

# CSP-RU Complete Illustrative Solutions Fall 2011

## 1. Learning Objectives:

2. The candidate will be able to evaluate sponsor's goals for the retirement plan.
3. The candidate will be able to evaluate risks faced by sponsors of a retirement plan by virtue of the plan's design and be aware of methods to mitigate these risks.

## Learning Outcomes:

- (2b) Compare the, sometimes conflicting, interest of management, employees, shareholders or taxpayers (in the case of public sector).

## Sources:

McGill, *Fundamentals of Private Pensions*, Ninth Edition, 2010, Chapters 1, 4, 5

R-C102-07: Turner & Watanabe, *Private Pension Policies in Industrialized Countries*, Chapter 5

R-C108-07: Why Are Healthy Employers Freezing Plans

## Commentary on Question:

This question tested the candidate's understanding of the issues surrounding the closure of a DB plan to new entrants, where a DC plan is established for the new entrants. This question required analysis and recollection of key points in the reading materials. Successful candidates addressed important issues from the perspectives of all stakeholders and commented on the consequences of having two plans for an indefinite period. Successful candidates also commented that a legacy DB plan would continue and affect costs for a long time.

Note that credit was given for considerations other than those listed below.

## Solution:

NOC's management is concerned about the cost of the National Oil Full-Time Salaried Pension Plan (the "Salaried Plan") and is considering closing the Salaried Plan all new entrants.

Under this proposal, all new salaried employees and hourly employees who are promoted to managerial positions will participate under a new defined contribution pension plan to be established by NOC.

Evaluate this proposal.

# 1. Continued

## NOC Finance/Treasury Perspective

- The retirement program must be sustainable in order to serve the ER's long-term strategic goals (e.g., overall cost of the program must be sustainable).
- Timing of the costs may be just as important as the overall cost. The ER is not required to make maximum DB contributions to the plan each year.
- Maintaining DB plan will not eliminate administrative implications:
  - Still need to retain services of an Actuary
  - DB and DC administrative implications
- Current Salaried Plan members will retain all the risks inherent in DB plans:
  - Investment risk as it invests DB pension plan assets.
  - Risk that interest rates will be very low and therefore the price of liabilities high.
  - Longevity risk on current DB plan.
  - Risk that accounting or legislative changes may make sponsoring a DB plan more costly.
  - Wage risk due to FAE borne by NOC.
  - DB plan will continue to face income statement and balance sheet volatility.
- DC plan may require an overly generous ER contribution to be effective, especially for EEs in transition.
- Major reason for closing DB plans is desire to cut total compensation. However, shift to DC will likely need to be offset by higher cash wages, so compensation is equal.
- ER DC contributions will be relatively stable and predictable.
- No volatility in income statement and on balance sheet. Accounting recognition is contributions made (no unfunded liability).
- Level of benefit determined by investment earnings; not cost efficient.
- ER must manage DC plan prudently or risk being sued.

# 1. Continued

## HR perspective

- New entrants to managerial positions may not be concerned about DC plan if overall pay levels are adequate.
- New entrants to managerial positions may be concerned with DC plan since workers with equal productivity should receive equal compensation.
  - Workers may trade cash wages for noncash elements of total compensation.
  - May be challenging to convince new entrants to managerial positions of the equality of their compensation.
  - Providing DB or DC plans does not necessarily lead to offsetting reductions in cash wages.
  - DB plans are “golden handcuffs” that discourages covered workers from changing jobs. DC plan will not discourage covered workers from changing jobs.
  - NOC may want to restrict worker's mobility in order to minimize labor costs over time.
  - Retaining trained workers minimizes the cost of investment.
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- The DC plan may sort out the undesirable workers.
- DB plans may attract workers who plan to work for the employer for a considerable duration. These are the types that NOC will look for in managerial positions.
- Workers covered by DB plans are less likely to shirk on the job. ER cannot afford to have workers who shirk on job in managerial positions.
- Plan sponsors need to share information with their workers so they can make informed assessments about the value of the benefits.

## 2. Learning Objectives:

7. The candidate will be able to evaluate the sponsors' financial goals and risk management with respect to their plan.
9. The candidate will be able to synthesize plan design and funding/accounting/economic value.

### Learning Outcomes:

- (7a) Describe ways to work with the sponsor on identifying and prioritizing the goals of management and shareholders related to the financial management of their retirement plan.
- (9a) Explain the interplay between plan design and plan funding/accounting/economic value.
- (9b) Given the sponsor's goals, recommend an integrated plan (design and funding/accounting/economic value) and defend the recommendation.

### Sources:

Allen, *Retirement Plans - 401(k)s, IRAs and Other Deferred Compensation Approaches*, Tenth Edition, 2008, Chapter 24

Mitchell/Hustead, *Pensions in the Public Sector*, Chapter 9

R-C149-10: Plan Sponsor Guide to Liability Driven Investing

### Commentary on Question:

This question tested a candidate's understanding of duration mismatch and strategies to reduce it, specifically the use of asset liability matching strategies. Candidates were expected to explain the concepts and apply them to real world scenarios. Candidates were expected to provide supporting details rather than just a list. Candidates who did well on parts (b) and (c) also described and applied ALM strategies and concepts.

### Solution:

- (a) Describe duration mismatch.

### Commentary on Question:

To receive full marks, the candidate had to convey an understanding of what causes duration mismatch. Candidates received points for acknowledging the duration mismatch that exists within NOC's pension plan.

## 2. Continued

Duration is the sensitivity of assets or liabilities to a 1% change in the interest rate. Duration mismatch occurs when the duration of the assets does not match the duration of the liabilities, meaning they react differently to changes in the underlying interest rate. Duration mismatch creates risk for a pension plan and, therefore, is undesirable.

NOC's plan has a mismatch between its liabilities (pension liabilities are generally longer duration) and its assets which are invested 60% in equities and 40% in short-term bonds.

- (b) Describe alternative investment strategies to reduce duration mismatch and the advantages and disadvantages of these strategies.

### **Commentary on Question:**

Most candidates understood the need to increase the duration of the assets to better match the liabilities. However, the question was looking for candidates to apply asset liability management strategies to manage duration mismatch, and candidates needed to do so to pass.

Increase the duration of the assets by:

- Replace short-term bonds with long-term bonds.
- Replace equities with long-term bonds.
- Use a derivative strategy to increase the duration of the assets (**Commentary:** candidates who also provided examples of derivative strategies received full marks for this point).

Cash flow matching (**Commentary:** also called dedicated portfolio) – construct a fixed income (bond) portfolio with cash flows that match the timing and amounts of the benefit payments from the plan.

- May be hard to find bonds with long enough maturities (30+ years) to match the cash flows of the pension plan.
- Higher costs

Duration matching (**Commentary:** also called immunization program) – match the duration of the liabilities to the duration of the assets using bonds.

- If durations match, then liabilities and assets move in tandem when interest rates change.
- Requires constant rebalancing.

Horizon matching – use cash flow matching for the first few years (3-5 years) then use duration matching.

## 2. Continued

- (c) Describe the risks and rewards of investing in equities in the following three situations.

**Commentary on Question:**

Candidates were expected to apply asset liability management strategies to each situation and understand that the funded status of the pension plan and the plan status (frozen, closed, and open) impact the appropriate investment strategy.

- (i) The pension plan is overfunded and benefits are frozen (no more future benefit accruals).

**Commentary on Question:**

Candidates needed to understand that a significant equity allocation was not the appropriate strategy in this situation.

If plan is overfunded and benefits are frozen, main objective of plan sponsor should be to maintain the existing surplus.

Frozen benefits are more predictable and more closely resemble bonds. Immunization or duration matching strategy would be more appropriate here.

Risks to investing in equities:

- Lose surplus and have to start making contributions again
- Plan sponsor may want to terminate the plan in the near future so don't want to risk creating a deficit
- In US, plan sponsor may have to pay high taxes to access surplus on plan termination ("trapped surplus")

- (ii) The pension plan is fully funded and closed to new entrants.

If the plan sponsor can afford to make large contributions, then may be appropriate to take more risk and invest in equities. However, if plan sponsor cannot afford to make these contributions, then it would be a good idea to be more risk averse and reduce volatility and equity exposure.

Rewards to investing in equities:

- Higher returns could lead to some cushion or surplus above target funding
- Closed to new entrants, but actives are still accruing benefits, so equities would provide a hedge against future salary increases in an FAE plan

## 2. Continued

Risks to investing in equities:

- Poor returns could lead to higher contributions
- Over time, the duration mismatch will increase as active members retire and liability shifts to mostly retiree liability

(iii) The pension plan is ongoing and open to new entrants but underfunded.

In order to make up the funding deficit, higher returns are required which leads to higher equity exposure.

Rewards to investing in equities:

- Potential to reduce plan costs by reducing future contribution requirements
- Younger plan means longer time horizon so some volatility is ok
- Higher EROA assumption, may reduce pension expense

Risks to investing in equities:

- Losses may lead to higher contribution requirements
- More volatility in contributions
- In US, if funded ratio drops too low, may be subject to accelerated funding requirements under the Pension Protection Act

### **3. Learning Objectives:**

10. Analyze the regulatory environment as it affects retirement plans

#### **Learning Outcomes:**

(10a) Describe and recommend proper plan governance practices and sponsor's fiduciary responsibility

#### **Sources:**

R-C132-07: 20 Questions Directors Should Ask About Their Role in Pension Governance

R-C119-07: Fiduciary Liability Issues for Selection of Investments

Mitchell/Hustead, *Pensions in the Public Sector*, Chapter 2, pages 33-35

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

A successful candidate identified the company/sponsor board of directors as the manager of the pension plan and specifically stated that the company/sponsor board of directors is in charge and must define responsibilities for executive functions, carefully select managers, monitor results, develop action plans, and report.

Note that credit was given for considerations other than those listed below.

#### **Solution:**

The government of Vosne is proposing new legislation mandating pension plan governance and oversight. You have been asked by a government official to prepare a report recommending four requirements of a good pension governance program. Describe your recommendations and justify your response.

1. Document the pension governance structure, that is, define the functions and ultimate responsibilities. The company board of directors bears ultimate responsibility for all aspects of the pension plan and fund. Periodically, evaluate the appropriateness of the governance structure, the delegation model, and the competencies of directors.
2. Document the investment policy and structure in the Statement of Investment Policies and Procedures (SIPP). The SIPP covers the long-term asset mix, return expectations, and performance measurement and monitoring.

### **3. Continued**

3. Prepare a formal written funding policy. Set out the desired ongoing relationship between pension fund assets and liabilities. The funding policy serves as a guide for other major areas of decision-making, for example, benefit security, stranded assets and investment policy for the pension fund.
4. Prepare written policies and procedures for administration. Provide standards for core tasks such as benefit calculations. Prepare annual administration reports for filing with the government.

#### 4. Learning Objectives:

8. The candidate will be able to recommend and advise on the financial effects of funding policy and accounting in line with the sponsors' goals, given constraints.

#### Learning Outcomes:

- (8d) Advise plan sponsors on accounting costs and disclosures for their retirement plans. This would include restrictions imposed by applicable accounting authorities (FASB, CICA, IASC, FRS17).
- (8f) Perform valuations for the following special purposes and advise plan sponsors on their financial implications:
- Plan Mergers and Acquisitions
  - Spin-Offs
  - Conversions from one plan type to another

#### Sources:

R-C118-07: Pension Issues in Corporate Sales, Mergers...

R-C144-10: Mergers & Acquisitions: Due Diligence for Retirement

FASB 158

Defined Benefit Plans Issues Grid

#### Commentary on Question:

This question required the candidate to first critique the assumptions used by XYZ and the expense calculations of XYZ's pension plans and retiree medical plan. A successful candidate demonstrated a good understanding of how each accounting assumption is selected and how the components of expense should be calculated. A successful candidate also recognized the need to request additional information in order to justify his/her observations.

#### Solution:

- (a) Critique the accounting information provided.

#### Assumptions

Each assumption should be management's best estimate with respect to that assumption and should be internally consistent

#### DISCOUNT RATE

#### Same discount rate used for pension plans and retiree medical plan.

The membership of the 2 pension plans is the same as the retiree medical plan. All assumptions except discount rate should be the same.

**Discount rate at 1/1/2010 used by XYZ is 1.0% higher than NOC (NOC 5.5%, XYZ 6.5%).**

## 4. Continued

The demographic of the employees and retirees of XYZ is comparable to NOC's employees and retirees, the discount rate is expected to be similar.

- Ask for methodologies used by XYZ in setting the discount rate for the pension plans and retiree medical plan and/or ask for the cash flows of the 3 plans and the yield curve used to determine the discount rate.
- Need to investigate the large gap between the discount rate used by XYZ and NOC.
- The expense of the retiree medical plan could be overstated if a higher discount rate should be used or understated if a lower discount rate should be used.
- The expense of XYZ could be understated if a lower discount rate should be used.

**Discount rate used for the 2010 expense is shown as 6.0% (i.e. the discount rate at 12/31/2010).**

The discount rate at 1/1/2010 of 6.5% should be used to determine the 2010 expense.

- Need to confirm the discount rate used for the 2010 expense and make any adjustment to the expense, if necessary.
- The expense of XYZ could be overstated if the 6.0% discount rate was used.

### EXPECTED RETURN ON ASSETS

**EROA for the Retiree Medical Plan is the same as Pension Plans.**

- Need to confirm the asset mix, investment strategy, the EROA assumption and calculation for the Retiree Medical Plan.

### TURNOVER TABLE

**The turnover table may not be appropriate: age table vs. age/service table.**

Expected Working Lifetime is different for the pension plans (20 years) and the medical retiree plan (18 years). Same table should be used for 2 pension plans and the retiree medical plan. The same number of employees should be expected to terminate before retirement OR both pension plans and retiree medical plan should have the same EARSL. Given mortality and retirement age assumptions are the same, looks like there is a problem with the turnover assumption (not internally consistent).

- Ask question about how many employees are expected to terminate every year in the future for pension plans and retiree medical OR ask for how the tables were developed (methodology).

### RETIREMENT AGE

**Retirement age assumption of 65 may not be appropriate.**

- Ask for past retirement experience, especially for the retiree medical plan.

## 4. Continued

- (b) Suggest a recommended course of action to NOC.

### **Expense Calculations**

Since the 2010 Expense reduces the purchase price, overstating the 2010 Expense would understate the purchase price (and understating the 2010 Expense would overstate the purchase price).

- Ask for plan documents and all amendments of the pension plans to confirm plan provisions.

For the Pension Plans:

**Amount of amortization of actuarial gains or losses in 2010 expense may be incorrect.**

Based on MV and Obligation, it appears that the unamortized losses are within the corridor and that no amortization should have been included in the expense.

However this may be correct.

- To determine if the amount is correct, we need the details of these figures for each pension plan separately (also for curtailment and other areas).

**Treatment of Change in Obligation due to curtailment may be incorrect.**

- To determine if this is correct, we need the details of these figures for each pension plan separately.

Need to know what created the curtailment, at what date, was there a reduction in the number of employees (service cost may need to be adjusted).

For the Retiree Medical Plan:

**Amortization of past service cost is incorrect.**

Amortization of past service cost was done over 18 years (expected working lifetime).

This should have been based on expected working life till full eligibility, which may be a shorter period of time.

**Amount of amortization of actuarial gains or losses in 2010 expense is incorrect.**

Based on the MV and Obligation, it appears that the unamortized losses are within the corridor.

There should not be an amortization of gains of \$1,096,800, especially when there are losses to amortized.

- The expense has been understated by \$1,096,800 and needs to be adjusted.

## **5. Learning Objectives:**

7. The candidate will be able to evaluate the sponsors' financial goals and risk management with respect to their plan.
8. The candidate will be able to recommend and advise on the financial effects of funding policy and accounting in line with the sponsors' goals, given constraints.
11. The candidate will be able to analyze the issues facing retirement plan sponsors regarding investment of fund assets and make recommendations on the actuarial issues.

### **Learning Outcomes:**

- (7f) Demonstrate how the retirement plan's cash inflows and outflows can affect the plan sponsor.
- (7g) Recommend an appropriate funding policy in line with sponsor goals and professional standards. The candidate will be able to defend the recommendation.
- (8b) Recommend an appropriate funding method and asset valuation method in line with the sponsor's investment policy and funding goals. The candidate will be able to defend the recommendation.
- (11a) Assess the different types and combinations of investment vehicles for providing retirement benefits given the particulars of the sponsor's financial circumstances, philosophy, industry, workforce and benefit package.
- (11b) Distinguish the various ways that retirement fund assets are managed.
- (11d) Assess the potential effects of various investments and investment policies on plan funding (short and long-range), accounting, design and administration.

### **Sources:**

R-C112-07: Pension Investment and Corporate Risk Management

R-C114-07: A Fresh Look at Pension Risks

R-C116-07: Financing the Future: How Fit is Your Funding Policy

R-C125-07: Pensions and Corporate Financial Performance, pages 1-14

R-C147-10: How a Pension Plan's Funding Level Should Influence its Investment Strategy

Pension Forum, June 1996, Funding Adequacy – A Canadian Perspective

## 5. Continued

Allen, *Retirement Plans - 401(k)s, IRAs and Other Deferred Compensation Approaches*, Tenth Edition, 2008, Chapter 24

Litterman, *Modern Investment Management*, Ch. 10, 24

Employee Future Benefits - Additional Disclosures, CICA 3461

R-C150-10: Mind the Gap: Using Derivative Overlays to Hedge Pension Duration

### **Commentary on Question:**

This question tested how well a candidate understood the financial impacts of funding policies chosen by the plan sponsor. Candidates were expected to analyze the two proposed funding policies in relation to the plan sponsor's goals and NOC's current funded status, asset allocation, and valuation assumptions. In order to receive maximum points on this question, candidates needed to examine each funding policy with respect to both of the plan sponsor's goals, not just provide a list. Successful candidates addressed the assumptions used for funding and accounting as well as the current funded position and asset allocation. Full credit was given for proposed asset strategies along with specific investment choices that would be appropriate with all reasoning explained.

### **Solution:**

- (a) Compare and contrast these funding policies in light of NOC's goals

#### Policy #1

The Salaried plan currently has a large accounting deficit. The Salaried Plan's liability is large relative to NOC's market capitalization and the required contribution to fund the plan on an accounting basis is large compared to NOC's market capitalization. The large required contribution on an accounting basis would increase the surplus on a funding basis. The potential for large surplus increases risks of stranded assets if there are plans to terminate.

Contributions under this policy would be volatile due to changes in investment return, discount rate, and plan experience. Prescribed discount rates under accounting standards are more volatile than long term discount rates set by actuaries and contributions under policy #2 would vary accordingly. In future years, contributions made to fund the plan on an accounting basis may not cover the normal cost on a funding basis if discount rates on an accounting basis increase to exceed the funding interest rate, and as a result, the funding deficit could increase.

## 5. Continued

Policy #1 achieves goal of minimizing long-term contributions to the Salaried Plan because larger contributions earlier (especially a large one payable immediately) should increase future investment income thereby reducing future contributions. The ultimate cost of a plan is equal to benefits payable plus expenses minus contributions minus investment income. It is also possible that long-term contributions under Policy #1 would not be minimized if the plan is left with a large surplus due a high asset return and/or high discount rates over the life of the plan.

Policy #1 achieves the goal of minimizing the deficit on an accounting basis.

### Policy #2

The Salaried Plan is currently in a surplus position on a funding basis. Policy #2 may achieve the goal of minimizing long term contributions by maintaining the Plan's surplus and/or by improving the funding ratio even further to provide more of a "cushion" for future plan experience. The only contributions currently required to the Salaried Plan under this policy are Normal Cost contributions. Minimizing contributions would also be achieved because deficiency payments are spread over 10 years

The duration of assets is usually much lower than the duration of liabilities, thus a large decrease in interest rates could move the plan into a deficit position (from the current surplus position) and thus increase the company's contributions in the short term. Surplus of \$40 million could sustain a small decrease in interest rates. Since the Salaried Plan has a surplus of \$40 million, experience losses would not initially increase the Company's required contribution substantially.

Policy #2 would not achieve the goal of minimizing the deficit on an accounting basis. The funding valuation discount rate of 7% is much higher than the discount rate of 5.5% prescribed by accounting standards (i.e. high quality debt instruments). The spread would need to narrow to achieve goal of minimizing accounting deficit. Increased required funding contributions would minimize the accounting deficit. The Current Service Cost (Accounting Basis) \$57 million exceeds the Normal Cost (Funding Basis) \$42.3 million.

- (b) Evaluate the current asset mix in light of the proposed funding policies.

Salaried Plan's current asset mix is 57% stocks / 36% bonds / 4% Real Estate / 3% Cash

Actuarial liability is approximately 84% actives / 16% pensioners

## 5. Continued

### Policy #1

It would be difficult to achieve the goal of minimizing the deficit on an accounting basis with the current asset mix. The Salaried Plan is not fully funded on an accounting basis.

If the goal is to fully fund the Plan on an accounting basis each year, then one objective should be to minimize funded status volatility in order to reduce contribution volatility. That makes this Plan an ideal candidate for a liability driven investment policy. The current asset mix appears inappropriate. I would suggest a higher proportion of long term or high duration fixed income securities and a lower proportion of equities, primarily interest sensitive ones.

There is a mismatch in basis on which the liabilities and assets are valued. The expected return on asset assumption is based on management's best estimate. The discount rate is set based on market interest rates at the measurement date on high-quality debt instruments with cash flows matching the timing and amount of the expected benefit payments OR the interest rate inherent in the amount at which the accrued benefit obligation could be settled.

### Policy #2

There is a mismatch between assets and liabilities in the Salaried Plan in that the duration of pension assets is lower than the duration of pension liabilities. In assessing the asset mix: funded status, liability duration, and diversification for the plan should be considered. Underfunded plans benefit more from higher equity allocations than overfunded plans because underfunded plans will benefit from the higher risk premium whereas overfunded plans will not benefit from excess return and will lose out in periods of low return.

The funding interest rate assumption is set to be the best estimate assumption for the rate of return on investments modified to make provisions for adverse deviations (i.e. for uncertainty in the assumption). The higher the provision for adverse deviation contained in the 7% discount rate, the more conservative the funding basis, which should result in a higher probability of gains and a lower probability of losses.

### Both Policies

For both funding policies, the plan sponsor should focus on managing the plan assets to maintain the funded status (surplus) relative to the pension liability (i.e. a liability sensitive approach to avoid the possibility of deficits in the future.)

NOC should focus on moving away from the current asset allocation to an asset mix combination of high duration fixed income securities and interest sensitive stocks which can reduce the volatility of surplus.

## 6. Learning Objectives:

7. The candidate will be able to evaluate the sponsors' financial goals and risk management with respect to their plan.
8. The candidate will be able to recommend and advise on the financial effects of funding policy and accounting in line with the sponsors' goals, given constraints.

### Learning Outcomes:

- (7a) Describe ways to work with the sponsor on identifying and prioritizing the goals of management and share holders related to the financial management of their retirement plan.
- (8a) Compare the financial economics perspective to the traditional perspective on funding and accounting for retirement plans.
- (8g) Provide advice and analysis to plan sponsors regarding the actuarial assumptions used in valuation for their retirement plans, including:
  - (i) The appropriateness of assumptions, given the purpose of the valuation
  - (ii) The financial risks associated with a particular set of valuation assumptions
  - (iii) Adherence of assumptions to applicable accounting standards.

### Sources:

Retirement Benefits, Economics and Accounting: Moral Hazard and Frail Benefit Designs

R-C130-07: Reinventing Pension Actuarial Science (with discussion)

Mindlin "Reaffirming" and counter papers – *Pension Forum* April 2005, Vol. 16 No. 2

What's Wrong with ASOP 27? Bad Measures, Bad Decisions by Bader and Gold

Michell/Hustead: *Pensions in the Public Sector*, Chapter 9

### Commentary on Question:

This question tested the candidate's understanding of measuring pension liabilities and assets that are disclosed in financial statements for the public sector plans. The question required understanding of financial economics and how to apply it to valuing liabilities and assets for public pension plans. To receive maximum points, candidates were required to answer the question as it related to this particular public sector plan.,

## 6. Continued

### Solution:

- (a) Address the drawbacks of using the projected unit credit method for financial reporting purposes for this public sector entity.
- By using the PBO, a percentage of future earnings is credited in each year's pension cost (reflects future pay increases).
  - It adds a second layer of implicit contract, recognizing the benefit impact of estimated future pay increases (projected costing).
  - Projected costing misrepresents the economic obligations incurred by the plan sponsor or taxpayers.
  - It invites moral hazard by providing lower compensation during an employee's early career without the promise of an explicit contract of future rewards.
  - Financial statements should not be based on PBO, since
    - PBO is not value relevant.
    - Future pay increases do not show up anywhere else in financial statements.
    - The projection of future salaries overstates costs for young employees and understates costs for older employees (PBO credits a percentage of future earnings in each year's pension cost).
    - The inclusion of a salary scale in the PBO overstates liabilities and misstates income.
    - Recognizing cost based on PBO threatens the existence of DB plans.
- (b) Vested Benefit Obligation (VBO) and Accumulated Benefit Obligation (ABO) are examples of other measures of liability. Discuss the merits of using VBO and ABO for financial reporting purposes.

### **VBO (vested benefit obligation)**

- VBO represents the explicit contract which defines the benefit entitlement of an exiting employee (exit costing) (reflects actual cost).
- Therefore, it minimizes moral hazard.
- It supports claim that pension contract does not constitute a contract of employment.
- It recognizes only those benefits to which an exiting employee is entitled under the explicit benefit contract (Employees have not been charged for promises that they cannot take with them; they will be fully charged when the promise vests).
- It provides more transparency to users of financial reports.
- It gives management more plan design flexibility.
- Exit costing does not raise employee expectations, so management does not have to anticipate negative reactions when they consider plan cutbacks.
- Those benefits reflect years of service and pay to date.

## 6. Continued

- They exclude non-vested benefits, benefits for which eligibility has not yet been satisfied, and salary scale effects.
- It informs the sponsor/taxpayers of economic obligations they have incurred.

### **ABO (accumulated benefit obligation)**

- ABO may be a better measure of the sponsor's economic commitments.
- ABO assigns probabilities to future service which may meet eligibility requirements for vesting and for subsidized benefits (accrued costing).
- It recognizes an implicit contract to continue employment beyond the current reporting date.
- Because of 5-year cliff vesting, ABO can be significantly greater than the VBO and this design is frail benefit design.
- It can raise expected compensation.
- It can enable training investments and enhance productivity.

(c) From the financial economics point of view, address the disadvantages of using an expected rate of return on assets as the discount rate and recommend an alternative method for selecting the discount rate. Justify your recommendation.

- When the expected return is used to discount liabilities without an adjustment for risk, the expected gain is reflected up front (ignores the risk).
- Using the expected return on assets to discount liability undervalues liability and overvalues funding status (higher funded ratio).
- Reflecting the risk premium in discount rate lowers cost for current taxpayers and passes on risk to future taxpayers (intergenerational equity).
- Anticipation of equity risk premium is not appropriate for liability discounting, financial reporting or statutory funding; it is only appropriate for budgeting purposes.
- It could lead to bad decisions because it does not show clear picture of funded status of the plan.
- Sponsor may offer too much in future benefits in exchange for smaller current wages.
- Sponsor is more likely to increase benefits when assets performance is good, instead of increasing compensation.
- It would permit cuts in current contributions without any other change in policy and increase probability of higher contributions in the future.
- Investment policy can be changed to increase equity exposure (increases risk).
- Financial economists argue that using expected return on assets to discount liabilities is misleading.

## 6. Continued

### **Alternative method for selecting the discount rate**

- According to financial economics, pension plans are obligations that closely resemble debt and should be valued in the same way.
- Liability should be discounted using discount rate curve that represents matching fixed income obligation with similar credit worthiness, after factoring in the collateral provided by the pension fund assets.
- Financial economics makes the case that actuarial liabilities usually should be discounted using interest rates that are consistent with assets whose durations and probabilities of payment are comparable to the duration and probabilities of payment of the benefits. For most public sector plans, a combination of existing funded status, taxpayer resources, and contractual rights or constitutional protection means that the benefits of participants are almost certain to be paid. Therefore, rates of return consistent with the yields on U.S. Treasury securities of comparable duration are the appropriate interest rates with which to discount expected benefits.

## 7. Learning Objectives:

11. The candidate will be able to analyze the issues facing retirement plan sponsors regarding investment of fund assets and make recommendations on the actuarial issues.

### Learning Outcomes:

- (11a) Assess the different types and combinations of investment vehicles for providing retirement benefits given the particulars of the sponsor's financial circumstances, philosophy, industry, workforce and benefit package.
- (11d) Assess the potential effects of various investments and investment policies on plan funding (short and long-range), accounting, design and administration.
- (11e) Assess the potential effects of various investments and investment policies on all of the stakeholders, including tax implications.
- (11f) Model the effect on setting investment strategy of factors including, cash flow requirements, various plan designs and various economic environments.
- (11h) Identify the sources of investment risk and assess risk facing retirement funds.

### Sources:

R-C147-10: How a Pension Plan's Funding Level Should Influence its Investment Strategy

R-C148-10: Jim Moore Discusses Liability Driven Investment Strategies and Concepts

Allen, *Retirement Plans - 401(k)s, IRAs and Other Deferred Compensation Approaches*, Tenth Edition, 2008, Chapter 24

R-C149-10: Plan Sponsor Guide to Liability Driven Investing

R-C120-07: Introduction and Overview of Retirement Plan Investments

Litterman, *Modern Investment Management*, Chapters 9, 10, 22, 23, 28

R-C107-07: Equities in DB Plans – Is the Traditional 60/40 Mix a Dinosaur?

Identifying Risks Inherent in Retirement Plans

Statement of Investment Policies for DB & DC Plans

## 7. Continued

### **Commentary on Question:**

This question tested the candidate's ability to explain important aspects of investment strategies that sponsors should consider, and how specific assets would fit given the provisions of the plan.

For part (a), successful candidates were able to elaborate and provide a description of why the key factors they identified are important. For part (b), candidates were asked to determine why specific asset classes would be a good fit for the NOC Salaried Plan.

For part (a) it was important for candidates to explain why each factor is important, rather than simply listing key factors.. In part (b), candidates were required to apply their knowledge of the NOC Salaried Plan provisions in their analysis of the CFO's proposed changes to the asset mix.

### **Solution:**

- (a) Describe influencing factors a plan sponsor should consider when developing an asset allocation strategy for an ERP.

### **Commentary on Question:**

In order to receive full credit, candidates were required to identify and describe seven key factors. Note that credit was given for factors other than those listed below.

The risk tolerance of the plan sponsor should be considered. Assessing the risk tolerance includes identifying which risks the sponsor is willing to accept and which they would like to pass off, determining the relative importance of reducing volatility or improving funded status, and determining whether they prefer to take risks within the pension plan or in the company's core business.

The pension plan's funded status should be considered. The sponsor should determine whether or not the disadvantages of being underfunded outweigh the advantages of being overfunded. In other words, are they comfortable with the plan being less than fully funded? Sponsors should consider whether they prefer to lock in the current funded status of the plan, or be more aggressive and seek higher returns.

Whether the plan is open, closed or frozen is an important consideration in the asset allocation decision. Frozen plans are more easily immunized, while open plans need to consider future benefit accruals. Any future plans to change the status of the pension plan should also be considered.

## 7. Continued

The size of the plan in general as well as its size in relation to the whole company is important. Large plans have access to a wider variety of asset classes. The size of the plan relative to the whole company affects the level of risk the sponsor is willing to take within the plan.

The sponsor's ability and desire to make contributions should be considered. If a plan is underfunded and the sponsor is unable to make contributions to make up the gap, they will be forced to take a more aggressive stance to investments in the hope that higher returns will bring the plan to a fully funded position. If the sponsor is not able to withstand a volatile contribution pattern, they will want to seek assets with stable returns.

The tax advantages of certain investments should be considered. If certain assets are tax exempt within the plan, the sponsor should invest in these within the plan in order to maximize shareholder returns.

The liquidity needs of the plan are important. If the plan offers lump sums, the plan will need adequate liquid investments to pay these benefits. If the plan sponsor has issues with liquidity, there may be a time when they are unable to contribute to the plan for a short period.

- (b) NOC's CFO is proposing the following changes to the pension fund asset allocation for the Salaried Plan:

- Add Treasury Inflation-Protected Securities ("TIPS")
- Increase real estate investments
- Add private equity investments

Analyze these proposed changes and provide supporting arguments for the CFO's proposal.

### **Commentary on Question:**

To receive full marks for part (b), candidates were required to analyze the appropriateness of the three asset classes in relation to the NOC Salaried Plan. While many candidates were able to identify characteristics of each class, fewer were able to provide the necessary link to the case study and/or provide a supporting argument for the proposal.

TIPS provide inflation protection. This protection is important for plans with inflation-indexed pensions, which is not the case for the NOC Salaried Plan. However, accruals under the plan are based on final average salary and are thus linked to inflation. Since the plan has a high number of actives, TIPS are a good source of inflation protection.

## 7. Continued

Similarly, real estate investments provide a good inflation hedge. Increasing the allocation of real estate in the portfolio will increase the diversification of the portfolio. This diversification benefit, combined with the fact that real estate is far less volatile than common equity, will serve to reduce the overall riskiness of the portfolio. A potential pitfall of investing in real estate is its lack of liquidity. However, this can be overcome by investing in REITs, rather than directly in real estate properties.

Private equity investments have the advantage of potentially higher returns than common equity. There is a lack of widely available information on these investments, so it is important to have a manager with access to the information. The long term horizon of these investments is a good fit for pension plans.

In general, the appropriateness of these proposed investments depends on the size of the allocation and which assets are being replaced. Since the plan is not severely overfunded or underfunded, some modest risk taking can be considered appropriate.

## 8. Learning Objectives:

1. The candidate will be able to analyze the risks faced by retirees and the participants of a defined benefit or defined contribution retirement plan, as well as retiree health plans.
2. The candidate will be able to evaluate sponsor's goals for the retirement plan.
3. The candidate will be able to evaluate risks faced by sponsors of a retirement plan by virtue of the plan's design and be aware of methods to mitigate these risks.
4. The candidate will be able to evaluate and recommend a plan design appropriate for the sponsor's goals.

### Learning Outcomes:

- (1a) Identify risks faced by retirees and the elderly.
- (1d) Describe the risks faced by participants of single employer sponsored retirement plans.
- (1f) Evaluate benefit adequacy for members of a particular plan given other sources of retirement income.
- (3a) Identify how plan features, temporary or permanent, can adversely affect the plan sponsor. For example – an early retirement window offering or a lump sum payment option.
- (4a) Given a context, design retirement programs that manage retirement risk and are consistent with sponsor objectives.

### Sources:

McGill, *Fundamentals of Private Pensions*, Chapters 4, 5

R-C102-07: Turner & Watanabe, *Private Pension Policies in Industrialized Countries*, Chapter 5

Allen, *Retirement Plans - 401(k)s, IRAs and Other Deferred Compensation Approaches*, Tenth Edition, 2008, Chapter 3

Yamamoto, *Fundamentals of Retiree Group Benefits*, Chapter 4

Derived from Question

Derived from Case Study

## 8. Continued

### **Commentary on Question:**

This question did not only require the candidate to recall information but also to apply (expand on/explain how) the recalled information to this specific question.

In order to obtain maximum points, candidates were required to not only outline the risks NOC and NOC's salaried employees are subjected to under both options but also explain these risks as they apply to NOC and NOC's salaried employees under these specific options. In answering this question, candidates were expected to not only apply their knowledge from recommended readings but also consider additional information provided in the case study and question.

### **Solution:**

Describe the risks to NOC and to NOC's salaried employees of each of the options under consideration.

### **Option: Freeze accruals under the NOC Salaried Plan and participate in the government-run defined contribution plan.**

#### **Risks to NOC**

Given that NOC's current plans satisfy the actuarially equivalent requirement, NOC is not required to participate in the mandatory government-run DC plan.

However, should NOC elect to freeze accruals under the NOC salaried plan and participate in the government-run DC plan, then NOC is subject to the following risks:

#### HR Perspective

- Total Compensation Package: given that ER contributions of 5% to the DC plan is less than current contributions (of 13.3% of total payroll) to the DB plan, EEs may demand increase in salaries.
- NOC may not be able to use plan as a tool to attract and retain quality employees.
- NOC will no longer be able to use DB plan as an HR tool to manage workforce, e.g., encourage early retirement.
- May increase Plan terminations - EEs may leave for competitive compensation package.
- May increase early retirement prior to the plan freeze, especially amongst EEs that are eligible for unreduced retirement benefits.
- EEs may be unhappy about change in retirement program - resulting in disgruntled and less-productive EEs.
- EEs may not be able to retire because insufficient retirement benefits - NOC may be saddled with a group of aging, unproductive employees that are ill-equipped to keep up with cutting-edge of technology.
- May have to adjust eligibility rules for retiree medical plan - changes may adversely impact retirement patterns and ultimately NOC's cost of maintaining the retiree medical plan.

## 8. Continued

### Funding Perspective

- **Market Risks:** the DB plan is fully funded as at 1/1/2010, but NOC will still be exposed to funding any deficits that may arise as a result of movements in the investment markets.
- **Investment Risks:** if the plan is frozen then there will be no contributions to the plan, so to keep the plan fully funded then NOC will need to rely on their investment strategy to ensure that the plan stays fully funded.
- NOC will have to commit to remitting the 5% of pay on behalf of the employees even in poor economic times vs. reducing future accruals by amending the plan provisions to provide lower benefits thereby reducing future employer plan costs.

### Accounting Perspective

- Will still have to prepare annual expense report.
- Freezing future accruals may result in a curtailment event and perhaps immediate recognition of unrecognized losses.

### Plan Administration and Regulatory Perspectives

- Will still have to keep up with plan administration for the frozen DB plans, e.g., issue annual benefit statements, process commuted value transfers from the plan, processing retirement payments, etc.
- May still have to comply with certain annual regulatory filing requirements.
- Will still have to file valuation reports with regulatory bodies.
- May be forced by regulators to wind-up the plan and immediately settling all benefits which may be costly due to low discount rates used to settle commuted values and purchasing annuities for pensions in pay status.

### Legal Perspective

- NOC may be subject to legal ramifications if changes in retirement program are not clearly explained to plan members.

### **Risks to Salaried Employees**

- **Business Risk** - NOC may go out of business and accrued benefits may be subject to reduction if benefits are fully funded or may lose benefits altogether.
- **Risk due to wrong doing** - in an effort to maintain fully funded position of the plan, NOC may utilize an aggressive investment strategy thereby putting the frozen benefit at risk of being reduced should the market decline.
- **Early Retirement Risk** - may not be able to retire early because combined benefits (DB + DC) are inadequate vs. if member were allowed to continue accruing benefits entirely under the DB plan.
- **Replacement Ratio Risk** - the combined benefit (DB + DC) may not be sufficient to provide for a retirement income to maintain a standard of living that is the same as that prior to retirement.

## 8. Continued

- Inflation Risk - if salaries are frozen then DB benefit accruals are subject to both pre and post retirement inflation risks
- Market/Investment/Interest Rate Risks: poor investment returns and investment strategy by NOC may result in benefits not being fully funded and thus result in reduced benefits at retirement.
- Freezing DB accruals might adversely impact the retiree medical plan - at risks that medical benefits might be reduced or eliminated altogether because member is no longer accruing service required to meet eligibility rules.
- Freezing DB accruals may adversely impact the SRP benefits - may never become eligible for SRP benefits if both salary and service are frozen.

**Option: Allow current and future employees a one-time election to participate in either the government-run DC Plan or participate in the Salaried DB Plan.**

### Risks to NOC

#### HR Perspective

- EEs may make the wrong decision and as a consequence may be unable to retire as planned because of inadequate retirement benefits.
- Education material may not be sufficient to allow employee to make an informed choice.
- Less flexibility to make plan design changes - any changes will require that the plan continues to provide benefits that are actuarial equivalent which may not be cost-effective for NOC.
- NOC may no longer be able to use DB plan as an HR tool to manage workforce, e.g., encourage early retirement.
- Public Policy Risk: Actuarial equivalence requirement may change in the future - will be forced to amend Salaried Plan if want to maintain this option.
- EEs may not be able to retire because insufficient retirement benefits - NOC may be saddled with a group of aging, unproductive employees that are ill-equipped to keep up with cutting-edge technology.
- May have to adjust eligibility rules for retiree medical plan - changes may adversely impact retirement patterns and ultimately NOC's cost of maintaining the retiree medical plan.

#### Funding Perspective

- Increased uncertainty in cost since do not know what ee's will choose (antiselection).
- If more younger employees choose the DC Plan, overall cost requirements may be higher for NOC.
- NOC retains all DB risks (e.g., investment risk) with respect to those electing to remain in the DB plan.

## 8. Continued

- NOC may have to fund two plans - in poor economic times this might put unnecessary stress on NOC cashflows.

### Accounting Perspective

- Will still have to prepare annual expense report for DB Plan.

### Plan Administration and Regulatory Perspectives

- Will still have to keep up with plan administration for the DB plans.
- Will still have to comply with annual regulatory filing requirements for the DB plan, in addition to remitting 5% of payroll for those that elected to move to the DC Plan.
- Will still have to file valuation reports for DB Plan with regulatory bodies.
- If enough members have switched to the DC Plan, then NOC may be forced by regulators to wind-up the plan and immediately settling all benefits which may be costly due to low discount rates used to settle commuted values and purchasing annuities for pensions in pay status.
- May have to increase communication (frequency and more information) to plan members in the DB and DC plans so they understand their choices and plan for retirement accordingly.

### Legal Perspective

- NOC may be subject to legal ramifications if choices are not clearly explained to plan members so they can make an informed decision.

### **Risks to Salaried Employees**

- Early Retirement Subsidies - not provided in DC Plan.
- Early Retirement Risk - may not be able to retire early because DC account balance may be inadequate.
- Replacement Ratio Risk - may not provide benefit based on a replacement ratio that would ensure that members maintain a standard of living that is at least the same as pre-retirement.
- Political Risk - funds of the DC plan is subject to political raid; thus may provide a reduced amount of the promised benefits.
- Longevity Risk - employees may outlive their benefits from the DC plan.
- Inflation Risk - DC Plan benefits are subject to post-retirement inflation risks, assuming that salary increases each year keep up with inflation thereby providing some pre-retirement inflation protection.
- Market/Investment/Interest Rate Risks: poor investment returns and investment strategy by government may result in inadequate funds to provide promised benefits at retirement.
- DC account balance may decline in poor economic times - a time when NOC might want to downsize workforce.

## 8. Continued

- Switching to the DC Plan might adversely impact the retiree medical plan - at risks that medical benefits might be reduced or eliminated altogether.
- DC plan does not provide spousal benefits.
- Switch to the DC Plan may adversely impact the SRP benefits - may be eliminated altogether.
- Employees may not understand choices; not provided with enough education to make an informed decision; thus may make the wrong decision.
- Those choosing Salaried Plan are subject to all DB risks.
- Benefits in Salaried Plan not guaranteed by government; DC Plan being government-run has an implicit guarantee.
- Choice is only one-time but one option can become more attractive later if NOC amends DB plan and/or government changes mandated plan.

## 9. Learning Objectives:

8. The candidate will be able to recommend and advise on the financial effects of funding policy and accounting in line with the sponsors' goals, given constraints.

### Learning Outcomes:

- (8d) Advise plan sponsors on accounting costs and disclosures for their retirement plans. This would include restrictions imposed by applicable accounting authorities (FASB, CICA, IASC, FRS17).

### Sources:

R-C103-09: Comparison of IAS 19 with FAS 87/88/106/132@/158, CICA 3461 and FRS 17 – Summary of Provisions Affecting Accounting for Post Retirement Benefits, Towers Perrin

FAS 87 (exclude paragraphs 54, 57-62, 76-77, appendix A, appendix B illustration 2 and 6, appendix C,) appendix D is for background only <http://www.fas.org/pdf/fas87.pdf>

### Commentary on Question:

This question tested the candidate's understanding of accounting, particular past service costs amortization to the full eligibility date. A successful candidate realized that the executive will be fully eligible for the benefit at retirement and that the PBO and service cost is still prorated based on years of service, even though the benefit formula itself is not calculated based on years of service. Candidates received points for both words and formulas and it was best for the candidate to show all their work.

Successful candidates were able to prorate the EBO to determine the PBO and prorate the present value of the benefit to determine the service cost. Successful candidates also recognized that this plan is a separate plan from the excess SRP plan and used end of year assumptions to measure the change in plan amendment. ..

### Solution:

- (a) Determine the 2009 pension expense under CICA 3461/U.S. accounting standards. Show all work.

$$\text{Service as of December 31, 2011} = \text{Service as of January 1, 2009} + 3 = 30 + 3 = 33$$

PBO at 1/1/09:

$$\begin{aligned} &= (\text{Present value of } \$500,000 \text{ payable on January 1, 2012 plus Present value of } \\ &\text{\$500,000 payable on January 1, 2013}) \times \text{service at January 1, 2009} / (\text{Projected} \\ &\text{service as of January 1, 2012}) \\ &= [\$500,000 / (1.035)^3 + \$500,000 / (1.035)^4] * 30 / 33 \\ &= \$806,084 \end{aligned}$$

## 9. Continued

$$\begin{aligned} \text{CSC at January 1, 2009:} \\ &= \text{PBO at January 1, 2009} / \text{Service at January 1, 2009} \\ &= \$806,084 / 30 \\ &= \$26,869 \end{aligned}$$

2009 expense = SC + IC + EROA + Amort (G)/L + Amort PSC + Amort Transition Asset/obligation + curtailment/settlement impact

Service Cost: \$26,869

IC = interest on APBO and SC - half a year's interest on benefit payments  
IC =  $3.5\% \times (\$806,084 + \$26,869) = \$29,153$

EROA = 0, no assets

Amortization of actuarial gains or losses = \$0 – nothing to amortized for 2009

Amortization of past service cost =  $\text{PBO}/\text{Earsl} = \$806,084/3 = \$268,695$ ,  
amortized over 3 years

Amortization of transitional asset/obligation = \$0

Total 2009 Expense =  $\$26,869 + \$29,153 - \$0 + \$0 + \$268,695 + \$0 + \$0 =$   
\$324,717

- (b) Determine the 2010 pension expense under U.S. accounting standards. Show all work.

### Commentary on Question:

Credit was given if incorrect numbers from part (a) were carried forward correctly in part (b). For example, if the PBO was incorrectly calculated in part (a) but a proper roll forward calculation was done to determine the PBO at 1/1/10 in part (b), full credit was provided for this calculation. Demonstration of the layering of the past service costs was needed to earn full credit for the PSC calculation.

1. Expected PBO at January 1, 2010 before the revision of discount rate and the transition agreement:  
= ( Present value of \$500,000 @3.5% payable on January 1, 2012 plus Present value of \$500,000 @ 3.5% payable on January 1, 2013) x service at January 1, 2010 / (Projected service as of January 1, 2012)  
=  $[\$500,000 / (1.035)^2 + \$500,000 / (1.035)^3] * 31/33$   
= \$862,106.90

## 9. Continued

2. PBO at January 1, 2010 after the revision of discount rate and before the revision of the transition agreement:  
= $(\text{Present value of } \$500,000 @ 2.5\% \text{ payable on January 1, 2012 plus Present value of } \$500,000 @ 2.5\% \text{ payable on January 1, 2013}) \times \text{service at January 1, 2010} / (\text{Projected service as of January 1, 2012})$   
= $[\$500,000 / (1.025)^2 + \$500,000 / (1.025)^3] * 31/33$   
= \$883,224.67
3. Increase in PBO at January 1, 2010 due to the change of discount rate from 3.5% to 2.5% (actuarial loss at 1/1/2010) =  $(\text{Actual PBO}@2.5\% - \text{Expected PBO} @3.5\%) = \$883,224.67 - \$862,106.90 = \$21,117.77$
4. Expected PBO at January 1, 2010 after the revision of discount rate and after the revision of the transition agreement:  
= $(\text{Present value of } \$750,000 @ 2.5\% \text{ payable on January 1, 2013 plus Present value of } \$750,000 @ 2.5\% \text{ payable on January 1, 2014}) \times \text{service at January 1, 2010} / (\text{Projected service as of January 1, 2012})$   
= $(\text{Expected PBO}@2.5\% \text{ new transition agreement} - \text{Expected PBO} @2.5\% \text{ original transition agreement}) = \$1,292,523.90$
5. Increase in PBO at January 1, 2010 due to the revision of the transition agreement  
= $(\text{Expected PBO}@2.5\% \text{ new transition agreement} - \text{Expected PBO} @2.5\% \text{ original transition agreement}) = \$1,292,523.90 - \$883,224.67 = \$409,299.23$

CSC at January 1, 2010:  
=  $\$1,292,523.90 / 31 = \$41,694$

IC =  $2.5\% \times (\$1,292,523.90 + \$41,694) = \$33,355$

EROA = 0, no assets (unfunded)

Amortization of actuarial losses = \$0 as actuarial loss of \$21,117.77 is less than 10% of PBO of \$1,292,523.90

Amortization of past service cost = Amortization of 1st layer of past service cost + Amortization of 2nd layer of past service cost  
=  $\$806,084/3 + \$409,299/2 = \$473,344$

Amortization of transitional asset/obligation = \$0

Total 2010 Expense =  $\$41,694 + \$33,355 - \$0 + \$0 + \$473,344 + \$0 + \$0 = \$548,393$

## 10. Learning Objectives:

8. The candidate will be able to recommend and advise on the financial effects of funding policy and accounting in line with the sponsors' goals, given constraints.

### Learning Outcomes:

- (8h) Perform and interpret the results of projections for short and long range planning including the effect of proposed plan changes.

### Sources:

McGill, *Fundamentals of Private Pensions*, Ninth Edition, 2010, Chapter 22, pages 608-615

R-C137-08: Pension Projections, Sections I, II, V (sections III, IV, VI and Appendix - background only)

R-C133-07: Back to the Future

### Commentary on Question:

This question tested the candidate's ability to identify the differences between a deterministic and a stochastic projection and explain the steps that apply to both types of projections.

Successful candidates outlined the steps and included the processes involved from an actuary's point of view. Successful candidates also fully described what is involved in a stochastic projection, including the random generation of variables using statistical methods (e.g. Monte Carlo), random number generation to assign the variables and the assumptions needed to be made for the investment assumptions.

Successful candidates also identified where deterministic projections fall short in providing meaningful results for interpretation.

### Solution:

- (a) Describe the process for performing deterministic and stochastic projections

#### General Steps to Either Type of Projection

- Discuss the scope of the project and identify client's goals
- Identify scenarios for various asset allocations
- Collect, process, and review data
- Determine assumptions
- Review demographic assumptions during the projection period given the plan is closed to new entrants, also discuss with client if any anticipated demographic change (e.g. layoff, early retirement window, etc)
- Economic assumptions for projection purposes need to be more explicit than those for valuation purposes
- Project population forward

## 10. Continued

- Perform standard valuation to determine liabilities and normal cost
- Produce liability streams for each scenario and ensure consistency among the liability streams, normal cost rate trend and population statistics
- Projection of future benefit payments
- Project assets forward
- Combine liability stream project with asset projection to produce projection results
- Check results
- Present results

### Deterministic Projection

- One set of fixed assumptions throughout the projection period
- Can run multiple scenarios (e.g. base scenario, optimistic, pessimistic)

### Stochastic Projection

- Randomly generate variables (assets and liabilities) via a number of statistical methods
- Monte Carlo simulation generally used - random number generation used to assign variables - distribution of variables based on mean and variance
- Produce set of results for each year of projection
- Run numerous random trials
- Requires the following investment return assumptions:
  - Expected future inflation
  - Expected future real returns on various asset classes
  - Variance or standard deviation of the expected returns and inflation
  - Correlation of returns and inflation
- Rank the results to provide confidence intervals (or range of outcomes or probabilities) for certain outcomes
- May do sensitivity testing

(b) Outline why the 50<sup>th</sup> percentile from the stochastic projection and the deterministic projection diverge over time.

- The 50th percentile from the stochastic projections shows the 50% chance of what the projected funded ratio would be and this is based on hundreds of randomly generated trials throughout the projection period.
- The deterministic projection only shows one set of results (based on pre-set and fixed assumptions throughout the projection period).

## 10. Continued

- (c) Based on the deterministic projection, the CFO has decided that it is not necessary to change the current asset allocation as the plan is expected to be more than 100% funded throughout the projection period. Outline the additional factors the CFO should consider prior to reaching such a conclusion.
- The deterministic graph only shows the one scenario, and this could be the best case scenario that the plan would be fully funded throughout the projection period.
  - The deterministic projection does not address the probability of the results.
  - The deterministic projection does not address the risk or volatility of the results.
  - Difficult to perform sensitivity analysis with deterministic projections.
  - Funded ratio issues should be considered (i.e., overfunding could lead to trapped surplus - being over 100% funded doesn't mean that there couldn't be problems).

## **11. Learning Objectives:**

1. The candidate will be able to analyze the risks faced by retirees and the participants of a defined benefit or defined contribution retirement plan, as well as retiree health plans.
3. The candidate will be able to evaluate risks faced by sponsors of a retirement plan by virtue of the plan's design and be aware of methods to mitigate these risks.
7. The candidate will be able to evaluate the sponsors' financial goals and risk management with respect to their plan.

### **Learning Outcomes:**

- (1e) Describe the risks faced by participants of a multiemployer retirement plan.
- (3f) In a given context, assess the effect that changes in plan design might have on collective bargaining agreements.
- (7h) Describe how a plan's funded status can impact union negotiations and multiemployer plans.

### **Sources:**

R-C102-07: Turner & Watanabe, Chapter 5, Pension Risk and Insurance

R-C123-07 Funding Risks for Multi-Employer Plans

### **Commentary on Question:**

This question tested the candidate's ability to evaluate the proposal of joining a multiemployer plan. It also tested the candidate's general understanding of multiemployer plans in a real world setting and tested their knowledge of how multiemployer plans are funded and what factors could potentially result in a difference of cost results.

Successful candidates clearly identified advantages from disadvantages. When discussing advantages and disadvantages, candidates were given credit for assessing the differences in costs if the candidate exhibited a clear understanding of the material.

### **Solution:**

- (a) Describe the advantages and disadvantages to NOC's employees of joining MEPPCAI.

## 11. Continued

### **Advantages to Employees**

- Contribution rate is determined by collective bargaining.
- Union has influence with respect to contributions and level of benefits. Unions have strong bargaining powers and usually have interest in maintaining benefit plans.
- Assets and administrative expenses can be pooled. This provides an economy of scale that may allow for a more sophisticated level of administration and investments at a lower cost. Lower administrative cost can lead to higher wages or improved benefits.
- Accrued benefit is portable so employee may be able to move from one employer to another with no loss of accrued benefit or service required for vesting. Also service for early retirement benefits remains continuous.
- NOC does not have unilateral ability to change Plan provisions. Union will have half the vote.

### **Disadvantages to employees**

- MEPPCAI consists of employees in the airline industry. They may have different needs such as different retirement goals. Future plan changes may not be in the best interest of NOC employees.
- NOC hourly has a better funded percentage. NOC may be subsidizing other employers. This also raises concerns about benefit security and also the plan's funding/investment policy.
- MEPPCAI has a higher ratio of retirees to actives versus NOC hourly. MEPPCAI is a more mature plan. This may increase liquidity needs.
- Withdrawal of other employers may hurt the long term funded status of the Plan thus putting benefits at risk.

- (b) Assess the potential differences in the funding cost requirements between the NOC Full-Time Hourly Union Pension Plan and the MEPPCAI.

### **Differences in costs may be due to:**

- MEPPCAI uses an 8% discount rate as opposed to 6.25% for NOC hourly, therefore investment policy allocations are likely to be different.
- MEPPCAI has an older active population 51.1 versus 49.4. This will result in a higher per capita normal cost.
- They may use different asset valuation methods. NOC hourly uses market value while many multiemployer plans use smoothing.
- They may use different funding methods. NOC hourly uses Unit Credit while many multiemployer plans use EAN cost method.
- Probably use different demographic assumptions.
- Utilization of early retirement subsidies may be different.