefits may be affected - the perceived stability of the sponsor may be helped by a buy-in, may be hurt by buy-out because assets are gone.

(b) Describe the decision-making process of entering into a risk transfer agreement with an insurance company, including the potential impact on NOC’s investment policy.

Decision should consider:

- Probability of outperforming the return of an insurance company
- Excess return for taking on the investment risk
- Decide the conditions that must be met in order to self-insure (or not)
- Consider asset allocations in portfolio
- Consider expected return ranges with current portfolio
- Obtain bids for buy-in and/or buy-out arrangements
- Determine asset allocation where it makes economic sense to purchase annuities rather than self-insure
- Decide whether to purchase annuities only for inactive participants or all participants

Consider changes to current investment policy:

- Currently says investment risk is borne by company -- may need to modify if purchase buy-out to indicate that some risk may be transferred

2. Continued

- Currently says investment objectives are to preserve capital, provide sufficient funds to meet payments, and maintain sufficient assets over actuarial requirements to meet unforseen liabilities -- may need to make more detailed to include buy-in or buy-out
- Rate of return objectives would need to be adjusted to reflect a buy-in or buy-out
- Asset allocation guidelines would need to be adjusted to reflect a buy-in or buy-out

3. 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.

Sources:

R-C138-09 – The case for stock in pension funds

R-C106-07 – The case against stock in public pension plans

R-C142-10 – Bader/Gold rebuttal to the case for stock in pension funds

RPIRM:

- 102-13: Equities in DB Plans – Is the Traditional 60/40 Mix a Dinosaur?
- 118-13: Reinventing Pension Actuarial Science, with discussion
- 129-13: Pension Actuary's Guide to Financial Economics and Pension Arbitrage Example Worksheet

Pension Forum: April, 2005, entire issue

Commentary on Question:

In this question, candidates were asked to demonstrate their knowledge of investing in equities for governmental and corporate pension plans. A well prepared candidate was expected to understand how future taxpayers and plan participants are impacted by equity investing.

Solution:

(a) A local government provides a defined benefit pension plan for its employees. Describe the impact of investing a portion of the plan assets in equities on:

(i) future taxpayers; and
(ii) plan participants.

Commentary on Question:

In part (a) many candidates described the impact of outperforming/underperforming, intergenerational equity and claims on surplus. Few candidates described the impact on taxpayers of taking equity exposure in their personal portfolio, Federal income taxes and debt service cost.

3. Continued

(i) Future taxpayers bear the risk of equities outperforming or underperforming. Intergenerational inequity arises when early generations pocket expected equity risk premiums, while later taxpayers bear the risk. Equity investment is not unfair to future taxpayers, if they receive market compensation for their risk & can hedge risk in markets.
Taxpayers should prefer to take equity exposure in personal portfolio, not pension fund, three issues: (1) Main second order effect of equity investment is to increase taxpayer's Federal income taxes (tax on bonds > tax on equities) (2) Potential employee claims on surplus may lead taxpayers to prefer minimal risk in the pension fund (3) Pension benefits are mispriced in compensation decisions, to the detriment of taxpayers. Pension plan equity investment increases risk of sponsor's bonds, raising debt service cost borne by taxpayers.

(ii) Equity investing, with its higher expected returns, invites the underpricing of pension liabilities. Participants benefit if higher expected equity returns are used for discounting, receiving pension promise in return for lower reduction in pay. Pension fund investment in equities leads to potential for participant claims on plan surplus. Participants contribute to plan and expect lion's share of investment gains, often written explicitly in the pension plan. Reduced benefit security for participants when plan invests in equities (vs. bonds).

(b) It has been argued that pension plan assets should not be invested in equities. Describe the rationale for this argument from a corporate finance perspective.

Commentary on Question:
In part (b) many candidates described the effects of financial risk and tax arbitrage. Few candidates described the effects of investment management fees, accounting change and benefit security.

Boots cited three advantages to moving 100% into bonds: (1) Increased Security for Participants - Matching pension assets and liabilities increases security since any change in liabilities is matched by an equal change in assets (2) Reduces Investment Management Fees - Boots used active management for its equities at a cost of 50 basis points. By moving to 100% bonds with a "buy and hold" strategy, it reduced these fees by over 95% (3) Reduces Boots' financial risk - Matching the assets and liabilities reduces the risk to Boots' shareholders of having to make up any future deficit.

3. Continued

Tax Arbitrage - Financial economics argues shareholders are better off if the pension plan holds higher-taxed investments (bonds) and shareholders hold lower-taxed investments (equity) in their individual portfolios. Accounting Change - Very soon FASB will move to a mark to market pension accounting that will highlight the true cost of holding equities within a pension plan. If a plan sponsor decided to hold equities, they would record a higher liability and lower earnings.

Plan sponsors should "de-risk" their pension plans and take risks where the market will compensate them, in their core business. Equity investment, with its higher expected returns, invites the underpricing of pension liabilities. Harrison and Sharpe concluded that weak sponsors with underfunded plans should invest entirely in stocks, while strong companies or companies with well-funded plans should invest entirely in bonds.

The vast majority of sponsors are taking the same risk—betting on equities instead of hedging their pension liabilities with bonds. A severe and prolonged decline in stock prices can trigger an assessment spiral. By funding with risky assets, a company fails to eliminate the plan's dependence on the company's credit; that company-specific risk is inefficiently borne either by employees (for nonguaranteed pensions) or by the PBGC.

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:

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

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

Sources:

Litterman – Modern investment management – Chapter 3 and 24

Commentary on Question:

This question requires the candidate to know the risks of investing in fixed income securities and interpret how they would apply to Mortgage Backed Securities (MBS). The candidate will also need to outline active management fixed income investment strategies.

Solution:

(a) Describe the risks of investing pension plan assets in fixed income securities.

Commentary on Question:

Candidates generally did well in listing the types of risk. However, some did not describe the risks to get full points (they simply listed the risks with no explanation/description).

- Interest rate risk – The risk that the yield will change due to changes in the otherwise risk-free bond with the same cash flows.
- Yield curve risk – It is the risk that the portfolio's value will change due to a change in the shape rather than the level of the yield curve.
- Sector risk – Volatility of returns due to yield changes derived from changes in spread between the sector in question and the baseline yield curve (government or swap curve).
- Credit risk – risk that the cash flows will not be paid due to the inability or unwillingness of the borrower.
- Volatility risk – Impact based not on the change in the level of interest rates, but rather by how much interest rates move or are expected to move in either direction.
- Prepayment risk –Defined as volatility arising from the over or underestimation of actual prepayment rates.
- Currency risk – exposure to investments denominated in a currency that is not the investor's base currency.
- Security-specific risk – volatility that cannot be explained by the other fixed income risk factors

4. Continued

- Legal risk – risk of loss due to a contract dispute, lawsuit, or illegal activity.
- Operational risk – risk of loss due to a problem in clearing or settlement of securities or contracts.
- Liquidity risk – risk of loss due to inability to dispose of securities or contracts in a timely manner.
- Reinvestment risk – risk that cash flows will not be able to be invested at the rate of return when the investment was originally purchased.

(b) Describe how the risks in part (a) apply to mortgage-backed securities.

Commentary on Question:
Many candidates did not explain how all of the risks either applied or did not apply to MBS. The candidate should have addressed all of the risks that they described in Part(a).

- Interest rate risk - if interest rates fall, all other things equal, the value of the MBS will increase; if interest rates rise, all other things equal, the value of the MBS will decrease.
- Yield curve risk is dependent on the underlying mortgage duration, whether the cash flows are "bulleted" (concentrated at one point in the future), "barbelled" (clustered at several maturity points), or "laddered" (spread out across the maturity spectrum).
- Sector risk – the yield spread can be affected by credit, volatility and prepayment risk in the MBS sector
- Credit risk – as evidenced by housing crisis, failure of borrowers to pay can significantly increase required yield and lead to material losses of MBS value.
- Volatility risk – Because mortgage holders can refinance if interest rates decline, the fund is effectively short a call option. Therefore, it would have a short exposure to volatility.
- Prepayment risk - borrowers can prepay when interest rates decrease.
- Currency risk – depends on whether the MBS invests in vehicle(s) outside of the country.
- Security-specific risk – can depend on supply and demand balance of the MBS or the market's perception of the credit quality of the issuer
- Legal risk – risk of loss due to issuer fraud and/or litigation.
- Operational risk – risk of loss due to the issuer having problems processing and making payments under the terms of the MBS.
- Liquidity risk – thinly traded security may have a large bid/ask spread so that sale could result in a material loss of value or it may take a long time to find a buyer to turn the security into cash.
- Reinvestment risk – if interest rates decrease, cash flows will need to be reinvested at a lower interest rate.

4. Continued

(c) Describe four active management fixed income investment strategies.

Commentary on Question:
Many candidates did not list the four investment strategies. Providing and describing four of the six strategies resulted in a full credit answer. A common mistake was to list passive strategies (for example, immunization and dedication) instead of active strategies.

Duration Timing Strategy
- Market timing strategy which positions the portfolio to have a longer or shorter average duration than the benchmark.

Yield Curve Positioning Strategy
- Manager overweights the contribution to duration (CTD) of one or multiple parts of the yield curve and offsets these long positions with underweights of other parts of the yield curve; generally expect this to have a net duration of zero.

Sector Allocation Strategy
- Overweight and underweight positions in the various sectors relative to the chosen benchmark; e.g. commercial vs. residential mortgages.

Security Selection Strategy
- Select individual securities within each of the sectors; generally believed to provide the best risk-adjusted return because the manager can diversify across many different active decisions (rather than just a small number of bets).

Country Allocation Strategy
- Taking active long and short positions in one country vs another country; could hedge with currency forward contracts.
  Currency Allocation Strategy
- Betting on one currency vs. another; usually implemented with forward contracts.

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:

(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.

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

Sources:

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

RPIRM-106-13: The place for Lifestyle Funds in a 401(k) Plan

Commentary on Question:

This question tested the candidate's general knowledge of the fiduciary duties and lifestyle funds in a DC plan.

Solution:

(a) Describe a company's fiduciary duties with respect to sponsoring a Defined Contribution (DC) pension plan.

Commentary on Question:

Many candidates simply listed the fiduciary duties without a description and did not receive full credit.

Duty of Loyalty

A fiduciary must discharge his duties solely in the interest of the plan's participants and beneficiaries and for the exclusive purpose of providing benefits to participants and their beneficiaries and defraying reasonable expenses of administering the plan.

Duty of Care

A fiduciary must discharge his duties with the care, skill prudence, and diligence under the circumstances then prevailing that a prudent man acting in a like capacity and familiar with such matters would use in the conduct of an enterprise of a like character and with like aims.

Any investment in employer stock, must be shown to satisfy the requirement that plan assets be expended for the exclusive benefit of employees and must satisfy the fiduciary requirement for prudence.

5. **Continued**

Duty of Diversification
A fiduciary must diversify the plan's investments so as to minimize the risk of large losses, unless under the circumstances it is clearly prudent not to do so. Diversification is not required in all circumstances, but the trustee runs a significant risk if he chooses not to diversify.

The trustee should avoid uncompensated risk, and minimize the transaction costs to the trust. It is possible to reduce transactions costs by investing in a mutual funds or pooled funds. A trustee choosing not to do so and absorbing additional cost should be prepared to show an expectation of greater returns or lower risk.

If employer stock is offered as one of the investment options, the employer must consider what opportunities an employee will be offered to diversify out of the employer stock as he or she approaches retirement. A plan must provide no less than three diversified investment options

Duty of Impartiality
Does not excessively favor one beneficiary at the expense of another.

Duty of Delegate
If the trustee lacks any essential ingredient of skill, then the trustee should employ experts as necessary to provide the required skills.

It is not uncommon for plans to be structured so that trustees and external investment managers, rather than the employer, are responsible for the investment of plan assets. In these plans, the plan sponsor has delegated specific investment authority to outside professionals thus limiting its own fiduciary liabilities.

The trustee may not delegate responsibility. He may delegate authority, but the remains responsible for the actions of the party to whom he delegated (selection of, give instruction to, and supervision of the investment manager).

The purchase of shares in a mutual fund or pooled fund may be viewed as a form of delegation.

Duty to follow statutory constraints
Many jurisdictions have statutory constraints on investments and transactions that may be made by trustees of a plan, which could involve self-dealing (e.g., trustee buying from or selling to the trust; holding employer stock or bonds, at the expense of beneficiary).

5. Continued

In the US, the primary statutory constraints are the prohibited transactions rules, which prohibit certain categories of transactions between a plan and a "party in interest". Most of the prohibited transactions could be violations of the duty of loyalty.

Duty to make the property productive
The prudent investor should see a reasonable return on the investment. Prudence is not satisfied merely by preserving capital and avoiding losses.

Duty Regarding Co-Trustees
Cooperate with any co-trustees for the benefit of the participants and beneficiaries. Take necessary actions to prevent co-trustees from breaching their duties.

Duty to Act in Accordance with the Trust Agreement
Manage the trust in accordance with the trust agreement. The trustee should not engage in a traction that breaches another duty, to the detriment of the participants and beneficiaries merely to follow the plan provisions.

Shifting duties for certain investments
In self-directed DC plan, the trustees remain legally responsible for the investment decision made by the participant until is shifted to the participant.
In US, Internal Revenue Code (IRC) section 404(c) provides an exception to the duty of care for a trustee who invests certain plan assets at the direction of the participant. To qualify as a IRC Section 404(c) safe harbor plan, the fiduciary has provided the participants with: at least three diversified "core" investment options representing a broad range of investment options; the opportunity to transfer money among the funds with an appropriate frequency not less than quarterly; sufficient information to make informed decisions. For such case, the trustee is not liable for the duty of care with respect to specific decision made by the participant. But other duties may apply (prohibited transaction rules, care, diversification, loyalty etc. for selecting the available funds in the plan.)

PPA has allowed plan sponsors to offer investment advice services. Plan sponsors are not required to offer investment advice services. However if plan sponsors decide to do so, their fiduciary responsibilities include prudent appointment of the investment advice provider and ongoing monitoring process of the investment advice provider.

(b) Describe the advantages and disadvantages of including Lifestyle funds in a DC plan from both an employee and employer perspective.

5. Continued

Commentary on Question:
To receive maximum points, candidates needed describe advantages and disadvantages for both the employee and employer.

Lifestyle fund is well-diversified, professionally managed portfolio designed to meet the investor's objectives through a single, convenient investment vehicle, which includes stocks, bonds and cash investments at weights within predetermined ranges, and investors will select the fund mix that is most appropriate for them.

- Approach A - is to create asset allocation funds based on a targeted risk and return, and investor will pick the fund matching their risk and return requirement. Over time, a participant may move from one fund to another.
- Approach B - is "target date fund" - Reallocate investment automatically over time to be more conservative as employees reach the retirement age.

Advantage to Employee

- Reduce transaction costs.
- Most people don't fully understand the investment issues, and can't create a well constructive investment portfolio. This option offers employees well-diversified investment solutions.
- Employees could achieve higher return based on their estimated risk tolerance (age related).
- Approach A - allows investors a little more flexibility and customization to their specific needs.
- Approach B - Adjust the asset allocation for employees over time. Most people don't regularly rebalance their portfolios. Lifestyle funds manager will do this.
- With proper participant education, can provide investors with an effective way to implement their retirement savings.

Disadvantage to Employee

- Approach A - Require the participant to review the allocation regularly to ensure that it remains appropriate for their circumstances.
- Approach B - The process assumes that all people become more risk averse at the same rate due to allocation shifts.
- Most participants choose target date at retirement date (age 65), resulting in a very conservative portfolio. Could choose a target date that is later than the retirement dates.
- Still suffer large loss in bad market due to more equity exposure.
- Participants could over diversify by holding across several life style funds.

5. Continued

Advantage to Plan Sponsor

- Satisfy duty of care, diversify and delegation etc.
- One of safe harbor default investment option, and might transfer investment risk to employees
- Plan fiduciaries need ensure that the plan meets the objectives of the participants, as well as providing education and offering investment advice. Lifestyle fund do offer a certain level of investment advice in pre-packaged vehicle and help plan sponsors meet fiduciary obligations.
- Satisfy duty to make the property productive.

Disadvantage to plan sponsor

- Even for the same the target date, different funds return could be totally different. Employer still has duty of care. Needs to select best funds and investment managers.