

DP-RC Model Solutions

Spring 2012

1. Learning Objectives:

10. The candidate will be able to analyze the relationship of plan investments with plan design and valuations.

Learning Outcomes:

- (10b) Solve for a measure of investment performance relevant to a given benchmark.

Sources:

R-D123 - 07

Maginn and Tuttle – Chapter 12

Commentary on Question:

In this question, candidates were asked to demonstrate how to evaluate pension fund performance using different statistics.

A well prepared candidate would have explained the different steps in evaluating the pension fund performance in part (a), calculate the ratios properly in part (b) and analyze them in part (c).

This question was fairly well answered by the majority of candidates.

Solution:

- (a) Describe the steps in a pension fund performance evaluation.

Commentary on Question:

Part (a) particularly addresses learning objective 10(b) and was well answered by candidates. Answers were not expected to consider all the criteria about a benchmark or produce calculations under the micro or macro analysis.

1. Performance measurement

- Calculate the rate of return.
 - 2 options exist:
 - Time weighted method
 - Dollar weighted method (or Money weighted method)
- Compare with the right benchmark
 - Many different benchmarks may satisfy the criteria for an acceptable benchmark (7 primary types)

1. Continued

2. Performance attribution

- For Macro level analysis, we need the following inputs in order to value the return on a macro level:
 - Policy allocations
 - Benchmark portfolio returns
 - Fund returns, valuations and external Cash Flows
- For Micro level analysis
 - Sector weighting/stock selection attribution
 - Fundamental Factor Model attribution
 - Fixed Income attribution

3. Performance appraisal

- Goal is to determine if performance luck or talent
- From the previous 2 steps
 - Determine the risk adjusted performance appraisal measures
 - Use quality control charts
 - Interpret quality control charts

(b) Calculate the following performance ratios

- (i) Ex post alpha (Jensen's alpha)
- (ii) Treynor measure
- (iii) Sharpe ratio

Commentary on Question:

Part (b) particularly address leaning objective 10(b) and was very well answered by candidates for Treynor Measure and Sharpe ratio, but poorly for Ex Post alpha. For Ex Post alpha, students calculated the expected return, but not the alpha.

Portfolio return formula: sum of portfolio asset class return * asset class portfolio allocation for each asset class

$$0.11 * 0.55 + 0.13 * 0.15 + 0.08 * 0.28 + 0.02 * 0.02$$

10.2800%

Benchmark return formula: sum of benchmark asset class return * asset class target allocation for each asset class

$$0.1 * 0.5 + 0.15 * 0.15 + 0.05 * 0.35$$

9.0000%

Alpha (definitions in [])

$$R_a [\text{portfolio return}] - r_f [\text{risk free =cash}] - \text{Beta} (R_m [\text{benchmark return}] - r_f)$$
$$0.1028 - 0.02 - 1.2*(0.09 - 0.02)$$

-0.12%

1. Continued

Treynor (definitions in [])

$(R_a [\text{portfolio return}] - r_f [\text{risk free = cash}]) / \text{Beta}$

$(0.1028 - 0.02) / 1.2$

6.90%

Sharpe (definitions in [])

$(R_a [\text{portfolio return}] - r_f [\text{risk free = cash}]) / \text{standard deviation}$

$(0.1028 - 0.02) / (0.25 \wedge 0.5)$

- (c) Compare and contrast the different ratios.

Commentary on Question:

Part (c) particularly addresses learning objective 10(b) and was not well answered by candidates. The candidates failed to address the different risk measures of each ratio and the usage of a ratio to evaluate the performance of an investment manager.

Sharpe ratio uses variance instead of Beta (used by Treynor).

Sharpe compares excess returns to the total risk of the account instead of systematic risk.

Alpha and Treynor measure always have the same conclusion on the investment manager.

For Alpha: the manager did not add value for the risk taken since the result is less than 0.

For Sharpe: the manager adds value if slope above the Capital Market Line; For Treynor, the manager adds value if slope above the Security Market Line.

Both Treynor and Alpha compare excess returns on an account relative to the account's systematic risk.

2. Learning Objectives:

1. The candidate will be able to analyze different types of registered/qualified defined benefit and defined contribution plans, as well as retiree health plans.

Learning Outcomes:

- (1d) Given a plan type, explain the relevance and range of plan features including the following:
 - (i) Plan eligibility requirements
 - (ii) Benefit eligibility requirements, accrual, vest and phased retirement
 - (iii) Benefit/contribution formula
 - (iv) Payment options and associated adjustments to the amount of benefit
 - (v) Ancillary benefits
 - (vi) Benefit subsidies and their value, vested or non-vested
 - (vii) Participant investment options
 - (viii) Required and optional employee contributions
 - (ix) Phased retirement and DROP plans

Sources:

Morneau Sobeco 14th Edition, Chapters 1 and 12

R-D101-07: Converting Pension Plans from DB to DC

Commentary on Question:

In this question, candidates were asked to demonstrate their understanding of the plan design between a DB plan and a DC plan. Also, a candidate should understand the differences among different money purchase plans.

A well prepared candidate would be able to provide an answer that shows why the DC plan is more suitable than the DB plan for ABC given their demographics

A well prepared candidate would be able to demonstrate the difference among different money purchase plans based on the purpose of each plan, eligibility, risk to employer and employees respectively, investment options, vesting rules, tax implications etc.

Solution:

- (a) Describe the advantages and disadvantages of providing a pension plan from ABC's perspective.

Commentary on Question:

Candidates generally did well on this question; however, certain candidates missed the key words “from ABC’s perspective” and started describing the advantages and disadvantages from members’ perspectives. Also most students listed all the advantages and disadvantages of providing a pension plan.

2. Continued

Advantages of providing a pension plan from ABC's perspective:

- Contributions to a registered pension plan are tax deductible
- Assets are accumulated on a tax-free basis until benefits are paid
- Company is allowed to expense its pension costs in the years in which the pensions were earned by and credited to its employees
- A pension plan makes it easier for a company to retire employees in an orderly fashion
- Improves the employer's competitive position for hiring employees especially with specialized skills

Disadvantages of providing a pension plan from ABC's perspective:

- Employers may prefer to use the funds to invest in their own company which may earn a higher return than that of a pension fund
- Employers are discouraged by the rising administration costs
- Employers are discouraged by the time and effort required to comply with the complex legislations
- Providing pension plan income to employees may reduce or eliminate government benefits, as a result, the company may be subsidizing the government rather than assisting the company's pensioners
- Employers feel that saving for retirement is the employee's responsibility
- RRSP limits and salaries are high enough for employees to accumulate adequate pension through personal savings.

- (b) Most of its employees are very young and mobile and ABC thinks that a capital accumulation plan may be more suitable for its employees.

Outline the reasons why ABC would favor a capital accumulation plan design over a defined benefit pension plan.

Commentary on Question:

Most candidates did well on this part of the question. They could list out the reasons why DC plan is more suitable than the DB plan given ABC's mobile demographics.

Given the young and mobile demographics at ABC, the company would favor a capital accumulation plan design over a defined benefit pension plan for the following reasons:

- The company has a greater cost stability given contributions are defined.
- The company has a more stable pension expense.
- Employees bear investment risks under a capital accumulation plan; and that employer is perceived to bear little risk under a defined contribution (DC) plan design.
- There is a perception that compliance activities will be reduced under a DC plan design.

2. Continued

- A DC plan offers a plan design that fits the career pattern of a more mobile workforce which fits ABC's demographics.
 - A DC plan is easier for employees to understand; and members do not fully understand the value of a defined benefit plan.
 - Actuarial valuation is not required for DC plan.
- (c) Compare and contrast defined contribution registered pension plans, group RRSPs, DPSPs and group TFSAs.

Commentary on Question:

Many candidates approached this question by setting up a table comparing the four different types of defined contribution (DC) plans under some general categories. This is a good approach given candidates are asked to 'compare and contrast;. However, many of them failed to address the specific items such as contrast. Also, many of them failed to address the specific items (such as plan design, eligibility, risk to employer and employees respectively, investment options, vesting rules, tax implication, etc.) that distinguish the four different types of DC plans.

It was also found that many students explained Group RRSPs and DPSPs but failed to discuss DC plans and TFSAs more fully. Many students listed common features except they did not discuss taxation, flexibility of formulas, investment options, and legislated compliance issues.

Registered Defined Contribution (DC) Pension Plan

- **General Descriptions:** DC pension plan is a registered plan that is registered with provincial or federal pension authorities and with the Canada Revenue Agency (CRA). Plan sponsor must comply with the requirements specified in the applicable pension standards legislation and with the *Income Tax Act* (ITA).
- **Contributions:** The level of contributions made by both employer and employee are specified as either a percentage of earnings or a flat dollar amount).
- **Distribution:** Retirement incomes are provided based on members' account balances.
- **Tax Implication:** Employees are not taxed on employer contributions made on their behalves. Contributions accumulate with investment earnings are tax free. In addition, a DC plan offers higher tax-deductible contribution limits and greater degree of tax deferral.
- **Vesting:** Vesting is subject to pension legislation.
- **Others:**
 - A DC plan allows for past service contributions.

2. Continued

Group RRSP

- **General Descriptions:** Group RRSP is not a pension plan; it's an alternative to pension plans. Therefore, Group RRSP is not subject to pension legislations and standards; there is no locking-in requirement, no mandatory J&S pension, and no pension committee required. There is also greater flexibility in eligibility requirements.
- **Contributions:** There is greater flexibility in employer contributions.
- **Distribution:** Since employer contributions are vested immediately, there is no way to ensure that funds will be used for retirement purposes.
- **Investment:** Members can access to a wide variety of investment funds. Employer has fiduciary responsibility, and is responsible to make the selection of administrator and fund manager with prudence and diligence.
- **Tax Implication:** Employer contributions are salary to the employees and therefore are subject to payroll taxes.
- **Vesting:** Employer contributions are vested immediately.
- **Others:**
 - Income splitting can be arranged under Group RRSP.
 - Group RRSP is convenient for saving through payroll deduction, and therefore administration and fund management costs are reduced.

DPSP

- **General Descriptions:** Employer contributions are referenced by “reference to profits” or “out of profits”. DPSP can be used as a stand-alone or supplementary basis; it is not subject to pension standards legislation.
- **Contributions:** Employer contributions can be calculated by “reference to profits” (i.e. a percentage of profits for the year); or by “out of profits” (i.e. either a fixed dollar amount per employee or a percentage of employee's salary). However, employer contributions cannot exceed a maximum contribution limit. Under DPSP, employee contributions are not permitted.
- **Distribution:** The ultimate amount of retirement income depends on future profits, investment income of the funds and annuity purchase price. Lump sum can be paid upon retirement; or employee can choose to purchase an annuity.
- **Investment:** May invest in employer's own common stock. Not allowed to invest in employer's notes or bonds
- **Tax Implication:** Employer contributions are not subject to payroll taxes.
- **Vesting:** Immediate vesting if member completed 24 months of DPSP membership.
- **Others:**
 - Employees may not borrow from the fund, nor surrender nor assign their interests

2. Continued

TSFA

- **General Descriptions:** TSFA is primarily a saving vehicle and is not designed for retirement savings. TSFA is a preferred savings vehicle to lower income individuals, and is preferred by individuals who expect to retire in higher income tax bracket
- **Contributions:** Contribution limits are not earnings related, and will increase with inflation, subject to a maximum.
- **Distribution:** Assets in TSFA can be used to secure a loan or can be used for any reasons.
- **Tax Implication:** Contributions are not tax-deductible. Withdrawals are not considered as income in federal means-tested benefits. Withdrawals and investment income are not subject to taxes.
- **Vesting:** If group TSFAs offered, employer contributions are notional only and vested immediately
- **Others:**
 - Withdrawals are added to TSFA room.
 - Unused contribution room will be carried forward.
 - No attribution rules on contribution made to spouse's TSFA.
 - Spousal contributions are permitted subject to spouse's contribution room.

3. Learning Objectives:

5. The candidate will be able to apply/synthesize the various methods used to value a pension plan or retiree health plan for various purposes.

Learning Outcomes:

- (5b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using the variety of cost methods for budgeting, funding accounting and measuring economic value.
- (5c) Analyze and communicate the pattern of cost recognition that arises under a variety of funding and asset valuation methods.

Sources:

Pension Mathematics for Actuaries, Anderson, Third Edition, Chapter 2 and 7

Commentary on Question:

A well prepared candidate will be able to calculate normal costs using the Unit Credit, Projected Unit credit and Aggregate cost methods. They will also be able to describe how and why normal cost accruals differ between the three cost methods.

Solution:

- (a) Calculate the normal cost for each participant of the plan at January 1, 2012 under the following cost methods:
- Unit Credit as a percentage of salary
 - Projected Unit Credit as a percentage of salary
 - Aggregate cost method allocated by total salary

$$\text{UC NC \% (or \$)} = B_x \times \ddot{a}_{60}^{(12)} \times v^{(60-x)} (/ S_x)$$

Member A $\text{UC NC \% (or \$)} = .02 \times 80,000 \times 12 \times v^{20} (/ 80,000)$
 $= 7.5\% \text{ OR } 5987$

Member B $\text{UC NC \% (or \$)} = .02 \times 12 \times v^{10} (\times 100,000)$
 $= 13.4\% \text{ (or } 13401)$

Member A $\text{PUC NC}_x \% \text{ (or \$)} = B_{60} \times (x-w)/(60-x) \times \ddot{a}_{60}^{(12)} \times v^{(60-x)} (/ S_x)$
 $B_{60} = 10,000 + .02 \times 80000 \times [(1.04^{20} - 1) / .04]$
 $= 57,645$
 $\text{PUC NC \%} = 57,645 \times 1/30 \times 12 \times v^{20} (/ 80,000)$

3. Continued

$$= 9.0\% \text{ or } 7190$$

$$\text{Member B } B_{60} = 20,000 + .02 \times 100,000 \times [(1.04^{10} - 1) / .04]$$
$$= 44,012$$

$$\text{PUC NC\%} = 44,012 \times 1/30 \times 12 \times v^{10} (/ 100,000)$$
$$= 9.8\% \text{ (or } \$9,830)$$

$$\text{Aggr NC\%} = (\sum PVFB_x - AL_t) / \sum PVFS_x \times \sum S_x$$

$$\text{Aggr } AL_t = F_t = \$180,000$$

$$\sum PVFB_x = 57,645 \times 12 \times v^{20} + 44,012 \times 12 \times v^{10}$$
$$= 510,602$$

$$\sum PVFS_x = 80,000 \times a^s(20) + 100,000 \times a^s(10)$$
$$= 2,262,454$$

$$\text{Aggr NC\%} = (510,602 - 180,000) / 2,262,454 \times 180,000$$
$$= 26303$$

- (b) Explain how the normal costs under the methods used in part (a) would change over time, assuming a closed plan.

Unit credit normal cost is low at young ages, significantly higher at older ages.

Unit credit normal cost increases each year with both interest and salary increase.

Projected unit credit normal cost is flatter than unit credit, but still higher at older ages.

Projected unit credit normal cost increases each year with interest.

Aggregate normal cost level percentage doesn't increase with age or salaries.

Aggregate normal cost is affected by experience gains/losses and averaged over all members.

4. Learning Objectives:

6. The candidate will be able to analyze/synthesize factors that go into selection of actuarial assumptions.

Learning Outcomes:

- (6c) Evaluate appropriateness of current assumptions given the purpose.
- (6d) Describe and explain the different perspectives on the selection of assumptions.

Sources:

2009 Selection of Actuarial Assumptions - Mercer Resource Manual

ASOP 27 – Economic Assumptions

ASOP 35 – Demographic Assumptions

Yamamoto, Chapter 20

Commentary on Question:

This question is testing candidate's knowledge of assumption setting for a pension plan valuation. In particular, part (a) addressed guidance provided to actuaries in choosing assumptions. Part (b) addressed other factors to be considered that are specific to individual pension plans causing variation among particular assumptions used for valuation.

This question was fairly well answered by the majority of candidates.

Solution:

- (a) List the factors that should be considered in setting each of these assumptions.

Commentary on Question:

Part (a) particularly addresses learning objective 6(c) and was moderately well answered by candidates. Answers were not expected to consider the specific plans described in the question.

General guidance for setting assumptions is found in the ASOPs. This guidance includes that assumptions:

- Are best estimates chosen from with a range,
- Are consistent with one another,
- Include a provision for adverse deviation,
- Take into account materiality,
- Take into account the characteristics of the covered group and obligation,
- Abide by statutes and regulations,
- Consider the purpose of measurement and factors which may affect future experience, and
- Be cost effective.

4. Continued

Other considerations that are specific to each assumption should be further outlined.

Setting of discount rate is primarily tied to the investments made within the plan. Therefore, considerations specific to the discount rate include:

- Calculation of the discount rate by
 - Building block approach = Average of expected return for each asset class, weighted by current or anticipated asset allocation, or
 - Cash flow matching method = Matching of cash flow and duration with investment grade debt securities
- Historical returns on each asset class,
- Investment policy, and
- Treatment of expenses.

Setting of mortality assumption needs to take into account the plan members and liabilities. It is important to follow guidance particularly with respect to reflecting mortality improvements. Other considerations include:

- Plan's own past experience and whether it is robust enough to be credible,
- Region/Country, industry and occupations of plan members, and
- Whether specific tables should be used for various sub-group: actives, disabled, retirees, blue/white collar.

Setting of salary scale needs to consider sponsor's action. Considerations specific to salary increase assumption include:

- Developing a best estimate using the building block approach (components include ;long term inflation, real wage/productivity growth, and merit/promotion),
- Historical pay increases,
- Current practice and negotiated increases,
- Management's philosophy and budget,
- Competitive factors, and
- Membership characteristics.

When setting retirement age assumption, it is important to look at why and when individuals retire. Considerations include:

- Plan provisions
- Non-pension incentives such as health plans,
- Early retirement windows and workforce reductions,
- Availability of social programs,
- Trends within the company, industry and society, and
- Health of economy and company.

4. Continued

- (b) Identify potential reasons for the variance between the two plans for each of the assumptions.

Commentary on Question:

Part (b) particularly addresses learning objective 6(d) and was poorly answered by candidates.

Candidates were not asked to critique the assumptions used in each valuation, rather they were asked to compare the assumptions. Candidates were given marks for providing reasons as to why the actuaries chose different assumptions in each case. Candidates were not given marks for commenting that specific assumptions were inappropriate or wrong.

It was also important for candidates to remember that the plan provisions and valuation date were identical. No marks were given for comments regarding the timing of the valuations or the particulars of the plan benefits.

Important reasons for variance include differences in:

- Historical experience of each plan,
- Credibility of plan experience – size of Large plan may have had more data than Small and would use it more readily in setting assumptions,
- Demographics/characteristics of members – including age, service, industry, job type, unionized, weight of retirees vs. actives vs. term vested,
- Health of the respective: economies, industries, companies,
- Derivation of best estimates by actuary, including different expectations of; building blocks, mortality, future work life,
- Materiality of the assumption versus the cost effectiveness of refining,
- Cash flow needs and duration of the liability,
- Company practices regarding compensation and reward, and retirement incentive, and
- Statement of Investment Policies, treatment of investment expenses and asset management style.

5. Learning Objectives:

1. The candidate will be able to analyze different types of registered/qualified defined benefit & defined contribution plans, as well as retiree health plans.
3. The candidate will be able to analyze plans designed for executives or the highly paid.
5. The candidate will be able to apply/synthesize the various methods used to value a pension plan or retiree health plan for various purposes.

Learning Outcomes:

- (1a) Describe the structure of the following plans:
 - Fixed dollar and pay-related defined benefit plans
 - Hybrid plan designs such as, cash balance, pension equity, and floor offset plans, target benefit plans
 - Defined contribution plans including 401(k) plans and capital accumulation plans
 - Retiree Health Plans
- (3a) Given a specific context, apply principles and features of executive deferred compensation retirement plans.
- (5a) Differentiate between the various purposes for valuing pension plans:
 - (i) Budgeting
 - (ii) Funding
 - (iii) Accounting
 - (iv) Solvency
 - (v) Termination/wind up
 - (vi) Economic value

Sources:

R-D 615-11

Yamamoto - Ch 4 pp 57-68, 90-115

Allen - Ch 14 pp 247-160

Morneau Sobeco - Chapters 11 and 12

R-D 603-07

R-D 616-09

5. Continued

Commentary on Question:

In this question, candidates were asked to demonstrate their knowledge of three different forms of benefit plans from both an employee and employer perspective. A well prepared candidate would be able to compare and contrast these three arrangements by incorporating important issues (such as funding, accounting, risks, economic value, taxation, termination/wind-up).

Many candidates brought up funding and economic value, but missed important concepts as impact on accounting, taxation (and deferral of taxes), risk and what would happen on termination/wind-up. Candidates were given additional credit for discussing certain funding vehicles on the SERP side. Candidates were unprepared to discuss details on deferred stock options.

The candidate was expected to compare and contrast at least 4 issues from the employer's side and at least 4 issues from the employee's side for each part to receive full marks.

Solution:

Your client's executives have requested improvements to their post-retirement compensation package. The Company is willing to consider introducing one of the following three arrangements:

- (i) Defined Benefit SERP
- (ii) Post-Retirement Health-Care Plan
- (iii) Deferred Stock Option Arrangement

Compare and contrast the arrangements from both an employee and employer perspective

DB SERP

From Ee perspective

- Top up benefit under base plan provides more generous retirement benefit and adequate replacement ratio – makes it easier for retirement planning.
- Employee not taxed until benefits paid.
- Funded SERPs provide benefit security.
- If plan is unfunded the employee is at risk of losing out on benefits if employer goes bankrupt or there is a change of control.

From Er perspective

- Competitive program that can be used to attract mid-career hires and used to retain top talent (example is strict eligibility requirements).
- Plans can be funded or unfunded.
- Certain funding vehicles exist if plan is funded such as RCA, letter of credit.
- If funded through an RCA, contributions and investment income attracts a 50% refundable tax, employer contributions are tax deductible.

5. Continued

- Employers could also choose to use terminal funding (Employer pays the present value of the employee's pension in lump sum or installments over a short period of time) lump sum amount is fully taxable to employee.
- Choosing not to fund the plan frees up cash flow.
- Employer bears all the inflation, interest and mortality risk with funded DB SERP plans.
- Whether or not an obligation is funded, employers are required to account for its costs and to disclose its related obligations in its financial statements

Post Retirement Health Plan

From Ee perspective

- Since post retirement health plans are generally unfunded, the ee loses out on benefits if company goes bankrupt.
- Health benefits are usually tax free and employee contributions are tax deductible.

From Er perspective

- Post retirement health plans do not need to be funded.
- Employer generally bears the medical inflation risk, unless it is a health care spending account.
- Employers are required to account for its costs and to disclose its obligations in its financial statements.
 - There are various ways to control these costs including:
 - Redefine eligibility requirements to be more stringent than their pension plan.
 - Introducing service related benefits or contribution rates based on service.
 - Introduce caps on subsidies such as fixed dollar subsidy, total expenditure cap.
- Reasons to offer group retirement plans:
 - Retiree group benefits are a tax effective way of providing retirement security.
 - They are valuable benefit for those currently receiving the coverage and those who are soon to retire.
 - The benefits can support workforce planning and growth opportunities for employees.
 - Availability of long term health care is a social responsibility for employer.
 - The current cash costs are nominal.
 - Retiree benefits are typically at the top of union's demands.
- Counter arguments to the above points
 - Employers do not receive full credit due to the hidden subsidy.
 - Benefits are valuable for a minority of employees and it is not until the employees seriously consider retirement that the benefits become valuable in their eyes.
 - Historical employment relationship that focused on long term career may be diminishing.
 - As workers assert independence and lack of loyalty to their employer, sense of social responsibility quickly evaporates.

5. Continued

- Cash costs are increasing rapidly.
- There is negotiating ability in this area.

Deferred Stock Options

From Ee Perspective

- Under stock option plan, eligible employees are given options to buy specific amounts of stock at a price fixed on day option is granted.
- Employee given a period of up to 10 years to exercise the option.
- Deferred stock options are worthless if underwater.
- Deferred stock options are taxed in the year the contribution is made, unless certain qualifying deferrals are made.
- When shares are exercised the employment benefit is the fair market price less the option price.
- Option to defer taxation until disposition of shares (limit is \$100,000 of options that vest in a year).
- Benefits can be deferred until the earliest of the following occurs:
 - The year the employee disposes of shares
 - The year the employee dies
 - The year in which the employee becomes a non-resident
- Employee must actually file an election to defer this tax.
- Ee usually bears all the risk once the option is granted.

From Er Perspective

- Deferred stock option plan does not need to be funded.
- Companies grant stock options for three main reasons:
 - An incentive for employees to increase profitability
 - As a method to retain key employees by creating an opportunity cost if they were to leave employment
 - As a method of compensating employees that is more tax effective than straight salary increases
- For publicly traded companies, the exercise price may not be lower than the market price.

Alternate Solution

SERP

Employer:

1. Good because it can be used to attract and retain key executives
2. It also serves as a tool for workforce management, through golden handcuffs and golden handshakes
3. Provides a good package for mid-career recruits because the sponsor has the ability to make the SERP more generous, i.e., through shorter service eligibility requirements, higher benefit accruals during first few years, higher contributions rates

5. Continued

4. Unlike a DSOP, it does not provide incentives to achieve performance targets.
5. Unlike a health care plan, it does not provide explicitly for medical expenses.
6. Can fund through LOC, RCA, annuities or life insurance

Employee:

1. Beneficial because it provides retirement income after leaving the company
2. Viewed as a “guaranteed” deferral of income, regardless of the employees performance
3. Viewed as a means to ensure income after retirement, but does not ensure adequate coverage for other expenses such as health
4. Does not provide an incentive to perform above expectations

Post-Retirement Medical Plan

Employer:

1. Can be used to attract and retain ee’s but not as well as a SERP since ee’s only usually value health benefits close to retirement
2. Costs can be quite volatile due to inflation and medical inflation as the employee ages
 - Compared to a defined benefit which stays the same for the employee’s life
3. Can be used as a workforce management tool if employees are only allowed to receive benefits at a certain age
4. Usually not funded which frees up liquidity for the employer
5. Cannot provide incentives to achieve performance targets

Employee:

1. Provides coverage for medical expenses which may be quite costly as the employee ages – good for the employee
2. However, does not provide a source of retirement income after leaving
3. Also, er will probably not fund the plan so benefits are less secure and subject to change
 - Freeze, caps, terminate, reduce coverage
4. Does not provide an incentive to exceed performance targets.

Deferred Stock Option Arrangement

Employer:

1. Good way to provide incentives for employees to achieve profit margins
2. Can be used as a tool to attract and retain executives
3. Not good for workforce management because employees may not have the incentive to retire
4. Arrangement does not provide guaranteed income to the employee, therefore, not a good way to provide an incentive to stay with company
5. Does not have to fund plan may reduce costs compared to other two arrangements

5. Continued

Employee:

1. Good way to provide incentive to achieve performance targets
2. Resulting value of benefit may be greater than the two other arrangements
3. However, it does not provide income for after retirement, ee must have on own terms
4. Employee may value long term benefits over short term incentives

6. Learning Objectives:

1. The candidate will be able to analyze different types of registered/qualified defined benefit and defined contribution plans, as well as retiree health plans.
2. The candidate will be able to understand how the regulatory environment affects plan design and understand how to apply relevant restrictions.

Learning Outcomes:

- (1a) Describe the structure of the following plans:
 - Fixed dollar and pay-related defined benefit plans
 - Hybrid plan designs such as, cash balance, pension equity, and floor offset plans, target benefit plans
 - Defined contribution plans including 401(k) plans and capital accumulation plans
 - Retiree Health Plans
- (2a) Explain and apply the regulatory limits placed on types of plans that can be offered.
- (2b) Explain and apply restrictions on plan design features to a proposed plan design.
- (2c) Explain and test for limits on plan designs and features that protect participant rights.

Sources:

Allen, Chapter 21

PBA

Wyatt Book, 3rd Edition, Chapters 14 and 18

Commentary on Question:

In this question, candidates were asked to demonstrate knowledge in structures of hybrid plan designs (in particular, age-weighted money purchase plan), and how the regulatory environment affects/ restricts hybrid pension plan designs in Canada.

A well prepared candidate would have identified the natures/characteristics of a money purchase plan and applied the regulatory environment/ rules regarding implementation of a new money purchase plan in Canada.

In part(a), most candidates understood that contributions cannot be based on age, that separate accounts are required for each member, and that benefits cannot be paid in cash.

6. Continued

Solution:

- (a) Discuss the regulatory issues in implementing the above US plan in Canada.

Commentary on Question:

For part (a), candidates generally missed out the details of the regulatory issues in implementing money purchase plans in Canada.

This hybrid pension plan design is restricted/ affected by the Canadian regulatory environment in the following ways/ categories:

Contribution Formula	<ul style="list-style-type: none">• Employer contributions cannot be based on age• Total contributions made in any particular year are limited by the pension adjustment (PA) limit for the year (i.e. lesser of 18% of member's compensation in a particular calendar year and the money purchase limit for that year)
Account Balance	<ul style="list-style-type: none">• Separate account (instead of hypothetical account) must be provided for each member• All contributions [including employer and employees (if allowed)] and other amounts [such as earnings and forfeited amounts (if any)] for each member are deposited into individual account• Non-vested forfeitures are reallocated to remaining plan members, or used to pay expenses incurred in connection with the plan
Investments	<ul style="list-style-type: none">• As a minimum, account balances must be invested in a default investment vehicle (i.e., money market or target date fund)• 30-year government bond yield rate is not appropriate• Account balances should earn interests based on fund return or some other benchmark• Interests can be credited based on a guaranteed minimum return• Members can also be given choices of investment options• Investment earnings must be allocated to plan members on a reasonable basis, no less frequently than annually

6. Continued

Distribution	<ul style="list-style-type: none">• The only benefits payable to members are based on the members' account balances• Cash payments on termination or retirement may be restricted in Canada• Minimum standards/legislation typically imposes restrictions on the portability of any lump sum payments where the member is vested or locked in
Others	<ul style="list-style-type: none">• Minimum standards/legislation requires pre-retirement death benefits to be paid to member's surviving spouse or beneficiary• A plan administrator is required to keep track of individual's account balances

- (b) Propose a plan design that would best meet the company's mandate, taking into consideration the Canadian regulatory environment.

Justify your proposal.

Commentary on Question:

For part (b), a lot of candidates missed the key words 'propose a plan design' and only provided general comments about the type of plan to be recommended to the company. Also, many candidates did not:

- Understand the term "hybrid."
- Regarding a plan design recommendation, some candidates only mentioned one type of plan (DC) but did not mention Group RRSP as a possibility, others proposed a hybrid plan which was really just a copy of the plan in the question. This did not earn them much credit and, finally, many did not provide any type of recommendation.

The company's mandate is to adopt a plan that mirrors the retirement program in the US, taking into consideration the Canadian regulatory environment. Given the nature of the current US plan, either a Group RRSP or a Money Purchase Plan to the company is recommended.

6. Continued

Proposed Plan Design – Group RRSP:

Contribution Level	<ul style="list-style-type: none"> • The company has the flexibility to vary employer contributions among plan members • Total maximum contributions must not exceed the pension adjustment (PA) limit for the year (i.e. lesser of 18% of member's compensation in a particular calendar year and the money purchase limit for that year) • Individual account balances are required under Group RRSP
Investment return	<ul style="list-style-type: none"> • As a minimum, account balances will be invested in default fund (low risk) • Account balances can earn at fund rate of return or can provide guaranteed minimum
Distribution	<ul style="list-style-type: none"> • Cash or lump sum transfer available on termination • Cash or annuity purchase available on retirement
Other Considerations/Costs	<ul style="list-style-type: none"> • Contributions are vested immediately • Group RRSP is not subject to pension regulations • The company could consider ER contributions as additional salary to employees for income tax purposes, however, additional cost including contributions to government plans (such as CPP & EI) will be incurred

Proposed Plan Design – Money Purchase Plan:

Contribution Level	<ul style="list-style-type: none"> • Employer contributions can be based on points (age + service) if want contributions to increase with age and reward long service • Contribution formula must be determined and administered in accordance with the plan as registered • Alternatively, employer may wish to apply flat rate to all in order to eliminate anti-selection and age-discrimination • Minimum employer contributions = 1% of total pensionable earnings • Total maximum contributions must not exceed the PA limit for the year (i.e., the lesser of 18% of member's compensation in a particular calendar year and the money purchase limit for that year)
Investment Return	<ul style="list-style-type: none"> • As a minimum, account balances will be invested in default fund (low risk) • Account balances can earn at fund rate of return or can provide guaranteed minimum

6. Continued

Distribution	<ul style="list-style-type: none">• No cash option is available on termination, only transfer to locked-in vehicle• Purchase an annuity on retirement
Other considerations/costs	<ul style="list-style-type: none">• Plan must be registered and comply with regulatory requirements (e.g., valuations, filings, reporting, vesting, etc.)

Other Considerations – Both Plans:

- The plan can allow employee contributions to encourage members' participation and cost sharing.
- Employer has responsibility to make selection of investments with prudence and diligence.
- Employer must monitor and evaluate fund performance on ongoing basis.
- Participants may be allowed to choose between self-directed investments.
- For employees choosing self-directed investments, employees bear investment risks.
- If self-directed investments are allowed, employer is required to provide education to employee and select certain providers for investment choices.
- ABC requires a plan administrator to keep track of individual's account balances and forfeited amounts.

7. Learning Objectives:

3. The candidate will be able to analyze plans designed for executives or the highly paid.

Learning Outcomes:

- (3b) Given a specific context, apply principles and features of supplemental retirement plans.

Sources:

RD-602-07

RD-603-07

Morneau Sobeco, Chapter 11

Commentary on Question:

In this question, candidates were asked to demonstrate understanding of plan design with respect to attraction/retention and funding vehicles for SERPs. A well prepared candidate would (a) describe each SERP plan design consideration and how it helped with attraction and retention and, (b) compare the various SERP funding options from employer and employees' tax and security perspectives.

Many candidates had marking points and did well on this question which showed an overall grasp of how SERPs help attract staff.

Solution:

- (a) Describe the considerations in designing a SERP to address the company's turnover concerns, taking into consideration the current registered pension plan provisions.
 1. Eligibility:

Automatic enrolment of all members of the RPP affected by the ITA limit or selected officers/employees above a certain position.
Eligibility can be set to allow key executives to participate in the SERP.
It could be immediate enrolment instead of 2-year waiting period in the RPP.
 2. Benefit formula that provides adequate pension benefits for executives:

Provisions could be identical to the RPP but without the ITA limit (top-up plan).
For benefit adequacy, there could be special provisions to meet needs of the executives, such as:

 - Accrual rate higher than 1% provided in the RPP
 - Pension as a flat percentage of final average earnings after a number of years of service
 - Pensionable earnings include cash bonuses or target bonuses
 - Maximum covered earnings or credited service to limit costs

7. Continued

For mid-career hires, benefit formula may be designed to provide an attractive retirement income, or to make up for pension credits forfeited when leaving prior employment.

3. Ancillary benefits:

Ancillary benefits can be maximized under the RPP to increase tax effectiveness.

Stringent vesting or early retirement provisions can be used to retain executive.

For example, instead of immediate vesting, there are no benefits if executive leaves before earliest retirement age.

SERP pension could have a J&S normal form instead of life only.

(b) Compare and contrast the following SERP funding options, including any tax implications:

(i) Retirement Compensation Arrangement (RCA)

- Employer makes contributions to the trust fund with 50% of all contributions, and subsequent realized investment earnings, to be remitted to Revenue Canada as a refundable tax.
- Refundable tax is later returned to the trust fund at a rate of \$1 for every \$2 of benefits paid.
- Additional funding required for contributions remitted as refundable tax.
- RCA contribution imposes opportunity cost on the company.
- Costly funding option because only half of RCA assets produce investment earnings
- There is added admin burden compared to Pay-as-you-go.
- It requires trustee/custodian and filing of plan documents.
- Funds held in trust provide benefit security to the employees.
- Employee not taxed until benefit payments are received.
- Employer is eligible for a tax deduction for its contribution to the RCA.
- 50% refundable tax set to approximate the highest individual marginal tax rate; a RCA cannot benefit from lower tax rates on capital gains and dividends from Canadian stocks.

(ii) RCA-Letter of Credit (RCA-LOC)

- A letter of credit is an irrevocable promise by a financial institution to pay a specified amount there is a default on pension, a failure to meet financial tests, change in control, a failure to renew LOC.

7. Continued

- Employees' pension benefits can therefore be secured against bankruptcy and change in control with a LOC.
- No funding of benefits required up front. Contributions are made as benefits are paid out to employees
- The employer pays a LOC premium and LOC is usually renewable each year.
- The amount of refundable tax remitted is based on the annual premium paid to the bank for the LOC (where there are no assets backing the letter).
- Given there are no other assets held in the RCA-LOC, there are no earnings subject to refundable tax.
- Tax treatments are identical to a regular RCA.

(iii) Pay-as-you-go

- No funds are set aside.
- No benefit security for the executives.
- Benefit payments are made to the executives from company revenues as they become due.
- Simple to establish and maintain and company not required to divert funds from its operations in advance to meet its obligation.
- Tax consequences occur only on payment of benefits to the executives.

(iv) Secular Trust

- An arrangement whereby the employer pays to the employee additional salary on the condition that it will be remitted in a trust to provide retirement benefits for the employee.
- All employer contributions are tax deductible to the company and fully taxable to the employee in the year in which they are made.
- All investment earnings in a year are taxable. The executive may take advantage of lower tax rates on capital gains and dividends from Canadian stocks.
- Taxes paid based on the marginal tax rate of the executive and it can be tax effective if the marginal tax rate is less than the 50% rate applicable to RCAs.
- Benefit security without the advantage of tax deferral.
- Upon retirements, payments to the executive are therefore tax-free.
- Commonly referred to as an "individual trust" in Canada.
- Lower administrative burden than for an RCA

8. Learning Objectives:

5. The candidate will be able to apply/synthesize the various methods used to value a pension plan or retiree health plan for various purposes.
8. The candidate will be able to evaluate the actuarial considerations in plan options and administration.

Learning Outcomes:

- (5c) Analyze and communicate the pattern of cost recognition that arises under a variety of funding and asset valuation methods.
- (5d) Perform valuations for special purposes, including:
 - (i) Plan termination/windup
 - (ii) Solvency valuations
 - (iii) Open group valuations
- (8a) Assess the gain/loss from options offered, including:
 - Phased retirement
 - Postponed retirement
 - Early retirement
 - Option factors
 - DROPs
- (8b) Assess the impact of applicable regulation, including:
 - Commuted value standard

Sources:

Anderson, Pension Mathematics for Actuaries, Third Edition, 2006, Chapters 1 - 4 and 6 - 7

CIA Educational Note: Calculation of Incremental Cost on Hypothetical Wind-Up or Solvency Basis_210095e.pdf

R-D600-10: Pension Benefits, R.R.O. 1990, Reg. 909 (Regs).doc

R-D612-10: Pension Benefits Act, R.S.O. 1990 c. P. 8 (Act).doc

Commentary on Question:

In this question, candidates are required to determine the solvency incremental cost on a hypothetical wind-up or solvency basis and describe the considerations in calculating the incremental cost.

A well-prepared candidate will not only correctly calculate the solvency liability and solvency incremental cost, but will also be able to describe all the steps to determine the incremental cost and identify any other considerations that could impact the calculation.

8. Continued

Candidates did well on part (a). However, very few discussed the considerations under part (b). Also in part (c), most candidates did not write enough to demonstrate a clear understanding of how all the components of solvency incremental cost are calculated. More specifically, most candidates did not show how the present value of expected payments in 2012 is calculated.

Note that the annuity factors in the question were incorrectly labeled but this did not affect any candidates' score and no one was penalized as a result.

Solution:

- (a) Calculate the solvency position of the plan as at January 1, 2012.

Employee A

Retirement Age

60: Not entitled to grow-in benefits, not retirement eligible

Normal Retirement Monthly Benefit

100 = 50 x 2 years

Solvency Liability

$$11,080.23 = 12 * 100 * 14.7 * (1.0425)^{-10} * 1.05^{-(60 - 49 - 10)}$$

Employee B

Retirement Age

52: Retirement eligible, highest liability if retires immediately

Normal Retirement Monthly Benefit

750 = 50 * 15 years

Early Retirement Monthly Benefit

$$570 = 750 * (1 - .03 * (60 - 52))$$

Solvency Liability

$$113,544.00 = 12 * 570 * 16.6$$

Employee C

Ret Age

59

Solvency Liability

$$178,704.00 = 12 * 1020 * 14.6$$

Total Solvency Liability

303,328.23

Market Value of Assets \$300,000

less Windup Expenses (\$10,000)

Solvency Assets \$290,000

Solvency Surplus / (Deficiency)

$$(\$13,328) = \text{Solvency Assets} - \text{Total Solvency Liability}$$

8. Continued

- (b) Discuss the considerations in determining the solvency incremental cost.
- The incremental cost does not reflect any possible changes in economic assumptions.
 - The actuary should consider whether new entrants should be reflected in the incremental cost.
 - The active liability at time t should reflect the pension benefits accrued at that time based on their assumed status given the going concern assumptions.
 - Ensure that the same postulated scenario and assumptions at time 0 is applied at time t .
 - Ensure that changes in discount rates are reflected for members where they become eligible for an annuity at time t .
 - Any pending amendments should be reflected.
 - Ensure that the incremental cost reflects any expected changes in benefits due to factors such as grow-in.
 - Expected return on plan assets should not be reflected.

- (c) Assume that on a going concern basis, the assumed retirement age is 55 and that there are no other pre-retirement decrements. Calculate the solvency incremental cost for 2012.

1. PV01/1/2012 (expected benefit payments during 2012 - as per going concern retirement assumption)
plus
2. Projected hypothetical wind-up / solvency liability at 1/1/2013 discounted to 1/1/2012 allowing for:
 - Expected decrements and changes in membership in 2012
 - Service accrual in 2012
 - Expected benefit changes in 2012
 - Projection of pensionable earnings to 12/31/2012less
3. Hypothetical wind-up or solvency liability at 1/1/2012

1. Monthly Interest Rate = $i(12)$
 $0.347\% = 1.0425^{(1/12)} - 1$

Expected Monthly Payments in 2012 - as per going concern retirement assumptions:

Employee A	0	Age 49 in 2012, not expected to retire until age 55
Employee B	0	Age 52 in 2012, not expected to retire until age 55
Employee C	N/A	
TOTAL	0	

8. Continued

$$PV_0(\text{expected benefit payments in 2012}) = 0 \times (1 - (1 + i(12))^{-12}) / (i(12) / (1 + i(12)))$$

2. Employee A

Age at 1/1/2013

50: Retirement eligible, highest value if retires immediately

Continuous Service at 1/1/2013

3

Normal Retirement Monthly Benefit

$$150 = 50 \times 3 \text{ years}$$

Early Retirement Monthly Benefit

$$105 = 150 \times (1 - .03 \times (60 - 50))$$

Solvency Liability 1/1/2013

$$21,420 = 12 \times 105 \times 17$$

Discounted Solvency Liability to 1/1/2012

$$20,546.76 = \text{Liability} / 1.0425$$

Employee B

Age at 1/1/2013

53: Highest value if retires immediately

Credited/Continuous Service 1/1/2013

16

Normal Retirement Monthly Benefit

$$800 = 50 \times 16 \text{ years}$$

Early Retirement Monthly Benefit

$$632 = 800 \times (1 - .03 \times (60 - 53))$$

Solvency Liability 1/1/2013

$$123,619 = 12 \times 632 \times 16.3$$

Discounted Solvency Liability to 1/1/2012

$$118,579.57 = \text{Liability} / 1.0425$$

Employee C

Ret Age

60

Solvency Liability 1/1/2013

N/A As there is no change in benefits

Discounted Solvency Liability to 1/1/2012

N/A

Total Projected hypothetical wind-up/solvency liability at 1/1/2013 discounted to 1/1/2012 = 139,126

3. Solvency Liability at 1/1/2012 = 124,624

Incremental Cost for 2012 = 14,502

9. Learning Objectives:

10. The candidate will be able to analyze the relationship of plan investments with plan design and valuations.

Learning Outcomes:

- (10c) Given a context, describe and compare the structure of appropriate investment vehicles.

Sources:

Allen, Chapter 24

R-D124-11: Introduction and Overview of Retirement Plan Investments

Commentary on Question:

This is a question requiring candidates to explain the process of selecting an investment manager, evaluate suitability of certain types of investments in pension funds, and explain the features of passive and active investments. A good candidate would be able to outline the key steps in investment manager selection, support reasons for including or excluding certain types of investments in a pension plan, and understand the similarities/differences of passive and active investments.

One of the more frequent areas for improvement from candidate responses was to provide supporting reasons for including the three types of asset classes in part (c) of the question (rather than simply listing characteristics of the asset classes).

Solution:

- (a) Recommend the process for selecting a new asset manager.

1. Perform a search for potential candidates. This can be done by staff within the plan sponsor or with assistance from a consulting firm.

Advantages to using a consultant include:

- Consultants likely have a better understanding of which firms are the best candidates to meet the plan sponsor's objectives
- More experience in the evaluation process—know the right questions to ask and not swayed by sales/marketing presentations
- Help construct the initial list of candidates

Explore other sources of information (counterparts at other companies, actuaries, attorneys, senior officers, etc.) that might be helpful

2. Send a detailed questionnaire to the selected list of potential firms. It should be designed to address key concerns and topics including:
 - Portfolio strategies and tactics
 - Ownership and employee compensation
 - Decision-making procedures

9. Continued

- List of current clients and specific people to contact for references
 - Names of accounts gained and lost in recent years
 - Historic performance of each class of assets managed
 - Explanation of how the firm's performance statistics have been computed
3. Conduct interviews
 - Decide if held at either sponsor or client location – client is usually preferable
 - Include consultant if one is used
 - Set guidelines in advance (no “canned” presentations)
 - Ask about issues such as
 - Research procedures
 - Decision-making routine
 - Strategies and tactics employed
 - Control disciplines
 - Transaction guidelines
 - Levels of salaries and other incentives for employees
 - Key personnel
 - Investment performance statistics and the degree of performance variation among accounts
 4. Final evaluation
 - Review sample portfolios of the investment firm to ensure it does what it says it does
 - Check for inconsistencies between written and oral statements
 - Condense list to small group of finalists and present to senior management
 - Management then meets with senior officers of the finalist firms
 - Management makes a decision on the firm to hire
 5. Post-selection activity
 - Review legal agreements, fees and other costs
 - Establish initiation date for performance measurement
 - Ongoing review of the investment firms – this is a continuing process
- (b) Compare and contrast passive and active management

Passive strategy is characterized by a broadly diversified buy-and-hold portfolio aimed at replicating the return on some broad market index at minimum cost.

Active strategies attempt to outperform the market either by selecting assets whose returns, on average, exceed those of the market, or by timing the movement of funds into and out of the market in an attempt to capitalize on swings in the prices of assets.

9. Continued

Proponents of passive strategy argue that as the stock market becomes increasingly efficient, it is more difficult for investment managers to consistently outperform the market.

Fees and transaction costs drive down the return on a net basis for active strategies.

Two most popular forms of passive investing:

1. Index funds - ultimate form of passive investing
 - Replicates a particular index (such as S&P 500) and designed to generate beta of 1.0
 - Based on the efficient market hypothesis (EMH)
 - Can use index as investment for core of portfolio and allow active management for rest
 - Allows managers to focus on their specialty areas
 - Can pursue higher-risk strategy in hopes of above-average returns
2. Dedication and immunization techniques
 - Dedication constructs a bond portfolio such that its cash flow can be used to fund specific plan liabilities
 - Immunization attempts to construct a portfolio of bonds whose market value equals the PV of liabilities and whose value, even if interest rates change, will always be at least as great as the value of the liabilities
 - Accomplished by using duration - sensitivity to interest rate changes
 - Requires rebalancing
 - Possible for assumptions used in model to be violated and sponsor may, therefore, experience a shortfall from this approach
 - Horizon matching - cover portion of liabilities (e.g. 1st 3-5 years) through dedicated portfolio and remainder through immunization
 - While giving up cost savings of full immunization, does mitigate effects of failing to satisfy assumptions of the immunization approach

Major disadvantage of immunization is giving up opportunity to produce additional income through active management.

- Can be partially overcome by contingent immunization
 - Adopt active management strategy until safety margin (e.g. 1 or 2 percentage points below current market rates) is exhausted, upon which the portfolio can be immunized at the minimum rate of return acceptable to plan sponsor

9. Continued

- (c) The following potential new asset classes are being considered for a pension plan's investment portfolio:
- (i) Government Bonds
 - (ii) Derivatives
 - (iii) Real Estate

Government Bonds

- Tax-free nature normally results in lower yield than corporate bonds
- Generally less risky than corporate bonds (Federal bonds have almost no default risk)
- Treasury bills, notes, and bonds
 - Bills are considered equivalent to cash since they are so liquid
 - Considered to be free of default risk since guaranteed by US government
- Pension plans will limit investments in government bonds to those that generate taxable investment income
- Hence, municipal bonds are not candidates

Recommend as appropriate or not

- Potential topics candidate may address in recommendation:
 - General risk of investment vehicle (taxability, liquidity, stability of value)
 - Plan characteristics (demographics, funded status, open/closed/frozen)
 - Investment objectives and policy (e.g. traditional, LDI, risk tolerance)
 - Fiduciary risk
 - Others?

Derivatives

- Value is derived from another asset
- Include call and put options, futures, convertible bonds, convertible preferred stock, swaps, and forwards
 - Forward
 - Drawbacks include lack of liquidity and risk of other party failing to fulfill the deal
 - Futures
 - Can be for a commodity, an interest earning asset, foreign currency, or an index such as S&P 500
 - May serve as a useful hedge against losses in the equity portfolio
 - Futures can be used to change the duration of a portfolio
 - Swap
 - Can be interest rate and currency swaps
 - Lack of regulation enables flexibility
 - Creditworthiness of counterparties is very important

9. Continued

- Call or put option
 - Option to buy or sell an asset at a specified exercise price until a specified date
 - American can be exercised at any time before expiration; European only at expiration

Recommend as appropriate or not

Potential topics candidate may address in recommendation:

- General risk of investment vehicle (taxability, liquidity, stability of value)
- Plan characteristics (demographics, funded status, open/closed/frozen)
- Investment objectives and policy (e.g. traditional, LDI, risk tolerance)
- Fiduciary risk
- Others?

Real Estate

- Can increase diversification
- Can increase return
- Can reduce overall portfolio risk
- Presents liquidity problems
- May offer inflation hedge
- REITs are companies that manage real estate and are traded on the stock exchange
- Mortgage pass-through securities represent a pool of mortgages
- Prepayment risk can be addressed by CMOs, PACs, VADMs, etc.
- Need skill in management and knowing local areas extremely well
- More difficult to obtain good, reliable data for real estate than stocks or bonds
- Includes difficulty in quantifying risk
- Property types include office space, retail, industrial, apartment, and raw land
- Segments include geographic location, population growth and density, property life cycle, tenancy type, and lease periods.
- Lack of marketability prevents most plans from investing majority of assets in real estate
- Volatility has been significantly below that of common stocks

10. Learning Objectives:

2. The candidate will be able to understand how the regulatory environment affects plan design and understand how to apply relevant restrictions.

Learning Outcomes:

- (2c) Explain and test for limits on plan designs and features that protect participant rights.

Sources:

Morneau Sobeco, Chapter 8

R-D600-10: PBA Regs 29, 31 and 32

R-D612-10: PBA Acts 68, 70, 71, 72, 73 and 74

Commentary on Question:

In this question, candidates are asked to demonstrate their understanding of the process that must be followed in Ontario (from start to finish) to wind up (“WUP”) and terminate a pension plan. Candidates were also expected to demonstrate their understanding of grow-in rights and how it applies (or doesn't apply) to various plan members. This question tests a candidate’s understanding of Ontario’s windup pension legislation

Solution:

- (a) Describe the process for winding up a registered pension plan in Ontario.

Commentary on Question:

When describing the WUP process, a well prepared candidate would identify the WUP process components identified in bold below, and would also provide some elaboration on each component.

Most candidates recognized that a WUP notice must be prepared, although very few candidates elaborated on who the notice should be provided to.

Most candidates recognized that a WUP valuation needed to be prepared and that the WUP needed to be approved by FSCO, the provincial regulator in Ontario. Most candidates provided some elaboration on what should be included in the report and the additional benefits to be provided on WUP.

The following provides a distribution of how candidates performed on various parts of the solution:

- Approximately 1/2 of the candidates identified that there would be a restriction on payments.

10. Continued

- Approximately 3/4 of candidates remembered that WUP statement and option election forms needed to be provided to plan members. A number of candidates incorrectly assumed that all members would be forced to take their value as a lump sum from the plan.
- Approximately 3/4 of candidates recognized that any remaining WUP deficit would need to be funded. Not all of these candidates demonstrated that they understood the legislative timing requirements for funding the WUP deficit.
- Approximately 1/4 of candidates remembered to identify that the filing of annual WUP update reports would be required until the WUP was complete.
- Approximately 3/4 of candidates identified that member obligations needed to be settled. Not all of these candidates indicated that they had a clear understanding of how obligations would be settled and a number of candidates assumed that all members would be required to take their benefits as lump sum payments.

Most candidates recognized that there was potential for the plan to accumulate surplus.

Very few candidates concluded the WUP process by indicating that the plan would need to be de-registered.

Declare WUP and Provide WUP Notice

A written notice must be provided in advance of the effective date of the WUP to various parties, including the pension authority, the Financial Services Commission of Ontario (“FSCO”), members (including former members or any other person with entitlements), any unions representing plan members and any plan advisory committees.

Prepare WUP Valuation and File WUP Report

The company must complete a WUP valuation and file a report with FSCO within 6 months of the WUP date. The report will be prepared by an actuary and must contain details on the benefits to be provided, the assumptions, plan assets, plan liabilities, the financial position of the plan, contribution/funding requirements and methods of allocating and distributing assets. Additional benefits to be provided on WUP (i.e. immediate vesting and grow-in considerations for members with age + service > 55 points) will also need to be considered. Approval of the WUP report by FSCO is required.

10. Continued

Restriction on payments

No benefits payments should be made to affected members until the WUP report is approved by FSCO. However, pension payments that commenced prior to the WUP notice being distributed can continue to be paid (for example, retirees not impacted by the WUP can continue to receive their pension). It is also possible to get approval from FSCO to pay out some pension benefits for affected members before fully funding (for example, if an affected member wishes to retire prior to the completion of the WUP process).

WUP Benefit Statements & WUP Option Election Forms

Members must be provided with a statement outlining their benefits and settlement options within the prescribed period of time. Members affected by the WUP are entitled to portability of their pension entitlement. Members must make an election within the prescribed time period or the member will default to an appropriate immediate or deferred pension option. The minimum commuted values provided to members are determined in accordance with the Canadian Institute of Actuaries Standards of Practice for Pension Commuted Values.

Funding of WUP Deficit

If the WUP valuation reveals a deficit, then the deficit must be funded over a period no longer than prescribed by legislation. Contributions to fund the deficit will need to be made annually in advance over a period no longer than 5 years. Following the approval of the WUP report, annuities cannot be purchased and the full value of a member's commuted value cannot be paid until the deficit is fully funded, after which a report would need to be filed to prove that there is no further amount to be funded.

WUP Report Updates

Annual WUP Update Reports will need to be filed until the plan is fully funded. These reports should be prepared by the plan actuary and filed within 6 months of each anniversary of the WUP date. The report will need to include an update on the WUP financial position, a gain and loss analysis and should detail any remaining special payment requirements for the remainder of the 5 year funding period.

Settlement of Obligations/Distribution of Assets

After the plan has been fully funded, payments will be made in accordance with member elections or deemed elections. If the plan paid out an initial lump sum to a member based on the transfer ratio of the plan, then any remaining entitlement can be paid. Annuities will be purchased for anyone with further entitlements under the plan.

10. Continued

Surplus

If there is any surplus remaining in the plan, then surplus will be distributed to members unless the plan document specifically states that any surplus would revert to the Company.

De-Registration

Within 30 days of final distribution of the assets, written notice must be provided to FSCO identifying that all assets have been distributed in order to de-register the plan.

- (b) Describe the impact that terminating membership in the plan as a result of the wind up has on the pension entitlements for the two active participants versus terminating on a voluntary basis.

Commentary on Question:

When comparing the impact that a WUP has on pension entitlements compared to a voluntary termination, a well prepared candidate must show their understanding of the additional benefits under a WUP provided for by the PBA (grow-in) and the plan terms, including the impact of amending the plan to change the post-retirement indexation provisions upon WUP.

Most candidates demonstrated their ability to determine whether a member had 55 points and was eligible for Grow-in. However not all of these candidates went as far as to demonstrate that they understood the implications of Grow-in (i.e. eligibility for early retirement subsidies). Most candidates recognized that under the WUP, the member would be eligible for the increased indexation provision. However a number of candidates mistook the original plan provision indexation to be more generous.

As NOC's Hourly plan already provides for immediate vesting, there is no impact on either active member's vesting under the plan. Both members are fully vested upon voluntary termination or termination under the WUP scenario.

Under the WUP scenario, Member A has less than 55 points and is not entitled to Grow-In (points = age + service = $40 + 1.5 = 41.5 < 55$ points). The termination and early retirement options are the same under both the voluntary termination and WUP scenario.

10. Continued

Under the WUP scenario, Member B has greater than 55 points and is entitled to Grow-in (member points = age + service = $50 + 25 = 75 > 55$ points). There will be no difference between the member's accrued benefit at age 65 under both scenarios, however the member will be entitled to active early retirement subsidies under the WUP scenario. Under the WUP scenario, the member can retire with an unreduced benefit at age 62 with 30 years of service or at an age earlier than age 62 with a benefit reduced by 0.25% per month prior to age 65. Under the voluntary termination scenario, the termination and early retirement options would be as per the plan provisions (i.e. actuarial equivalent of deferred pension).

Under the WUP scenario, both members are entitled to the guaranteed 1.25% post-retirement indexing. Under the voluntary termination scenario, both members are entitled to post-retirement indexing of the lesser of 1% and CPI each year after pension commencement.

Due to the fact that certain approval and funding needs to occur prior to paying out benefits on a WUP, if the members elected commuted values, then they would likely receive payment of their commuted value sooner (following their termination date) under the voluntarily termination scenario versus the WUP scenario.

- (c) Describe the impact of the wind up on the retired member.

Commentary on Question:

When commenting on the impact that the WUP has on a retiree, a well prepared candidate must show that they understand that the member may be offered portability, that any remaining pension entitlement for a retiree would be purchased as an annuity with an insurer and that the retiree would be impacted by the plan amendment to change the post-retirement indexation provisions upon WUP.

Most candidates recognized that the retiree would have an annuity purchased. Approximately half of the candidates recognized that NOC could choose to offer portability to retirees. A small portion of candidates incorrectly identified that the retiree would be forced to commute. Most candidates recognized that under the WUP the member would be eligible for the increased indexation provision. Similar to part (b), a few candidates were not able to demonstrate that they understood the plan's original indexation provisions.

10. Continued

Under the WUP scenario, a retiree will continue to receive their pension uninterrupted, even prior to the WUP report being approved. NOC may choose to provide the retiree with portability and provide a commutation offer. An annuity will be purchased on behalf of the retiree with an insurance company in respect of their obligation under the plan (assuming they do not commute their remaining entitlement). The member will also receive an increase in their post-retirement indexation based on the negotiated 1.25% per year. This increase will be effective from the WUP date, so the retiree may receive a lump sum retroactive payment to account for any pension payments since the WUP that did not reflect the updated indexation rate. The retiree's level of benefit security may also be increased as a result of their pension obligation being secured with an insurance company.

11. Learning Objectives:

1. The candidate will be able to analyze different types of registered/qualified defined benefit and defined contribution plans, as well as retiree health plans.
6. The candidate will be able to analyze/synthesize factors that go into selection of actuarial assumptions.

Learning Outcomes:

- (1a) Describe the structure of the following plans:
 - Fixed dollar and pay-related defined benefit plans
 - Hybrid plan designs such as, cash balance, pension equity, and floor offset plans, target benefit plans
 - Defined contribution plans including 401(k) plans and capital accumulation plans
 - Retiree Health Plans
- (6c) Evaluate appropriateness of current assumptions given the purpose.
- (6g) Recommend appropriate assumptions for a particular type of valuation (e.g., ongoing, termination, etc.) and defend the selection.

Sources:

Yamamoto, Fundamentals of Retiree Group Benefits, Chapter 4

Yamamoto, Fundamentals of Retiree Group Benefits, Chapter 9

R-D112: Selection of Actuarial Assumptions, Consultant Resource Manual

R-D125: ASOP No. 35 Selection of Demographic and other Noneconomic Assumptions for Measuring pension Obligations

R-D126: ASOP No. 27 – Selection of Economic Assumptions

R-D127: ASOP No. 6, Measuring Retiree Group Benefit Obligations

Commentary on Question:

In this question, candidates were asked to demonstrate their understanding of the design features employers are able to use to reduce company medical costs for future retirees and describe the assumptions that may be impacted by these design changes.

For part (a), a well-prepared candidate would have been able to describe the types of changes that could be made to the eligibility, benefits, cost-sharing provisions and cost management to reduce company medical costs.

For part (b), a well-prepared candidate would have been able to describe the assumptions impacted by these changes.

11. Continued

Most candidates performed well on this question. For part (b), some candidates missed commenting on the retiree contribution assumption and plan participation assumption required due to the introduction of retiree premium co-sharing.

Solution:

National Oil Company (NOC) would like to make changes to the Full-Time Salaried and Union Retiree Health Benefit Program for future retirees to reduce NOC's program costs.

- (a) Describe the plan design changes that NOC could make to meet this objective.

Introduce retiree contribution

1. Set retiree contributions as a fixed percentage of cost
2. Introduce service-related retiree contribution
 - i.e. Employer portion of plan cost varies depending on employee's service at retirement.
3. Adjust retiree contributions based on the employee's age at retirement
 - i.e. Employer would reduce the age 55 benefit by 55% or after age 65 could be rewarded with higher subsidies.
4. Setting the employer subsidy of the retiree medical plans as a fixed dollar amount
 - Fixed dollar subsidy cap per year
 - Total expenditure cap per year
 - Defined contribution cap
 - Account balance

Redefining eligibility requirements

1. Traditionally retiree group benefit plan eligibility tied directly to early retirement requirements for pension plans. More recently employers are requiring person to be at least age 60 with 15 years of service versus simply meeting pension eligibility.
2. Some employers have allowed low-service retirees to enroll in their group benefit plans but with no company subsidy

Reduce Benefits Level

1. Add coinsurance and/or deductible, annual or lifetime plan maximums
2. Terminate coverage at specified age (i.e. age 65 when government benefits commence)
3. Reduce or eliminate survivor coverage
4. Medicare Coordination

11. Continued

Introduce Provision to Managed/Reduce Health Cost

1. Managed Care Program
 - Reduce costs through provider discounts and better management of care (negotiated reimbursement rates, reduced administrative fees, real-time eligibility information, utilization review, mail-order plan).
2. Large Case Management
 - Minority of retirees generate majority of the program costs. Managing these cases could mean potential savings.
3. Utilization Review
 - Designed to evaluate appropriateness of medical treatment before it is provided.
4. Spousal Initiatives
 - Encourages spouses to accept their own plans (i.e. surcharge if spouse has other available coverage, pay bonus for signing a spouse under the spouse's plan, make the spouse ineligible if other coverage is available).
5. Dynamic Provisions
 - Retiree plans should be changed periodically to reflect more dynamic plan provisions. Fixed dollar plan deductibles, out-of-pocket maximums and other copays, contribute to annual cost increases.

Other Plan Design Strategies

1. Lower copays for generics with coinsurance for brand name drugs. Add coinsurance for former blockbuster drugs that lose their patent as price variability of the generics will increase.
2. For certain therapeutic classes, plan could pay at a defined maximum level. The maximum allowable charge (MAC) could be set at a given "percentile" of a range of available drugs dispensed.
3. Enhanced Quality - centers of excellence, health care coalitions, outcome monitoring and retiree education programs.
4. Consumer Awareness Initiatives - deliver to retirees enough information to make health care decisions on basis of cost and quality of care.
5. Decision Making Tools - Employers provide retirees with various tools to help them make the right decision in the choice of a health care plan, maintain appropriate healthy lifestyles and select appropriate physician.

- (b) Describe the impact the plan design changes in (a) could have on each of the valuation assumptions.

Health Care Trend Rate

- Expect the future trend to decrease from managed/reduced cost
- Expect the future trend to decrease if introducing reduced benefit such as deductibles, coinsurance, lifetime and other maximum dollar
- Consider plan design change impact on future claim costs

11. Continued

- Consider anti-selection effect on future claim cost increases
 - When retiree group benefit plan requires contribution as condition of continued participation, those choosing to participate may have a higher average benefit cost than those not participating
 - If assume reduction in percentage participating, then should also assume an upward adjustment for adverse selection in per capita health care rates

Retiree Contribution

- Need starting (current) contribution level plus assumption regarding how they increase
- Generally, a plan sponsor policy of increasing these retiree contributions/plan design dictates how this increases

Plan Participation

- Due to the introduction of retiree contributions, not all retirees will elect coverage
- Separate assumption of retiree versus dependent coverage may be appropriate, especially if there are different employer subsidy levels
- In general, more retirees required to contribute, less likely they are to participate in plan

Retirement & Termination Rates

- The termination assumption is for current employees who are expected to leave their employer before retirement age and the retirement assumption is to specify the expected ages that current employees will retire
- Depending on value perceived by employee, change in plan may impact decision to leave company before becoming eligible to receive benefits or wait to retire

Discount Rates

- The discount rate used for accounting purposes may change if the expected future cash flows change significantly

12. Learning Objectives:

4. The candidate will understand alternative plan types that occur internationally.
9. The candidate will be able to understand principles and rationale behind regulation. Material on U.S. and Canada.

Learning Outcomes:

- 4b. Give examples of the structure of different plan types.
- 9a. Describe the principles and motivations behind tax policy.

Sources:

GAO Study Note – Private Pensions – Alternative Approaches Could Address Retirement Risks Faced By Workers but Pose Trade-Offs

R-D108-07

Turner – Pension Policy – Chapter 5

Commentary on Question:

In this question, candidates were asked to demonstrate their knowledge of current issues with employees accumulating adequate retirement benefits. A well prepared candidate would have identified the issues faced by various types of employees in various types of pension plans in accumulating adequate income. The candidate will be able to identify various methods other countries have used to address the adequacy of retirement income and comment on their applicability to the case study pension plans.

In general, points were missed by not discussing tax policies in their answer

Solution:

- (a) Describe the issues that both the NOC Full-Time Salaried Pension Plan participants and Part-Time DC Pension Plan participants face in accumulating and preserving pension benefits.

Commentary on Question:

Most people received points for mentioning post-retirement inflation, investment and longevity risks. Major missed points were 1) part-time employees tend to have lower coverage during career and 2) analysis that DC contributions may not be enough especially if employees did not make required contributions to get the matching contributions

Full-Time participants:

- NOC could potentially reduce future benefits
- Final Average Pay plan protects against erosion of benefits while employed
 - But FAP does not grow after termination leading to erosion of benefits

12. Continued

- Participants do face inflation risk since post-retirement benefits are not indexed
- Benefits are taxed at regular marginal rates upon retirement

Part-Time participants:

- PT workers tend to have lower retirement coverage throughout their career
- Current DC formula may not be sufficient to provide adequate retirement income
- Participants do not have investment choices, but still bear investment risks
- Administrative fees may be borne by DC participants which will erode investment earnings
- Participants face longevity risk
- Benefits accumulate tax free

- (b) Describe the alternative approaches private pension systems in other countries have used to address the issues raised in (a). References to specific countries are not required.

Commentary on Question:

To receive credit, we were looking for general ideas of how to increase retirement adequacy. Some individuals were giving details of other country's pension systems which was not necessarily the correct answer. Most points were earned for mandatory pension coverage.

- Mandate retirement coverage
 - Provide pension coverage for workers over a minimum income threshold
 - Provide automatic enrollment into the pension system
- Pool private pension assets
- Adjust worker's DB benefits by investment gains
- Can guarantee a minimum rate of return on accrued benefits
- Portability:
 - Old DB accrued benefits can be used to buy pension credits
 - Personal accounts can be kept in single account during entire career
- Limited lump sum payments
- Minimum conversion rates to calculate annuity benefits from lump sum
- Adjust annuity benefits by inflation
- Increase tax incentives
 - US and Canada provide incentives through tax incentives for contributions and retirement
 - Could offer additional tax credits on contributions
 - Also could reduce taxation of retirement income during retirement

12. Continued

- (c) Discuss the feasibility of using the alternatives in (b) to address the issues in the NOC pension plans described in (a).

Commentary on Question:

Some individuals just stated that the alternatives listed in part (b) were not permissible. You can first assume that law can be changed and then elaborate on consequences of the alternatives.

- If the US/Canada implemented mandatory pension coverage, this would put roadblock to freezing the plan
- Indexation for vested terminated employees may be possible with salaried final average pay plan
 - However, would raise costs
- Indexation for retirees could be provided in the DB plan
 - Could be payable out of excess investment returns for DB plan
- Can look at restricting lump sum amounts in the salaried and union plans
 - This would prevent leakage of participant's benefits
- Could try system of pension credit purchases
 - Determination of basis of actuarial equivalence to use is subjective
- If the US/Canada mandated coverage, it might mandate a certain level of contributions
 - This would help part-time employees if contribution level was higher than current benefit
 - Would cost more for NOC
- Changes to the tax incentives would require government actions.

13. Learning Objectives:

5. The candidate will be able to apply/synthesize the various methods used to value a pension plan or retiree health plan for various purposes.

Learning Outcomes:

- (5b) Perform periodic valuations of ongoing plans, calculating normal cost and actuarial liability, using the variety of cost methods for budgeting, funding accounting and measuring economic value.
- (5c) Analyze and communicate the pattern of cost recognition that arises under a variety of funding and asset valuation methods.

Sources:

Pension Mathematics for Actuaries, Anderson, Third Edition, 2006, Ch. 2

Commentary on Question:

A well prepared candidate will be able to calculate unfunded accrued liability using the Entry Age Normal cost method. They will also be able to analyze gains and losses arising under this cost method.

This question was very well done. Most candidates correctly calculated the unfunded liability and normal cost in part (a) (both the retrospective and prospective methods were accepted). However, some candidates missed the 98% optional form adjustment. In part (b) most candidates correctly calculated the investment gain but missed the contribution gain. The retirement gain was generally calculated appropriately.

Solution:

- (a) Calculate the unfunded accrued liability and normal cost of the plan at January 1, 2012.

Commentary on Question:

Both the retrospective and prospective methods were accepted for this question as they produce the same answer. This sample solution uses the retrospective method.

$$\text{EAN AL} = \text{PVFB} - \text{PVFNC}$$

$$\text{where EAN NC} = \text{PVFB}_w / \text{PVFY}_w = \text{PVFB}_w / \ddot{a}_{(y-w)} \rfloor$$

$$\begin{aligned} \text{PVFB}_w &= 100 \times 12 \times (60-33) \times \ddot{a}_{60}^{(12)} \times v^{27} \times \text{ERF} \\ &= 100 \times 12 \times 27 \times 12.2 \times .2074 \times (1-0.03 \times 5) = 69,673 \end{aligned}$$

$$\text{PVFY}_w = \ddot{a}_{27} \rfloor = (1 - v^{27}) / (1 - v) = 14.003$$

$$\text{NC} = 69,673 / 14.003 = 4,976$$

$$\text{PVFB}_{2012} = 69,673 \times 1.06^{24} = 282,101$$

$$\text{PVFNC}_{2012} = 4,976 \times a_{3} \rfloor = 14,099$$

13. Continued

$$AL_{2012} = 282,101 - 14,099 = 268,002$$

$$UAL_{2012} = AL - F = 268,002 - 250,000 = 18,002$$

- (b) Calculate the gains and losses by source for 2012.

Commentary on Question:

Most candidates forgot the gain on contribution in their calculations.

Gain on Contribution:

$$\text{Gain} = \text{Act'l} - \text{Exp'd (w/int)}$$

$$\text{Gain} = (10,000 - 4,976) \times 1.06 = 5,325$$

Gain on fund return:

$$\text{Gain} = \text{Act } F_{2013} - \text{Exp'd } F_{2013}$$

$$\text{Exp'd } F_{2013} = (250,000 + 10,000) \times 1.06 = 275,600$$

$$\text{Actual } F_{2013} = (250,000 + 10,000) \times 1.1 = 286,000$$

$$\text{Gain} = 286,000 - 275,600 = 10,400$$

Gain on retirement:

$$\text{Gain} = \text{Exp'd } AL_{2012} - \text{Act'l } AL_{2012}$$

$$\text{Act'l } AL_{2013} = B_{58} \times \ddot{a}_{58}^{(12)}_{15}$$

$$\text{, where } B_{58} = 100 \times 25 \times 12 \times 0.98 \times (1 - 0.03 (65 - 58))$$

$$\text{Act'l } AL_{2013} = 100 \times 25 \times 12 \times 0.98 \times (1 - 0.03 (65 - 58)) \times 13.2$$

$$\text{Act } AL_{2013} = 306,583$$

$$\text{Exp'd } AL_{2012} = (268,002 + 4,976) \times 1.06 = 289,357$$

$$\text{Gain} = 289,357 - 306,583 = -17,226$$