

CSP-RU Complete Illustrative Solutions Spring 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 the 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:

- (2a) Describe the agency relationship between management of the sponsor and its shareholders or taxpayers.
- (3a) Identify how plan features, temporary or permanent, can adversely affect the plan sponsor.

Sources:

Morneau Sobeco, Handbook of Canadian Pension and Benefit Plans, Fourteenth Edition, 2008, Chapters 1, 5 and 6

R-C108-07: Center for Retirement Research at Boston College – March 2006 Bulletin

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

Commentary on Question:

The question tests specific knowledge of disability benefits, understanding of the actuarial basis of a retirement plan actuarial valuation. It tests competence in working with management on innovative benefit plan ideas.

The points are 5 for part (a), but only 2 for part (b).

The expected answer to part (a) focuses on the business risk for NOC of its relationship to the retirement plan that would add this innovative proposed benefit design. The 5% deemed earnings increase would be a plan provision, not an actuarial assumption. This benefit provision would increase administration cost initially and ongoing. The proposed design would affect recruiting, selection, and retention and might have unintended consequences. The proposed design creates exposure to a new benefit liability.

The expected answer to part (b) is built on understanding the structure of the actuarial assumptions. Due to the low point value for this part of the question, no elaboration is expected.

1. Continued

Solution:

- (a) Identify the risks to NOC associated with adding this disability provision to the plan.

The deemed five percent increases may exceed actual average pay increases. The benefit may provide a more than adequate retirement income.

NOC would self-insure this benefit. The main risk faced by the plan is the increase in accrued liabilities which could increase future contributions.

To avoid problems with determination of disability will require careful design, procedures, and training. The benefit must be coordinated with other disability and medical plans. There will be new record-keeping requirements for disabled employees, who may return to work with NOC or another employer.

Generous benefit structures affect the workforce:

- Active workers may resent the value of the benefit for their disabled colleagues.
- The benefit may help attract and retain employees, but may attract those who have a greater expectation of becoming disabled.

The rate at which employees become disabled varies.

- Increases may be experience in economic slumps.
- Plans that cover members in cyclical business can be at a higher risk.
- Disasters and epidemics happen.

The duration of disability varies. For disabled employees, the deemed 5% and service credits may be an incentive to malingering.

- (b) Assuming this amendment is adopted, address the impact this would have on NOC's assumptions for funding purposes.

New actuarial assumptions may be needed:

Disability incidence
Disabled life mortality
Recovery and return to work

Old assumptions may need adjustment:

Turnover
Retirement

2. 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.
4. The candidate will be able to evaluate and recommend a plan design appropriate for the sponsor's goals.

Learning Outcomes:

- (1b) Propose ways in which retirement plans can manage the range of risks faced by retirees.
- (1d) Describe the risks faced by participants of single employer sponsored retirement plans.
- (2b) Compare the, sometimes conflicting, interest of management, employees, shareholders or taxpayers (in the case of public sector).
- (4e) Given a context and plan type, recommend appropriate plan design/features and defend the recommendations.
- (4h) Given a context and sponsor objectives, advise a plan sponsor regarding the choice of design elements for their retiree health program.

Sources:

Yamamoto, *Fundamentals of Retiree Group Benefits*, 2006, Chapters 4 and 7

Allen, *Retirement Plans*, Chapter 2

McGill, *Fundamentals of Private Pensions*, Chapter 14

Commentary on Question:

This is a straightforward question on retiree health plan designs and retiree contributions. The key is to recognize that NOC is not exposed to medical claims inflation under the alternatives. Also, candidates needed to assess why the alternatives under part (b) reduced risks to score full marks.

Solution:

- (a) Identify the risks to NOC and the future retirees of introducing retiree contributions and compare the proposed approaches in terms of the impact on NOC.

Both NOC and retirees would still be subject to inflation risk. This is the risk of future increases in the cost of healthcare.

2. Continued

The inflation risk is shared by both NOC and the retiree in approach 1, with 80% of the cost being paid by NOC and 20% being paid by the retiree. The inflation risk is capped for NOC under approach 2. The impact of inflation is absorbed by NOC until the per capita claims exceed \$15,000 and then the inflation cost is borne by the retirees.

Both NOC and retirees are subject also to volatility risk. This is the risk of healthcare cost fluctuation from year to year. The volatility risk is shared by NOC and the retiree under approach 1 and eliminated for NOC when the per capita claims exceed \$15,000 under approach 2.

Introducing contributions could create workforce planning risk for NOC. The additional contributions make NOC benefits less competitive compared to its competitors and lead to employee attraction and retention problems. The required contributions also effectively reduce retirement income forcing employees to delay retirement in order to maintain target income.

There would be a risk of anti-selection for both NOC and the retirees. Healthy retirees will tend to opt out of the program leaving less healthy retirees in the program leading to an increase in healthcare costs.

In addition, contributions could also see the cost of healthcare reduced as the retirees start to make smarter decisions as they are now affected by cost increases.

Healthcare cost could also increase if retirees defer preventative services leading to more expensive treatment later.

The administration cost for NOC will increase as it now needs to collect contributions from the retirees.

- (b) Describe two other methods of introducing retiree cost sharing to the Program and explain how these methods might mitigate risk to the plan sponsor.

(Marks limited to two cost sharing options from list.)

1. Introduce contributions based on age
Description: required contributions higher or lower subsidies for early retirees
Risk Mitigation: lowers cost for pre-65 population, which is most expensive

2. Continued

2. Redefine retirement eligibility requirements - eliminate some people from plan
Description: increase eligibility requirements so that employee must have more service to retire and receive benefits from the plan
Risk Mitigation: lowers total employer cost since less people in the plan
3. Introduce service related benefits
Description: increase employer subsidy for employees who have more service
Risk Mitigation: lowers total employer cost since people with lower service will be paying higher premiums
4. Introduce a total expenditure cap
Description: NOC will only pay a certain amount for all retirees
Risk Mitigation: lowers total employer cost since total cost capped
5. Introduce an account based plan for future retirees
Description: employees provided with a dollar amount per year of service, withdrawal options include: annuitization or establish a flex spending account
Risk Mitigation: lowers total employer cost since cost for each employee is essentially capped
6. Introduce deductibles or co-pays
Description: only healthcare claims paid if above a determined dollar amount or only a percentage of healthcare claims paid
Risk Mitigation: lowers total employer cost since lower benefit coverage

3. 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.
5. The candidate will be able to synthesize and evaluate deferred compensation and supplemental retirement plans for the highly paid in a given context.

Learning Outcomes:

- (1a) Identify risks faced by retirees and the elderly.
- (1d) Describe the risks faced by participants of single employer sponsored retirement plans.
- (5c) Given a context, assess the plan from an executive's perspective.
- (5e) Assess the taxation issues.

Sources:

Post Retirement Risks Chart, SOA

Allen, Chapter 14

Morneau Sobeco, Handbook of Canadian Pension and Benefit Plans, Fourteenth Edition, 2008, Chapter 11

Private Pension Policies in Industrialized Countries, Chapter 5, "Pension Risk and Insurance," pp 65-81

Commentary on Question:

This question was trying to test candidate's ability to assess the two options from the CEO's perspective.

To receive maximum points, it was important to describe the actual risks inherent to these particular two options rather than just "list" all potential risks for any retirement arrangement.

Candidates often mentioned a few of the risks but missed others. The risks most often not mentioned were related to benefit adequacy, interest rates and taxation.

3. Continued

Solution:

Compare and contrast the risks to the CEO associated with each option.

Risk	Option 1	Option 2
Benefit Adequacy	<ul style="list-style-type: none"> • Accrual of benefits is "backloaded" (i.e. increases relative to salary the longer member has been in Plan) • Option doesn't compensate for mid-career hire • Doesn't provide for higher level of benefits than broad-based plan • Earnings definition doesn't recognize incentive pay (could be a large component of compensation) 	<ul style="list-style-type: none"> • Can compensate for mid-career hire • Earnings definition doesn't recognize incentive pay
Inflation Risk	<ul style="list-style-type: none"> • No post-retirement inflation protection 	<ul style="list-style-type: none"> • No adjustment to lump-sum benefit between termination of employment and pay out
Benefit Security	<ul style="list-style-type: none"> • Ongoing lack of protection if employer is unable to pay benefits (e.g. bankruptcy) • Ongoing lack of protection if employer is unwilling to pay benefits (implicit contract risk, change of ownership) 	<ul style="list-style-type: none"> • Same as Option 1, but for shorter period (i.e. only until payment of lump sum)
Treatment on Events	<ul style="list-style-type: none"> • Stringent vesting/early retirement requirements • No benefits on termination, death, etc. 	<ul style="list-style-type: none"> • Benefit payable under all contingencies
Taxation	<ul style="list-style-type: none"> • If arrangement was funded, member may have to include value of benefit in taxable income 	<ul style="list-style-type: none"> • Large amount of tax payable upon receipt of lump sum benefit
Longevity Risk	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Risk of outliving lump-sum benefits (unless annuitized)
Interest Rate Risk	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • The higher the interest rate, the higher the annuitized benefit at retirement/replacement ratio • Annuitized benefit at retirement will depend on pension commencement age and form of benefit at termination of employment
Market Risk	<ul style="list-style-type: none"> • None 	<ul style="list-style-type: none"> • Stock market risk if payment is invested in equities

4. 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:

- (11b) Distinguish the various ways that retirement fund assets are managed.
- (11c) Given a context, evaluate a Statement of Investment Policy.

Sources:

R-C 112-07 Pension Investment and Corporate Risk Management

Litterman, *Modern Investment Management*, Chapter 24

Cassidy, "Equities in DB Plans – Is the Traditional 60/40 Mix a Dinosaur?"

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

Commentary on Question:

In part (a), candidates were expected to understand what an index fund is in order to analyze investing in such. Candidates did not do well if they did not recognize that there are a variety of different types of index funds for the different types of asset classes (i.e., stocks, bonds, cash equivalents, etc.).

In part (b), candidates were expected to demonstrate an understanding of the components of an investment policy statement. Candidates were expected to show this comprehension by synthesizing an actual investment policy statement for the NOC Salaried Pension Plan. Candidates who did well on the question connected the components of the IPS to the Salaried Plan itself and the fact that investments were limited to index funds.

Solution:

- (a) Describe the advantages and disadvantages of limiting the investments to index funds.

Advantages

- Based on the efficient market hypothesis, active management cannot add value (can't beat the market).
- Investment only in index funds should result in lower investment management fees.
- Index funds offer good diversification.
- Plan liabilities will follow assets if benefits are tied to an index.
- The duration of plan liabilities can be matched to an index.

4. Continued

Disadvantages

- Studies published show a complete efficient market hypothesis does not exist and there are some excess returns.
- Full replication is difficult or expensive particularly within the bond market.

- (b) Assuming the pension fund investments are limited to index funds, outline an investment policy statement for the pension fund of the National Oil Full-Time Salaried Pension Plan

Investment Policy Statement for the National Oil Full-Time Salaried Pension Plan

Purpose

The objective of the IPS is to ensure the benefit promised is secure and provide the retirement benefits at a reasonable cost that is not unacceptably volatile.

Plan Overview and Investment Implications

The Salaried plan is a defined benefit, final average earnings plan. The benefits are not indexed however the final average earnings is tied to a future salary scale. The liabilities are uncertain due to mortality rates and future salary growth. A large portion of the liability is due to actives. The average active age is 48.

The plan is an ongoing plan and overfunded on an accrued liability basis. There is a chance of takeover.

Governance

Relevant parties, such as NOC, the board of trustees, investment committee, actuary, custodian, etc, should be identified along with their duties.

Investment Beliefs

NOCs philosophy is that active management does not add value and index funds provide a cost effective way to get exposure to markets.

Investment Objectives of Fund

The return expectations of the funds should be quantified based on the return of the fund the index is replicating. Risk expectations and tolerance levels should be described. NOC should consider liquidity as they pay lump sums and would need approximately 29 million per year for benefit payments.

Asset Mix and Policy Ranges

The major asset classes and permitted ranges around the mix, based on the index funds, should be identified.

4. Continued

Rebalancing Policy

Less frequent rebalancing because invested in passive funds. Asset classes should be rebalanced to mimic the allocation of assets within the index.

Investment Manager Structure, Selection and Mandates

One investment manager will be hired at little cost to mimic the index fund. It is not worth paying the additional cost for many managers for markets are assumed to reflect all knowledge.

Investment Objectives / Monitoring for Managers

Set benchmarks at the fund level using index funds at policy weights. Describe the review of investment performance and outline reasons that managers may be replaced (i.e., failure to meet target performance).

Permitted Investment Constraints

List of permitted asset classes and individual investment limits. Investments constrained to index funds.

Derivative Policy

Derivatives are permitted for derivative based indexing strategies.

Conflict of Interest Policy

Investment managers shall be governed by professional standards.

Voting Rights Policy

Delegate responsibility of exercising voting rights acquired through the funds' investments.

Securities Lending

Plan sponsor may enter into loan agreement if loaned investments secured by cash or marketable security and losses guaranteed by custodian.

Valuation of Investments

Investments not regularly traded or inactive will be valued at least annually by custodian.

Soft Dollar Policy

Use of soft dollars are permitted by managers if manager discloses how they are allocated.

4. Continued

Policy Review

The IPS shall be reviewed annually or if there is a significant change in legislation, demographics or company structure.

Related Party Transactions

Any related party transaction necessary for the operation of the pension plan shall be exempt.

5. 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.
- (11e) Assess the potential effects of various investments and investment policies on all of the stakeholders, including tax implications.
- (11g) Describe the regulatory restrictions on retirement plan assets.
- (11h) Identify the sources of investment risk and assess risk facing retirement funds.

Sources:

Allen Chapter 29

Morneau Sobeco – Chapter 6

20 Questions Directors should ask about their Role in Pension Governance, CIC

Commentary on Question:

The question was trying to test if a candidate understands the advantages and disadvantages of having employer stock as an investment option in a pension plan and what is the employer's fiduciary responsibility by offering its own stock as an investment options.

For part (a) of the question, most of the candidates could list the advantages and disadvantages of having employer stock as an investment option and this received most marks.

For part (b) of the question, candidates were required to demonstrate an understanding of the employer's fiduciary obligations in the context of the question rather than simply providing a list of fiduciary obligations in general.

Solution:

- (a) Describe the advantages and disadvantages of offering employer stock as an investment option under this plan.

Advantages

- Reduce administrative costs (investment management)
- Strengthens the link between employees
 - Align employer's and employee's interest

5. Continued

- Dividends paid will be tax deductible to employers
- Employee ownership reduces hostile takeover attempt

Disadvantages

- Undiversified option and may be inappropriate from a financial perspective
- Employee relation problems may surface if stock value declines
- Employer contributions invested in company stock at the employer's discretion are not eligible for the Section 404 (c) safe harbor provisions
- Plan sponsors who permit employee contributions to be invested in company stock must comply with SEC registration and reporting requirements
- Must satisfy the fiduciary requirement for prudence
 - Show that it is for the best interest of the participant
 - Still need to offer alternative options
- Employee may have their livelihood and savings tied to the well being of the company
 - Exposure to business risk
- Should dividends be paid to employees as cash which may be different from the plan objective of providing retirement income

(b) Describe the fiduciary obligations of XYZ Co. with respect to the investment options offered under a qualified defined contribution pension plan.

- Responsible for structuring appropriate investment programs
 - Follow regulatory constraints
 - Make sure fees are reasonable
 - Allow timely changes
- Selecting suitable investment managers
- Monitoring investment performance
- Communicating critical investment provisions to employees
 - Educating employees about retirement, investment strategies/income
 - Ensure that employees are able to manage investment decisions
- Discharge its duties solely in the interests of plan participants and their beneficiaries
 - Make decisions that are best for participants
 - Loyalty
- Act honestly and in good faith
- Standard of care
- Exercise care, diligence and skill that a person of ordinary prudence would exercise
- Prudent portfolio rule
- Overall reasonable level of risk the plan should undertake as a whole and the appropriate level of diversification of the entire pension fund

5. Continued

- Ensure investment decisions are based on sufficient information and sound judgement, not necessarily to guarantee a certain level of performance
- Responsible for the proper selection and retention of external fiduciaries (delegating specific investment authority to outside professionals)
- Prudently select and monitor investment advisor services (if offered)
- Identify, disclose, and manage any conflict of interest
- Ensure the SIP&P is in place and well documented
 - "CAP" or "CAPSA" guidelines
- Stay current on developments that have a significant impact on the elements of good governance
 - Continue to ensure investment options remain appropriate
 - Provide ongoing communication to employees on changes relating to the plan
 - Provide sufficient notice if any changes are being made to the investment options

6. 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.

Learning Outcomes:

- (1f) Evaluate benefit adequacy for members of a particular plan given other sources of retirement income.
- (1g) Construct a model for measuring replacement income adequacy under different scenarios.

Sources:

R-C104-09 Replacement Study – A Measurement Tool for Retirement Planning

McGill Chapter 7, pages 232-245

Morneau Sobeco Chapter 1, pages 22-23

Commentary on Question:

Maximum points earned for those who saw shortcoming of analyzing plan replacement based on one individual case and proposing alternatives to make a better analysis. No marks were given for recommending plan changes.

Solution:

- (a) Assuming the new DC provisions are adopted, calculate the income replacement ratio at age 65 for Member A.

Commentary on Question:

Candidates should provide definition, so grader knows what is being calculated; annuity certain approximation accepted as long as it is close to above value; partial credit if only employee contributions used in calculation.

Replacement Ratio = gross income after retirement/gross income before retirement.

Accumulated funds at age 65 in DC Plan:

Employee contributions are 10%, employer contributes 6%

Annual total contribution first year = 50,000 * 16% = 8,000

Annuity certain accumulation factor = 48.06 = $((1+i+ss)^{19}-1)/\ln(1+i+ss)$

Accumulated contributions = 8,000 * 48.06 = 384,480

Total Income:

Annuity factor at age 65 = 13

Lifetime indexed income = 384,480/13 = 29,575

6. Continued

Frozen DB pension = 10,000

Total retirement income = 39,575

Final salary = $50000 \times 1.03^{19} = 87,675$

Max contribution will be $16\% \times 87,675 = 14,028$, which is below max of \$20,000

Replacement ratio = $39,575 / 87,675 = 45\%$

- (b) Recommend adjustments to the analysis in (a) that could be considered to more accurately assess benefit adequacy.

Calculate replacement ratio using different formulae which incorporate different factors as follows:

Expenditure, tax, and savings model takes into account changes in age-and-work related expenditures after retirement, in addition to taking into account savings patterns and changes in taxes after retirement.

The “Expenditure, Tax, and Savings” Model:

Replacement Ratio = $f(\text{Taxes, Savings, Expenditure Changes})$

$$RR = [PrRPG - PrRT - PrRS \pm NCCR + PoRT] / PrRPG$$

Tax and savings model disregards changes in age-and-work related expenditures.

The “Tax and Savings” Model: Replacement Ratio = $f(\text{Taxes, Savings})$

$$RR = [PrRPG - PrRT - PrRS + PoRT] / PrRPG$$

Tax only model disregards both savings and changes in age and work-related expenditures.

The “Tax Only” Model: Replacement Ratio = $f(\text{Taxes})$

$$RR = [PrRPG - PrRT + PoRT] / PrRPG$$

The symbols used in the formulas are defined as follows:

PrRPG: Gross pre-retirement income

PrRT: Pre-retirement taxes

PrRS: Pre-retirement savings

NCCR: Change in age-and-work-related expenditures

PoRT: Post-retirement taxes

Replacement ratios are more precise if they are based on after-tax earnings, so a net replacement ratio may provide better results.

However Vosne has a flat tax, so it does not matter.

6. Continued

Calculate replacement ratio taking into account the fact that the pension will be non-indexed.

Replacement ratio is for an un-indexed pension, since factor not indexed.

Need to factor in the erosion of pension earnings after age 65.

Calculate replacement ratio using different assumptions.

The calculation is based on one salary scale, expected return on assets, annuity rate assumptions. Using different values will result in a different replacement ratio.

Lower rates may be more conservative.

It is not known if the DB accrued pension is based on future average income.

Calculate replacement ratio at various retirement ages. The retirement age selected is 65. Another age selection would yield different results.

It does not compare the outcome at age 62, when an unreduced pension is payable.

It does not factor the value of the subsidized early retirement reductions before age 62.

Calculate replacement ratio using stochastic methodology. Deterministic calculation (steady state calculation) only shows one possible scenario.

Determine whether calculation can be used to determine if benefits are similar.

This is only one case and cannot be representative of all membership.

We must compare different situations and profiles (income, age, service etc.).

Savings rate may not be representative.

At the very least replacement ratios should be evaluated at various starting age and income levels.

The DB is non-contributory, so we should compare the employer replacement ratio, not the combined ratio.

6. Continued

A person needs less gross income after retiring, primarily due to:

1. Income taxes go down after retirement. This is because extra deductions are available for those over age 65, and taxable income usually decreases at retirement.
2. Saving for retirement is no longer needed.
3. Changes in age-and-work-related expenditures that occur at retirement also influence the amount of income someone needs at retirement. Changes in these expenditures, however, vary from person to person.
4. The mortgage may be paid off.
5. There are no longer child care and education costs.
6. Include health care costs, personal savings and government plans in replacement ratio.

7. **Learning Objectives:**

12. The candidate will be able to apply the standards of practice and guides to professional conduct.

Learning Outcomes:

- (12e) Explain and apply all of the applicable standards of practice related to valuing retirement obligations.
- (12f) Recognize situations and actions that violate or compromise Standards or the Guides to Professional Conduct.

Sources:

ASOPs 4, 23, 27, 35

CIA Standards of Practice

Commentary on Question:

This question was trying to test whether candidates would be able to assess whether an actuarial valuation report was prepared in accordance with accepted actuarial practice and pertinent legislative or regulatory requirements.

Candidates received full marks for addressing the appropriateness of each assumption and method applied in the actuarial valuation performed by the actuary in light of the purpose of the valuation.

Marks were given for considering whether each economic and demographic assumption was appropriate and whether each liability and asset valuation method was appropriate for the purpose of the report adequately answered the question. Providing the contents of the report, that is, whether or not specific items were disclosed in the report did not address the question and did not receive full marks.

Solution:

Your firm has been retained to review an actuarial valuation prepared by another firm to ensure compliance with the actuarial Standards of Practice in the US

Identify specific items you would review and describe the criteria used in your evaluation.

In reviewing the actuarial valuation, the following should be considered:

- The purpose and nature of the measurement
- The plan provisions and benefits or factors that will affect the timing and value of any potential benefit payments
- The characteristics of the obligation to be measured (e.g. measurement period, future cash flows, open or closed group, volatility)
- The assumptions and methods given the purpose of the measurement
- The characteristics / demographic profile of the covered group

7. Continued

Consider whether any assumptions that are prescribed by legislation have been determined accordingly.

Review the combined effect of the demographic and economic assumptions for consistency (reasonable independently and in aggregate).

Consider whether the demographic assumptions reflect any contingencies that will cause increase/decrease in liabilities.

- Consider whether the demographic assumptions are appropriate given demographic profile of the covered group

Review the appropriateness of the retirement assumption:

- Consider the demographic profile of the plan

Termination Assumption

Mortality Assumption:

- Consider whether it would be reasonable to have a separate mortality assumption for pre-retirement versus post-retirement

Disability Assumption

Optional Form Assumption

Administrative Expenses

Inflation Assumption - Does it reflect appropriate indices, forecasts, and yields on government securities?

Discount Rate

Compensation scale if the pension plan benefits are salary based:

- Compensation increases and practices of other sponsors in the same industry or geographic area

Consider whether the methods to allocate costs or contributions to past and future periods are appropriate.

Consider whether the measurement of the accrued/vested benefits reflects:

- Whether the plan provisions regarding accrued benefits provide an appropriate attribution pattern for the purposes of the measurement
- The impact of a special event e.g. plant shutdown, change in investment policy

Review whether the asset valuation method is acceptable for the terms of engagement.
Review the report to ensure that all relevant disclosures are communicated.

8. Learning Objectives:

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.
7. The candidate will be able to evaluate the sponsors' financial goals and risk management with respect to their plan.
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:

- (3a) Identify how plan features, temporary or permanent, can adversely affect the plan sponsor.
- (3b) Recommend ways to mitigate the risks identified with particular plan feature.
- (4a) Given a context, design retirement programs that manage retirement risk and are consistent with sponsor objectives.
- (4b) Given a context, design retirement programs that promote employee behavior consistent with sponsor objectives.
- (7b) Compare the, sometimes conflicting, interests of management, employees, shareholders or taxpayers (in the case of public sector).
- (7c) Define the retirement plan risks (financial and design) in a way that integrates with the sponsor's risk management strategy.
- (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.

Sources:

Critique of "Pension Deficits: An Unnecessary Evil"

Record - V31, #2 -- Addressing the financial risks from retirement systems seminar: Plan Design - overview, general, limited specifics

Full Circle: purchasing insurance annuities in a defined-benefit plan
Recent trends in Canadian DB pension sector investment and risk management

8. Continued

RC-108 Why are Healthy Employers Freezing Their Pensions

CICA 3461/FASB materials

Morneau Sobeco - chapter on financial mgmt - acct'g section (C5)

Equities in DB plans - Is the Traditional 60/40 mix a dinosaur

Morneau Sobeco - Chapters 1 and 2

RC112 - Pension investing and corporate Risk Management -
overview coverage generics

Jim Moore's LDI Strategies and concepts
Plan Sponsor guide to LDI

Mind the gap: using derivative overlays to hedge pension duration

Intro and Overview of Ret Plan Investments - background on
investments

Litterman - Modern Inv Management

Commentary on Question:

Part (a) was testing investment related strategies for risk mitigation. Part (b) was to focus on plan design changes that could be used to mitigate financial risks.

Part (b) was to focus on plan design changes that could be used to mitigate financial risks. Candidates were given points for listing and describing the features of a proposed plan design. They were then also given points for explaining how this design either reduced or didn't reduce the volatility of the funded status on an accounting basis.

Solution:

- (a) Describe the advantages and disadvantages of each of the following risk-mitigating pension fund investment strategies:
- Cash Flow Matching
 - Duration Matching
 - Derivatives Overlay Strategy -- Interest Rate

8. Continued

Cash Flow matching:

A bond portfolio is set up to match future asset cash flows with anticipated future liability payments.

Advantages:

Relatively easy to understand. Matching bonds provide a good fit to liability movements and can reduce volatility.

Disadvantages:

Liability payments are unknown, especially more so for less mature plans. As such, it is difficult to keep the matched cash flows out in the future. Rebalancing is often required. Can be difficult to implement due to bond availability and uncertainty regarding cash flow timing. Bonds may earn less over the long term than equities.

Duration Matching

Set up an investment portfolio to match the duration of the asset portfolio to the liabilities.

Advantages:

Interest rate risk minimized (reduce funded status volatility) due to values of assets and liabilities moving in same directions/amounts as interest rates change. Relatively easy to understand and implement.

Disadvantages:

Are there enough investments available to match up with longer duration liability payments? Not as effective for non-parallel yield curve shifts or for larger changes in interest rates. Duration is only an estimate of liability movements. Bonds may earn less than equities over the long-term.

Derivative Overlay Strategy

Without changing current asset mix, use derivatives to increase asset duration to close gap to the generally longer duration liabilities.

Advantages:

Do not have to disinvest from equities to add duration. Can reduce volatility in funded status while not impacting current expected fund rates of return.

Disadvantages:

Introduces other risks like counter party risks and trading. Complicated and needs knowledgeable people to implement and monitor.

8. Continued

- (b) Describe plan design strategies that can assist in mitigating pension plan financial risks and comment on how effective each strategy is in reducing the volatility of the funded status on an accounting basis.

Sample Answer:

Change the cost-sharing of the plan design: For instance increase or implement member contributions. This strategy reduces the expected employer contributions provided the other elements of the plan design remain the same. However absent some other change to the plan design or asset allocation – in general this strategy would not have a material impact on balance sheet volatility.

Change the plan design to a cash balance design. A cash balance design is a design that promises a notional account balance to members rather than a formulaic benefit based on final average pay. Additionally, typically the cash balance is paid as a lump sum of the notional account rather than as an annuity. A cash balance design therefore generally has a smaller liability duration than does a final average pay annuity type design. This would materially reduce the volatility of the sponsor's balance sheet.

Change the plan design to a defined contribution design. A defined contribution design is a design that provides an account balance to members rather than a formulaic benefit based on final average pay. The account balance belongs to the participant along with any investment gains or losses. The investment discretion may be given to the member. A defined contribution design therefore has less risk than a defined benefit plan for the plan sponsor. Also, since financial reporting for a defined contribution plan is not done on an accrual basis the volatility of the sponsor's balance sheet would be materially smaller (assuming that the defined benefit plan was frozen or even closed).

Additional Commentary on Question:

Points were awarded based on (1) describing the method/strategy that would mitigate financial risk – and which risks it mitigates, and further (2) describing the impact of the method/strategy on balance sheet volatility. Other valid method/strategies include:

- Reducing ancillary benefits
- Moderating the current design somehow (e.g., reduce the benefit multiplier)
- Purchasing annuities for a group of plan participants
- Adding portability features to the plan (e.g., a lump sum option)

Many candidates did not answer how a particular strategy impacted volatility of funded status. Among those candidates who did answer this part of the question some candidates referred to the absolute balance sheet risk, while others referred to the relative balance sheet risk. As long as the candidate adequately and appropriately explained the impact of the change either path was acceptable.

9. 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-C123-07 Funding Risks for Multiemployer Plans

Commentary on Question:

The question tests how well candidates understand multiemployer plans, including the unique risks they face.

The question requires candidates to go beyond a list of points to explain the issues facing multiemployer plans.

Candidates had trouble identifying many of the risks facing multiemployer plans. While most understood basic funding considerations for multiemployer plans, few discussed plan governance structure, difference in risk appetite, and accounting and union considerations.

Solution:

- (a) As NOC's consulting actuary, describe the considerations that NOC should address when assessing the contribution levels of these two plans.
- Contribution levels for a MEPP are usually negotiated and set by collective bargaining agreements.
 - Therefore, NOC has little control over contribution levels.
 - Though contribution levels are currently lower than that of NOC, future contribution levels are subject to change with future collective bargaining agreements and may increase.

9. Continued

- Review historical contribution levels - the current contribution levels may be artificially low (not enough to cover the cost of additional accruals and amortization of the unfunded liability) if they are based on an old collective agreement that does not reflect recent actuarial losses.
 - In a MEPP, any funding excess (surplus) cannot revert back to the employer.
 - The demographic profile of the MEPP would also impact the level of contributions. Older populations will create higher costs.
 - NOC should consider the assumptions and methods chosen by the MEPP. For example, if the MEPP uses asset smoothing, the contributions could be temporarily low due to losses not fully recognized yet. (COMMENT: another valid example would be if the MEPP and NOC used different discount rates in their valuations.)
 - NOC should consider the current funded status of the MEPP. If the funded status of the MEPP is less than 100% or less than NOC Hourly Plan's funded status the plan could be at risk if events occur that lower future contribution. (For example, declines in employment.)
 - Contributing employers have no unilateral ability to decide how to resolve funding shortfalls.
 - NOC should also consider the possibility of a key employer withdrawing from the plan in the future. This would leave NOC and remaining employers with a larger cost burden.
- (b) Assuming that NOC chooses to join the multiemployer plan, assess the risks to NOC and additional considerations that should be taken into account when making this decision.
- MEPPs have different governance structure than single employer plans.
 - A board of trustees serves as the plan administrator and is responsible for defining plan provisions, setting benefit levels, and keeping the plan in compliance with the law. Therefore, NOC would relinquish control of plan administration responsibilities.
 - The board is responsible for setting risk tolerances when considering funding and investment policies. NOC should consider the possibility that the MEPP risk tolerance could be different than that of NOC and its employees.
 - NOC may have a different view of the appropriate investment strategy (asset allocation) for the plan than the MEPP.
 - MEPPs are common in industries where employees move around from employer to employer. This allows participants to change employers without a disruption in benefits.

9. Continued

- If NOC decides to join the MEPP, their assets and administration will be pooled with other employers, which could be a cost savings for NOC.
- NOC should consider the possibility of future changes in legislation that could increase cost for MEPPs and NOC.
- Accounting for MEPPs is different than for single employer pension plans and similar to DC plans (expense based on actual contributions). It is possible that NOC could lower their expense by joining the MEPP.
- There may be union considerations. NOC needs to consider whether the union representing its current employees is willing to join the MEPP.

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:

- (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:

Handbook of Canadian Pension and Benefit Plans – Ch. 5

FAS87

FAS88

FAS106

Commentary on Question:

This is a pension accounting question with a curtailment first and then a negative plan amendment on July 1, 2010.

The candidates need to be able to identify the accounting treatment of these two changes and determine the impact of each change on the pension expense.

The candidates also need to identify the unrecognized loss is amortized over the adjusted FWL to retirement and the unrecognized past service cost is amortized over the adjusted FWL to FEA and how each of them is calculated.

Solution:

Determine NOC's 2010 accounting expense under U.S. accounting standards including the effects of the plan changes.

- **Change 1: Termination of 1,250 Actives is a curtailment due to FWL reduction**

Expense for the first 6-month of the year

= service cost for the first 6-month + interest cost for the first 6-month – EROA for the first 6-month + amortization of (gains)/losses + amortization of prior service cost/(credit)

$$= 63,425 * 0.5 + 100,340 * 0.5 - 0 + 10,130 * 0.5 + 2,682 * 0.5$$

$$= 31,713 + 50,170 - 0 + 5,065 + 1,341$$

$$= 88,289$$

10. Continued

Re-measurement at 6/30/2010 (date of event) of liability before curtailment:

Expected PBO at 6/30/2010

= PBO at 1/1/2010 + SC for the first 6-month + interest cost for the first 6-month
– benefit payment for the first 6-month

= 1,776,933 + 31,713 + 50,170 – 32,000 * 0.5

= 1,842,816

Actual PBO = expected PBO because no change in discount rate and there is no other source of actuarial gains or losses since January 1, 2010

Unrecognized loss after re-measurement, but before curtailment

= Unrecognized loss at 1/1/2010 – amortization of loss for the first 6-month of the year + additional losses/(gains)

= 283,624 – 5,065 + 0

= 278,559

Unrecognized PSC after re-measurement, but before curtailment

= Unrecognized PSC at 1/1/2010 – amortization of PSC for the first 6-month of the year

= 20,000 – 1,341

= 18,659

Curtailment impact

Post-curtailment PBO

= pre-curtailment PBO – curtailment gain

= 1,842,816 – 100,000

= 1,742,816

Unrecognized loss

= max (pre-curtailment loss – curtailment gain, 0)

= max (278,559 – 100,000, 0)

= 178,559

Curtailment charge

= (pre-curtailment PSC * % reduction in total future working lifetime to retirement age

= 18,659 * 25%

= 4,665

10. Continued

$$\begin{aligned} &\text{Unrecognized PSC} \\ &= \text{pre-curtailment PSC} - \text{curtailment charge} \\ &= 18,659 - 4,665 \\ &= 13,994 \end{aligned}$$

- **Change 2: Elimination of spousal coverage is a negative plan amendment**

Negative plan amendment impact

$$\begin{aligned} &\text{Post-amendment PBO} \\ &= \text{Pre-amendment PBO} - \text{reduction in PBO due to amendment} \\ &= 1,742,816 - (1,742,816 * 0.2) \\ &= 1,742,816 - 348,563 \\ &= 1,394,253 \end{aligned}$$

$$\text{Unrecognized loss} = 178,559 \text{ (no impact of amendment on net loss)}$$

$$\begin{aligned} &\text{Unrecognized PSC} \\ &= \text{pre-amendment PSC} + \text{plan amendment impact} \\ &= 13,994 - 348,563 \\ &= -334,569 \end{aligned}$$

Calculation of average future working lifetime to FEA and retirement age after changes

$$\begin{aligned} &\text{Total number of Actives in plan prior to changes} \\ &= \text{number of Actives in Salaried plan} + \text{number of Actives in Hourly plan} \\ &= 4,067 + 6,285 \\ &= 10,352 \end{aligned}$$

$$\begin{aligned} &\text{Calculation of average future working lifetime to retirement age} \\ &= [\text{average of FWL before curtailment} * \text{number of Actives prior to curtailment} * \\ & \quad (1 - 25\%)] / (\text{number of Actives before curtailment} - \text{number of Actives being} \\ & \quad \text{curtailed}) \\ &= [10.46 * 10,352 * (1 - 25\%)] / (10,352 - 1,250) \\ &= [108,281.92 - 27,070.48] / 9,102 \\ &= 8.92 \end{aligned}$$

10. Continued

$$\begin{aligned} & \text{Number of Actives prior to curtailment who are already eligible for retirement (55} \\ & \text{\& 10)} \\ & = \text{Salaried 55 \& 10 + Hourly 55 \& 10 (pull from individual age and service charts)} \\ & = (50 + 90 + 410 + 5 + 10 + 4) + (95 + 177 + 802 + 13 + 9 + 7) \\ & = 569 + 1,103 \\ & = 1,672 \end{aligned}$$

$$\begin{aligned} & \text{Calculation of average future working lifetime to FEA} \\ & = [\text{average of FWL before curtailment} * (\text{number of Actives prior to curtailment} - \\ & \text{number of Actives who are already eligible for retirement}) * (1 - 25\%)] / (\text{number} \\ & \text{of Actives before curtailment} - \text{number of Actives who are already eligible for} \\ & \text{retirement} - \text{number of Actives being curtailed}) \\ & = [7.46 * (10,352 - 1,672) * (1 - 25\%)] / (10,352 - 1,672 - 1,250) \\ & = [64,752.80 - 16,188.20] / 7,430 \\ & = 6.54 \end{aligned}$$

Expense for the second half of the year:

$$\begin{aligned} \text{SC} & = (\text{annual SC at 1/1/2010}) \text{ adjustment by curtailment and plan amendment} \\ & \text{impact at 6/30/2010} * 0.5 \\ & = (63,425 * (1 + 0.5 * 0.055) - 8,000) * (1 - 40\%) * 0.5 \\ & = 34,301 * 0.5 \\ & = 17,151 \end{aligned}$$

$$\begin{aligned} \text{IC} & = (\text{PBO} + \text{SC} - \text{benefit payment}) * \text{discount rate} * \text{half year adjustment} \\ & = (1,394,253 + 34,301 - 16,000) * 0.055 * 0.5 \\ & = 38,845 \end{aligned}$$

$$\text{EROA} = 0$$

$$\text{PSC amortization} = -334,569 / 6.54 * 0.5 = -25,579$$

$$\text{Loss amortization} = (178,559 - 0.1 * 1,394,253) / 8.92 * 0.5 = 2,194$$

$$\begin{aligned} & \text{Expense for second half of the year} \\ & = 17,151 + 38,845 + 0 - 25,579 + 2,194 \\ & = 32,611 \end{aligned}$$

Total 2010 expense

$$\begin{aligned} & = \text{expense for first half of the year} + \text{curtailment charge} + \text{expense for the second} \\ & \text{half of the year} \\ & = 88,289 + 4,665 + 32,611 \\ & = 125,565 \end{aligned}$$

11. 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:

- (8a) Compare the financial economics perspective to the traditional perspective on funding and accounting for retirement plans.

Sources:

R-C105-07 Pension Actuary's Guide to Financial Economics and Pension Arbitrage
Example Worksheet

Commentary on Question:

This was a calculation question testing the financial economics perspective.

Many candidates did not apply the corporate tax to the pension plan assets prior to doing the augmented balance sheet.

Candidates did well when they listed out in detail all of their steps and formulas. If a math error was encountered, they could still achieve many points.

The question asked that a recommendation be provided as to whether the proposed policy supports the CFO's objectives of maximizing shareholder value. This recommendation needed to be supported. Candidates could rely on the financial economics theory along with their supporting calculations to make a recommendation.

Solution:

Using the Augmented Balance Sheet approach, calculate the total after-tax income for the new policy and make a recommendation whether the proposed policy supports the CFO's goal.

The augmented balance sheet takes the view that the shareholders own the assets and owe the liabilities of the company's DB plan.

Below is the completed augmented balance sheet with supporting calculations following:

	Investor Holdings	Pre-tax Income	Personal Tax	After-tax Income
Pension Plan (PP)				
Equity	1,680,000	117,600	(11,760)	105,840
Bonds	420,000	16,800	(1,680)	15,120
Total	2,100,000	134,400	(13,440)	120,960
Direct holdings (DH)				
Equity	8,320,000	582,400	(58,240)	524,160
Bonds	9,580,000	383,200	(114,960)	268,240
Total	17,900,000	965,600	(173,200)	792,400
Total Portfolio	20,000,000	1,100,000	(186,640)	913,360
Increase				3,360

11. Continued

Investors own \$3B of the Pension Plan (PP) holdings adjusted for the corporate tax rate. ($\$3B \cdot (1-.3) = \$2.1B$). The PP assets are split 80%/20% equity and bonds.

The investor's Direct Holdings (DH) are the remainder of the \$20B allocating the total portfolio according to the 50%/50% allocation.

Total direct holdings = ($\$20B - \$2.1B$) = \$17.9B

Equity direct holdings = ($\$20B \cdot 50\%$) - \$1.68B = \$8.32B

Pre-Tax Income assumes a 7% return on equity investments and a 4% return on bonds.

PP Equity Pre-Tax Income = ($\$1.68B \cdot .07$) = \$0.1176B

PP Bonds Pre-Tax Income = ($\$0.42B \cdot .04$) = \$0.0168B

The taxes applied to the Pre-Tax Income are 10% for all PP income, 10% for equity direct holdings and 30% for bond direct holdings.

PP Total Tax = ($\$0.1344 \cdot .1$) = \$0.01344B

DH Equity Tax = ($\$0.5824 \cdot .1$) = \$0.05824B

DH Bonds Tax = ($\$0.3832 \cdot .3$) = \$0.11496B

The After Tax Income equals the Pre-Tax Income less the taxes.

PP After Tax Income = ($\$0.1344 - \0.01344) = \$0.12096B

DH After Tax Income = ($\$1.1 - \0.186640) = \$0.913360B

With the new 80%/20% allocation, there was an increase after tax of \$3.36M ($\$0.91336 - \0.910).

To verify that the solution was correct, the tax arbitrage or shortcut formula can be used.

Arbitrage = (PP holdings) * (Bond return) * (1 - Corp tax rate) * (Tax spread)

Arbitrage (20% bonds alloc) = ($\$3B$) * 4% * (1-30%) * [(30%-10%) * 20%] = \$3.36M

Financial economics theory suggests that all pension plans should invest in bonds since the tax rate is higher for the direct holdings. To demonstrate the further arbitrage available, utilize the formula above or the full augmented balance sheet.

Arbitrage (100% bonds alloc) = ($\$3B$) * 4% * (1-30%) * [(30%-10%) * 100%] = \$16.8M

By investing the pension plan 100% in bonds, the shareholders would receive an additional \$13.44M ($16.8 - 3.36$) over the proposed plan. To maximize shareholder value, it would be recommended to invest the pension plan 100% in bonds. Therefore the CFO's goal is not achieved.