

8R -- Solution #1

- (a)
1. Purpose
 - Goal of “statement.” What we try to establish in this policy and an overview.
 - DB and DC plans clearly have different purposes.
 - Conflict between salaried and union plans in terms of philosophy.
 2. Plan Overview
 - Description of plans and benefits offered.
 - Impact that the type of plan can have on the investments to make.
 - In our case, the DC can have very different objectives than the DBs. The fact that employees are seasonal can affect the risk to take.
 - The indexation of the “hourly” plan and its “flat benefit” must also be considered.
 - Must take into account the demographics of the populations.
 3. Governance
 - Who makes the decisions?
 - Decision-making structure particular to the company
 - Common management?
 4. Investment Beliefs
 - What kind of investments do we want? There could be a conflict of interests here, depending on the average age of the actives, the allocation between actives/inactives, and the different needs of each plan.
 5. Investment Objectives
 - Maximize return, stable return, real return important.
 6. Asset Mix
 - Most important part. Explains 90% of returns. Allocation between stocks, fixed investment, cash ...
 7. Rebalancing
 - The less we believe in market timing, the more we need to rebalance. Depends also on whether we use specialists or “balanced fund managers.” In the case of specialists who manage one field, the rules must be very clear.
 8. Management Structure
 - Use of “specialist managers” or “balanced fund managers.” How are the responsibilities allocated?
 9. Manager Objectives
 - The basis that will be used to evaluate the “managers” – must have long-term objectives but with short-term means to evaluate performance.

8R – Solution 1 (Continued)

10. Maximum Investment in Each Class
 - Maximum percentage in one type of security
 - Percentage maximum in one industry
 - Percentage maximum possessed in one company
11. Conflict of Interests
 - Measures to solve conflicts
12. Investment Lending
 - Possibility that the fund makes loans
 - Establish the guarantees to have, the maximum, and the period.
13. Voting Rights
 - Generally the managers exercise them on their own by respecting the objectives of the employer.
14. Derivatives
 - Can we use them? For what purpose?
 - Purpose can be to do some “hedging.”
15. Valuation
 - Must evaluate investment at a frequency no less than once a year (e.g., real estate).
16. Policy Review
 - Should be reviewed at least annually to take into account change in circumstances.
17. Soft Dollar Costs

- (b) The guidelines must depend on:
- Type of plan
 - Demographics of the population
 - Investment objectives
 - The “business” of the employer (cyclical ...)
 - Possibility to terminate the plans
 - “Funded status” of the DBs.

As the DBs have a relatively young population (low average age, actives/inactives allocation), we are not yet at a maturity phase as the employer contributions usually exceed the benefit payments. We can, hence, have a proportion of stocks quite high.

8R – Solution #1 (Continued)

(b) (Continued)

We must take into account the “hourly” plan which has a low indexation (besides 1% of CPI) and a flat pension. This means that a higher real return could allow frequent improvements.

Current asset mix – large differences:

- 70% equities – salaried plan
- 53% equities – hourly plan
- 100% GIC – DC plan

Cash not typically part of asset mix; residual asset class.

GIC component for DC plans:

- Primarily for individual choices
- Not appropriate for segregated fund.

However, since it is a cyclical company, the employer could want to minimize volatility of return in order not to have to contribute more in a bad year. This would mean being more conservative. However, the fund must be managed “for the exclusive benefits of employees.”

For the DC, we could want a stable return, as the return seems important and we don't very likely aim at the long term. This would mean negative returns could be viewed negatively. Requires safer investments. Plan membership is young ⇒ more aggressive asset mix possible.

We could also want to immunize the liability of the retirees (e.g., with “horizon matching”).

A usual allocation of 60% equity/40% bonds for DB plans seems acceptable (with a cash portion of about 3% in the bonds for the annual payments and about 3% to 5% real estate for the real return).

Overall, risk characteristics should lead to fund with medium risk.

Typical asset allocation for DC plans – 65% equity, 10% fixed income, 15% GIC, 10% cash.

8R – Solution #1 (Continued)

- (c) The DC has different objectives than the two DBs. The employees in the DC do not seem to have a horizon as long as that of the DBs. Also, they are not necessarily capable of supporting the same risks as the employer. We could suggest a master trust for the two DBs (would have the advantage of reducing the administrative fees) and separate for the DC. We could then decide that the employer would let the employees assume the management of their investments (“relief of responsibility for employer” and more adequate investments for the employees according to their risk tolerance). If he wants to continue to manage the investments of the DC (because paternalistic or for administrative capabilities), could have a balanced fund with different objectives than the DBs.

Factors to consider in setting investment objectives for DB assets:

- Characteristics of the plan sponsor and industry
- Demographics of work force and plan maturity
- Possibility of plan termination.

Analysis of two DB plans:

- Company and industry characteristics the same
- Demographics of both plans similar
- Risk of plan termination small for both plans \Rightarrow similar investment objectives and asset allocations appropriate for the DB plans.

Both DB plans noncontributory and the employer bears investment risk \Rightarrow pooling of assets appears appropriate.

DC plan:

- Individual investment choice often given in DC plan
- Not available if all assets co-mingled.

Member circumstances, risk tolerances vary greatly and each member would likely have a different investment objective. Many members would prefer to have their account balance invested in GICs. Not possible under a seg fund approach.

8R -- Solution #2

(a) Asset allocation is important – affects volatility/risk of getting expected returns.

- Current allocation is 70% equities/30% fixed income, etc. ⇒ this can give high expected returns, but also with high expected volatility.
- 75% of the PBO liability is attributable to retired employees. This liability, while susceptible to interest rate risk (fluctuations) is quite predictable and has the characteristics similar to bonds.
- NOC could reduce the volatility of expense by investing more in fixed incomes – specifically bonds that have similar characteristics to the retiree’s liability. This can be done through either (a) duration matching, or (b) cash-flow matching.
- While giving up future expected returns, this should reduce volatility. In an case, the plan has a significant surplus so can afford to give up future expected return for less volatility.

(b)

- In anticipation of buying annuities for inactives, I would recommend reducing risk and increasing liquidity in the current portfolio. This can be done through reducing equity allocation, increasing bond allocation, especially looking at bonds with similar duration or similar payment schedules to the inactive liability (see point (a) above).
- Company should investigate current annuity market to see what anticipated costs of “annuitizing” will be. If current market is found to be attractive, may want to “lock-in” current rates through implementing a immunization or hedging strategy. While this has risk, if rates get better (i.e., interest rates increase), it may save company if rates go the other way.
- ⇒ In general, need to reduce risk and try to move out of illiquid assets. Don’t want to be liquidating equities during a market downturn to buy annuities.

After purchase:

- Retirees annuitized
- Cash flow needs lower
- Duration higher
- All actives (inflation-sensitive liabilities)
- ∴ increase equities, higher risk acceptable.

8R Solution #2 (Continued)

(c)

- Purchasing annuities will have the effect on balance sheet under accounting rules (IAS 19 used by NOC).
- Currently NOC has an “asset” on their balance sheet due to the pension plan. As the cost of purchasing annuities will be more than the liability that NOC is currently carrying for inactives, this will cause a change in the balance sheet asset.
- Settlement accounting requires adjusting unrecognized gain/loss for difference between liability held and cost of annuities and an adjustment to any unrecognized gains/losses in proportion to the amount of liability settled.
- No curtailment since future service unaffected.

(d)

Amounts shown in Millions

	Before <u>Dec. 31, 2004</u>	Settlement <u>Remeasurement</u>	One Time Effect of <u>Settlement</u>	After <u>Settlement</u>
Act-PBO	(90)	(90)	0	(90)
Ret-PBO	<u>(270)</u>	<u>(290)*</u>	<u>290</u>	<u>0</u>
Total – PBO	(360)	(380)	290	(90)
Assets	<u>480</u>	<u>480</u>	<u>(290)</u>	<u>190</u>
F.S.	120	100	0	100
Unrec. PSC	30	30	0	30†
Unrec. (gain/loss)	<u>(90)</u>	<u>(70)</u>	<u>53.4</u>	<u>(16.6)</u>
Proposed/(Accd)	60	60	53.4	113.4

*No impact on expenses.

†IAS normally requires recognition of PSCs, but all unrecognized PSCs are for active, nonvested members.

∴ no impact in this case.

8R – Solution #2 (Continued)

(d) Continued

Impact on Annual Expense After Settlement

	<u>“Before” Expected</u>		<u>After</u>
Svc Cost		SC	SC
Int. Cost		28.8	7.2
Exp. ROA		(38.4)	(15.2)
Amort.			
PSC		15	15
(Gain)/Loss		<u>(4.2)**</u>	<u>0</u>
Total NPPC		SC+1.2‡	SC+7

** $(90 - 10\% \max(480,360))/10$

‡ $\Delta = 5.8$ million increase in expenses offset by settlement gain of 53.4 million. Net is \$47.6 million income for 2005.

8R -- Solution #3

(a) To evaluate SERP plan you must consider:

- Adequacy
- Competitiveness
- Cost

In order to attract/retain executives, may be more than just a tax “top-up” or “restoration.”

With this typical plan, consider:

- No security due to lack of funding
- No bonus coverage or incentive pay
- No additional accrual for mid-career hires
- Lack of ancillary benefits.

(b) Current (pre-change) tax policy supports pay-as-you-go funding.

- Change in policy allows investment income to accrue tax-free, which will reduce long-term cost (due to tax-free accumulation of investment returns).
- Similar to ERP, except deduction of contributions
- Must balance increased security with cost of providing the security
 - Company’s internal rate of return could be higher
 - For example, 10% post-law-change is equal to $10/0.6 = 16.67\%$ pre-law change.
- Potential problem of prefunding. Who owns the surplus?

Recommend advance or career funding.

- Stable funding pattern and orderly accumulation of funds
- Possibly same funding policy as ERP for consistency and ease of valuation
- Gives best match over working lifetime of contributions and expenses ⇒ provides least balance sheet impact.
- Flexibility to contribute more or less as business conditions warrant.

(c) Current effect on:

1. Balance sheet – Reduces accrued liability since contributions offset the accrued liability.
 2. Pension expense will decrease with return on assets.
- Funding does not affect PBO
 - In comparison to PAYGO or terminal funding:
 - Balance sheet accrual is lowest over time.
 - Expense is lowest over career and matches with contributions.
 - National Oil seeks stability of cash/expense.

8R -- Solution #4

- (a) HoldCo and NOC should define accrued benefits, future benefits, assets to be transferred, surplus entitlement. Determine actuarial assumptions and methods for figuring amount of asset transfer.

HoldCo can windup salaried plan and transfer assets to DC plan.

- Complex to do
- How to determine benefits to transfer:
 - Just accrued benefits
 - Value salary increases and early-retirement subsidies
- Employee dissatisfaction
- Investment risk borne by employees.

HoldCo maintain two plans for future:

- Dual administration
- Different benefits for employees working side-by-side.

Keep accrued benefits in old plan while new benefits accrue in DC plan.

- How to define "accrued benefits."

Global can keep old plan with future service covered under HoldCo plan.

- Coordinate administrations: Complex
- Employees lose future salary increases on old service.

- (b) Salaries: Take into account:

- Compensation philosophy
- Compensation volatility
- Competitiveness factors
- If termination is expected

Can use building block approach

Should use select and ultimate salary scale

Note gains in 1997 and 1999

Vary by age?

Mortality:

- Table popular, but outdated
- Move to UP94
- Consider generational
- Increase liabilities now, decrease losses in future

8R -- Solution #4 (Continued)

(b) (Continued)

Retirement Age:

- Early retirement highly subsidized
- Losses: Age 62 too high
- Use retirement rates, after doing study

CPI:

- Important part of “building block” for salary and interest assumptions

Interest:

- Same assumption used as for hourly plan, but “real returns” greater with equity allocation.
- Consistent with building block approach, inflation and salary scale assumptions.
- Large gains recently.
- Are there margins or provisions for adverse deviation?

Asset Valuation Method:

- Could consider market-related value (“smoothing”) because of strong return volatility.

Turnover:

- Assumption seems outdated as data from 1986-1988. New table should consider:
 - Service
 - Age
 - Sex
 - Economic conditions
 - Growth rate of workforce
 - Amendment of plan
 - Changing business of employer (e.g., downsizing, spin-offs)

Actuarial cost method seems appropriate.

Percentage married – seems reasonable, but should use data for employer.

General:

- Purpose of valuation
- Relationship among assumptions
- Plan design

8R – Solution #4 (Continued)

(c) Risks to HoldCo:

(i)

- Undervaluing liability – should ensure that future salary increases assumed in determining the liability.
- Global might want to receive a refund of surplus from the plan by reducing the asset transfer amount or negotiating an increase in purchase price.
- HoldCo should insist on PBO being transferred.
- Alternatively, HoldCo might want to renegotiate the purchase price.

(ii)

- HoldCo will be forced to increase funding contributions, since asset transfer will eliminate funding surplus.

(iii)

- Valuation methods and basis may be different between Global and HoldCo.
- HoldCo's assumption might be more conservative – subject to negotiation between two parties

(iv)

- Make sure HoldCo understands the liabilities it is assuming.
- Documented or not.

8R -- Solution #5

As the actuary of the NOC salary plan, must balance between client pressures and professional duties.

The contribution requirement is based on the liabilities and assets measured in the actuarial valuation. The actuarial valuation assumptions must be within best-estimate ranges that maintain individual and aggregate appropriateness. For example, to increase the contribution requirement, could reduce the interest assumption to the lower end of the best-estimate range and increase the salary assumption to the upper end of the best-estimate range. Since asset returns have been favorable in the last two years, could change the method and smooth the gains over an averaging period.

Ultimately, if these changes that fall within appropriate ranges can't achieve the client's goal, will need to inform the client that the \$25 million contribution is unattainable.

Plan members may regard contributions as deferred wages and require improved plan provisions. Union may question these costs. Benefit security is enhanced.

Shareholders would see lower future contribution requirements. Could be more profitable to invest these funds in NOC operations. Increases exposure to tax penalties.

Taxpayers would suffer loss of revenue on future investment income. The need for social security benefits would be reduced.

8R -- Solution #6

(a) Advantages:

- Supports concept of employee empowerment
- Avoids winners and losers
- Positive publicity
- Avoids sticky transition issues
- Defined-benefit beneficial to long-term employees
- Defined-benefit protects mid-career employees
- Defined-contribution beneficial to younger employees

Disadvantages:

- Flexibility passes to employee
- Under PUC, NC increases with age
- Older employee will take defined benefit
- Younger employee will take defined contribution
- Administration of two plans
- Per capita costs of defined plan will increase
- Communication to employee
- Employee may not be sophisticated enough to understand choice
- May be difficult to later amend plan
- Removal of golden handcuffs
- More complicated work force management plan

(b)

- Under PUC, $NC = PV(\Delta AB)$ with projected salary
- PUC spreads the projected benefit across career
- PUC increases as percentage of pay as employee age
- As spread between discount rate and salary scale increases, spread between NC at younger and older ages.
- NC under PUC is level if new entrants continue to enter
- Cost in DB increase if participation is frozen
- True cost of plan, use EAN
- Younger employees cost less than 8%.
- In DC plan, younger employees cost 8%.
- Older employees in DB cost more than 8%.
- Proposed plan will cost more.
- Younger employees accrue benefits slowly in DB.
- Younger employees accrue benefits more quickly in DC.
- Defined contribution does not provide early retirement subsidies.
- Under DB, benefits are guaranteed.
- DC passes investment risk to employees
- DC will not provide same amount of benefits to each employee.

8R – Solution #6 (Continued)

(c) The assumption regarding who selects which option will be key along with choices of new hires, if they have the DB choice.

- Current DB: First consider scope. In this case, we are concerned with plan design changes more so than funding policy, cost method, or investment policy.

Collect Data: It is important that good information regarding turnover, retirement, salary scale, optional forms (if subsidized), possible disabilities, rate of return, etc., be gathered.

Based on data and usual assumptions, benefit payments and liabilities should be projected deterministically.

These should be combined at each year-end with the projected assets for the expense valuation.

The deterministic results should show trends in cost, benefit payments, etc., and reflect gains or losses to the extreme. They are assumed to occur other than identically to valuation assumptions. At this point, further revisions, including stochastic projections, may be assumed and studied.

- Assumptions: Numerous assumptions and more current/real than val assumptions are needed for stochastic projections.

ROR, standard deviation, and COV for each asset class and relative to inflation, salary scale, inflation. Often demographic assumptions are deterministic for simplicity. May miss out layoffs in recession, etc.

Stochastic projection requires integrating assets and liabilities (i.e., salary scale and investment ROR change with inflation). The assets and liabilities are again combined at the end of each year for a valuation.

The results should be ranked and percentiled. Presentation is key due to so much information and graphical methods are useful. Using contribution as a percentage of payroll, for example, may be more useful as absolute cost 10 years from now may seem distorted. The presentation should include the desired scope, summary, etc.

The difference when DC is included is largely in the percentage and which employees select a change. If all go DC, it becomes first salary scale. If only some do, great consideration should be made to consider separate turnover assumptions for DB vs. DC.

8R – Solution #6 (Continued)

(c) (Continued)

Choosing Assumptions:

- Projection assumptions are realistic – move data from year to year.
- Valuation assumptions used to value at snapshot date based on long-term expectations.
- For simplicity, demographic can be same for projection and valuation – but important that turnover and retirement reflect select and ultimate rates.
- Assumption for increases in government limits.
- Salary scale using age and building block (merit, productivity, and inflation).

Data:

- Collect required data adhering to ASOP 23.
- Need new entrant assumption.

Taking into account choice:

- Maximum cost could be modelled using DB plan as a floor.
- Older employees take DB.
- Younger employees take DB.

And finally, check results and communicate to client.

(d) Communication is very important. Must show them how to use assumptions:

- Salary increase
- Investment return
- Inflation
- Number of years of service until retirement.

Must explain to them how DB plan works:

- Plan provision
- How to do an projection
- How to convert the DC to get a pension or how to convert a DB to a DC account.

Must make them aware of various legislation that could interfere in their projection:

- Maximum employee contribution tax deductible.
- Maximum pension under a DB.

Must explain to them:

- The importance of early retirement provisions.
- The advantages/disadvantages of a DB vs. a DC.

8R – Solution #6 (Continued)

(d) (Continued)

Defined-Benefit:

- Low accrual when young but larger after.
- Investment selection is with employer.
- Early retirement indexation protection of a FAE, DB plan
- Generosity of a FAE, DB plan (especially at 2%)
- Vesting rule under DB vs. DC.
- Unreduced at any age if 35 years of service
- Expense paid by employer
- No post-retirement indexation.

Defined-Contribution:

- Investment risk is with employee
- Must show them the various risks of the investment funds if employee can direct the employer contribution
- No pre-retirement indexation
- No post-retirement indexation
- Interest rate risk if buying an annuity
- Might pay for investment expense and administrative expense.

Must explain to them all the investment funds:

- Various risk
- Frequency of transaction
- Past performance compared to level of risk
- Probably need to produce comparison statements to all employees as they are not able to do it themselves.
- Can provide them with personal counseling to make the right choice.
- Want to do it right the first time to avoid complaints after
- Benefit booklet should be produced.
- Presentation should be done.
- Focus group could be arranged.
- They need to know everything about the old and the new plan.

DB plan description should identify forms of payment.

Full description of DC plan including:

- Formula
- Basis for determining contribution
- Method of paying out for retirement, death, disability, etc.

8R – Solution #6 (Continued)

(d) (Continued)

Projections should show comparisons based on:

- Annuity and lump-sum basis
- Pre-retirement ages (every five years)
- All retirement ages.

Encourage employees to consider their future plans.

8R -- Solution #7

- (a) Assess the appropriateness of NOC's adequacy target

In determining the appropriateness of any adequacy target, one could look at numerous definitions of adequacy. In all cases, the goal is to provide a stream of income to maintain "acceptable" living standards in retirement.

Two acceptable methods are

- A minimum absolute level of income
- Maintenance of pre-retirement living standards

In determining the minimum absolute level of income, you should look at absolute levels of income required to provide for minimal levels of need. The absolute level of income could be compared to

- A poverty threshold.
- A consumption-based standard

This method is not very useful for middle and high income individuals.

Maintenance of Pre-Retirement Living Standards

In the maintenance of pre-retirement living standards method, you want to look at level of income required to maintain pre-retirement standard of living during retirement. The levels should look at spendable pension vs. pre-retirement spendable wages.

Spendable pension could be equal to the company pension plan benefits plus social security benefits plus income derived from personal savings less income tax.

Spendable wages may equal gross wages less income tax and deduction for social security and private employer pension plans.

You need to take into account the difference in tax rates, which are typically lower after retirement.

As you compare pre- and post-retirement "spendable" income, keep in mind that an individual does not typically need the same amounts pre- and post-retirement. This is because the expenses before and after retirement are different. Expenses vary between work-related expenses (such as transportation expenses, clothing expenditures, meal cost) and net change in age-related expenses. Work-related expenses are eliminated after retirement vs. age-related expenses tend to change after or near retirement. For instance, the mortgage tends to be paid-off, individuals might no longer save for retirement, and education expenses and other child-related expenses probably have ceased. Other expenses, such as medical expenditures tend to be higher in retirement.

8R – Solution #7 (Continued)

The Mercer Handbook states that replacement ratio of 60-70% of pre-retirement income needed to enjoy same standard of living.

Comparison to Competitors

Another measure NOC might want to use to assess their adequacy target is how it compares to competitors and their plans.

Factors Affecting Replacement Ratio Adequacy

The overall replacement ratio needed can increase or decrease, due to various factors.

- Retirement age – the earlier an individual retires, the less favorable the replacement ratio
- Earnings level – The replacement ratios drop as earnings increase since the social security benefit provides a higher replacement ratio for lower paid employees
- Return on plan assets – The higher the return on the assets in the defined contribution plan and the PPA, the higher the replacement ratio
- Pension plan benefit formula – the more generous the plan, the less savings required to meet target
- Retiree health benefits – The presence or lack of retiree health benefits will affect replacement ratios
- Marital status – Presence of spouse social security benefits and other retirement sources could lower replacement ratio goal compared to a single individual.

Analysis of NOC Specific Model

- NOC does not identify absolute minimum income target (i.e. minimum dollar amount)
- NOC assumption may be that employer provided pension in combination with social security will at least provide for minimal levels of need
- We do not have information on benefits provided by NOC's competitors so adequacy relative to competitors cannot be assessed
- NOC definition does not account for personal savings - PPA contributions are not used to reduce pre-retirement income and pension derived from PPA is not included in numerator
- Income tax is included in definition both pre and post retirement but in Belair the tax rate is level at 40% so tax could have been excluded from definition
- NOC does not identify the age at which the 70% target is to be achieved - may be difficult to achieve if workers tend to retire early
- NOC pension plans are quite generous so we would expect high replacement ratios
- NOC provides retiree health benefits - would want higher replacement percentage if employees had to provide own health benefits

8R – Solution #7 (Continued)

- Use of 70% rather than 100% replacement target seems reasonable since consumption and savings aren't included in denominator
- National Oil target is reasonable if the sum of pre-retirement savings and the decrease in consumption expenditures pre and post retirement are approximately 30% of gross income.

(b) Evaluate Employee A's retirement income benefits relative to NOC's adequacy target.

- We are not told that Assume Employee A is in the SERP, so I will assume not.

Pre-retirement Earnings

- Employee A's pre-retirement gross income - \$180,000
- Employee A makes social security contributions of $4\% \times \$50,000 = \$2,000$ and it is tax-deductible
- Employee A makes PPA contribution of minimum of $(\$20,000, 7\% \times \$180,000) = \$12,600$ and it is tax-deductible
- Tax on pre-retirement income is 40% of $(\$180,000 - \$2,000 - \$12,600) = \$66,160$
- So pre-retirement net income is $\$180,000 - \$66,160 = \$113,840$

Company Pension and Social Security (Post-retirement earnings)

- NOC Pension equals minimum $(2\% \times \$170,000, \$3,000) \times 35 \text{ years} = \$105,000$
- Social security pension equals $0.5\% \times \$50,000 \times 35 \text{ years} = \$8,750$
- Tax on post-retirement income is $40\% \times (\$105,000 + \$8,750) = \$45,500$
- Post-retirement net income is $\$105,000 + \$8,750 - \$45,500 = \$68,250$

NOC Replacement ratio for Employee A is $\$68,250/\$113,840 = 60\%$.

This does not meet the NOC adequacy target of 70%.

However, Employee A has a PPA that is not included in NOC adequacy target.

If PPA $(\$540,000/9.0=\$60,000 \text{ annuity value})$ is included, then:

- The pre-retirement net income is then still \$113,840
- The post-retirement net income is $\$105,000 + \$8,750 + \$60,000 - 40\% \times (\$105,000 + \$8,750 + \$60,000) = \$104,250$
- The replacement ratio is $\$104,250/\$113,840 = 92\%$.

8R – Solution #7 (Continued)

- (c) Comment on the adequacy of retirement benefits for Employee B relative to Employee A.

Employee B's replacement ratio is as follows:

Pre-Retirement Earnings

- Employee B's pre-retirement gross income - \$40,000
- Employee B makes social security contributions of $4\% \times \$40,000 = \$1,600$ and it is tax-deductible
- Employee B does not make PPA contributions
- Tax on pre-retirement income is 40% of $(\$40,000 - \$1,600) = \$15,360$
- So pre-retirement net income is $\$40,000 - \$15,360 = \$24,640$

Company Pension and Social Security (Post-retirement earnings)

- NOC DC Pension as equivalent annuity equals $\$100,000/9.0 = \$11,111$
- Social security pension equals $0.5\% \times \$38,000 \times 35 \text{ years} = \$6,650$
- Tax on post-retirement income is $40\% \times (\$11,111 + \$6,650) = \$7,104$
- Post-retirement net income is $\$11,111 + \$6,650 - \$7,104 = \$10,657$

NOC Replacement ratio for Employee A is $\$10,657/\$24,640 = 43\%$.

This does not meet the NOC adequacy target of 70%.

Employee A vs. Employee B Analysis

- Employee A has higher replacement ratio than Employee B
- Employee A under DB plan and Employee B under DC plan, so comparison between plans and their adequacy is more difficult. For instance, a higher assumed DC return would improve the adequacy ratio for Employee B.
- Employee A has PPA contribution, Employee B does not – though NOC model does not consider
- Portion of replacement ratio attributable to social security is higher for Employee B than Employee A, since Employee A's compensation was limited to \$50,000 in determining their social security benefit.

8R – Solution #7 (Continued)

- (d) Evaluate methods of integrating NOC's Full-Time Salaried Pension Plan with the retirement benefits provided by the new social security pension system.

Issues to Consider

- Will probably have to rework integration in the future due to changes in social security benefit levels
- Best to implement formula that provides pension benefit after integration that is higher than before integration
- Integration method could provide windfall to employer if private plan benefits are reduced by amount equal to social security benefit - employees would reap no benefit from social security in this case
- Half of Belair's social security benefit is financed by employees so only employer financed benefits should be part of integration

Integration Methods

- Formula method
- Benefit Ratio method
- Offset method
- Salary Exclusion method
- Combination method
- Indeterminate method

1. Formula method

- Pension plan benefit is 2% of BAE
- Social security is 0.50% up to 40 years
- Since employer pays 50%, integration would be $50\% \times 0.50\%$ or 0.25%
- Social security pay limited to \$50,000
- Formula would be 1.75% up to \$50,000 plus 2.00% for all pay over \$50,000.

I would recommend this approach since it is easy to administer, easy to communicate, and directly relates social security benefits to pension plan benefits.

2. Benefit Ratio method – This is not recommended since it only works on employee contributory plans

3. Offset method

- Offset private plan benefit by all or part of the social security benefit
- Since social security accrues over 40 years, may want to prorate offset over 40 years such as $2\% - \text{social security} \times \text{service}/40$.

8R – Solution #7 (Continued)

I would not recommend, even though it is easy to understand, because it is difficult to calculate social security benefit for terminations prior to eligibility for social security benefit. Also, the formula automatically changes when the social security benefit changes, which fails to pass on increases to employees and could hurt employers if social security was reduced.

4. Salary Exclusion method

- A specified portion of employee's salary is excluded in calculating private plan benefits with rationale being that when benefit formula is applied to these earnings it will produce a benefit equal to the social security benefit
- So since social security is 0.5% up to \$50,000 or \$250, would take the 2% formula beginning at \$12,500 (since 2% of \$12,500 is \$250 as well).
- Thus benefit under this method would be 2% of BAE in excess of \$12,500.

I would not recommend this method because it does not directly relate to social security benefits and therefore is difficult to communicate. It also could lead to a different salary exclusion for each entry age and separate treatment for those earning less than the social security wage base.

5. Combination method - This is not recommended since it only works on employee contributory plans

6. Indeterminate method

- Focuses on benefit objectives of private plan and does not attempt to determine direct mathematical link between reduction in benefit and social security benefits
- Reduction determined after studying social security; amount of benefit to be received and looking at financial position of private plan and benefit objectives of private plan
- Example might be a formula like 1.75% of BAE

I could recommend this method since it is simple and employer is not hampered by rigidity of social security benefit. It can be used with any formula. One drawback is that employees may not realize that plan has been integrated, so they could view as cutback.

8R -- Solution #8

- (a) CFO's analysis is not valid for many reasons:
- Maximizing returns is not the only goal of a pension fund; CFO needs to consider other goals or objectives
 - CFO should consider "risk-adjusted return;" ABC fund may be more risky
 - Should compare performance with agreed upon benchmarks
 - Should consider the style of various investment managers
 - NOC's returns were reasonable over the past few years
 - Have NOC's managers followed the investment policy?
 - Should consider a longer time horizon that includes a full market cycle; 3-year period is not enough

It is not appropriate to compare with ABC:

- Single firm sample size
- Different industry
- Different demographics

CFO should investigate how returns (both NOC and ABC) have been calculated

- Time-weighted (preferred for performance analysis) or dollar-weighted returns
- How figures have been annualized: arithmetic or geometric?
- How securities were valued? Bonds, equities, real estate, etc.

8R – Solution #8 (Continued)

(b) Process to determine asset allocation:

- Determination of goals
- Determination of investor's risk tolerance
- Analysis of current capital market conditions
- Use an optimizer to determine the most appropriate mix

Derivative securities:

- NOC's 20% proposal suggest derivatives used for speculation, not hedging
- 20% is too high

Fixed income:

- Fixed income investments are appropriate for pension plans with retirees liabilities
- The proposed allocation is not acceptable – especially for the salaried plan (0%)

Cash allocation:

- Need some cash to pay benefits – both plans pay lump-sum on termination
- May cause cash/liquidity problems
- More important when no employer contribution and low fixed income – like salaried plan
- For hourly plan – less a problem since contributions exceed benefits payments

Real estate:

- Offer an adequate inflation hedge and help diversification

Equities and overall proposed asset allocation:

- Would lead to an increase in expected return – which may lead to increases in benefits
- But volatility of the portfolio's return will increase (more risky)
- Is less diversified – low bond holding and no real estate
- Reallocation of assets needed to obtain the proposed mix will incur transaction costs (the benefits of the new mix should exceed these costs)

8R – Solution #8 (Continued)

(c) Duty of loyalty:

- The trust must be administered solely in the interest of the participants and beneficiaries
- May be in breach, if CFO's decision benefits NOC

Duty of care:

- Must manage the trust with attention, skill, prudence

Duty to diversify plan assets:

- As to minimize risk of large losses
- Potential breach; proposed mixes lack diversification

Duty of impartiality:

- Not excessively favor one beneficiary at the expense of another

Duty to delegate:

- May not delegate responsibility, only authority
- CFO should seek advise from an investment expert

Duty to follow statutory constraints:

- Avoid prohibited transactions; none in Belair

Duty to make the property productive:

- Should seek a return on investment (CFO is doing this)

Duties regarding co-trustees:

- Must cooperate with other co-trustees

Duties to act in accordance with the trust agreement:

- May be in breach, depending on terms of the agreement (derivatives)

8R – Solution #8 (Continued)

- (d) A passive investment strategy:
- Buy-and-hold strategy
 - Assume the Efficient market Hypothesis is valid – difficult for active managers to consistently outperform the market.
 - Transaction costs can be kept low.
 - More attractive with smaller pension funds.
 - Is not in line with NOC's objective to improve asset performance – cannot manage derivatives passively.
 - Major disadvantage: Sponsor gives up the opportunity to produce additional income through active management.
 - May require frequent rebalancing.

Active managers can add value through security selection, market timing.

Passive strategy can be accomplished in many ways:

- Index funds – the ultimate form
- A dedicated portfolio that matches cash flow.
- Immunized portfolio – Match asset duration with liability duration.
- Horizon matching – Use dedication for short duration (3 to 5 years) and use immunization for the other portion.
- Contingent immunization.

CFO should consider a combined active/passive strategy.

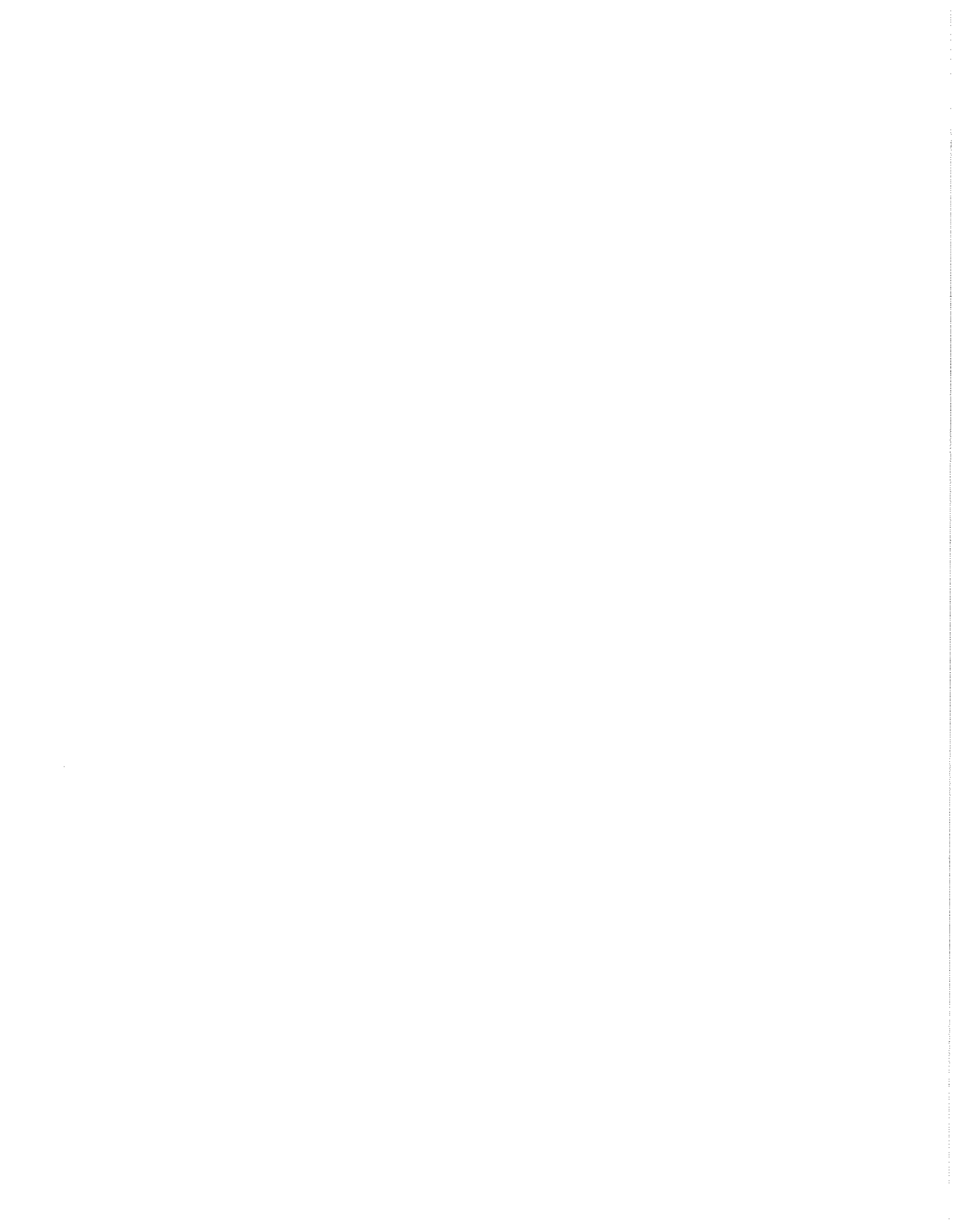
8R – Solution #9

(a)

- Requirement to fully fund on termination basis will place a strain on underfunded plans in Belair.
- Employers may wind-up/terminate plans.
- Employers will freeze benefits in current plans or reduce benefits.
- There will be no new DB plans, or no enhancements to DB plans.
- There will be a move to convert to DC.
- There will be a negative impact on the current private pension system.
- No impact on salaried plan.
- If a shortfall exists, it will need to be made up immediately.
- No impact on DC plans or SERPs.
- Plan sponsors will avoid investing in risky assets to avoid contributing in a bad performing year.
- By investing in less risky investments, investment return will be reduced, which will diminish benefit security in the future.
- Actuarial standards/government rules will need to be amended to reflect valuations on a termination basis.

Suggestions for change:

- Amortize current shortfall over a 5- to 10-year period.
- Increase contributions quickly so that expected assets in three years will equal expected liabilities.
- Give exemptions to newly established plans.
- Establish a pension benefit insurance scheme (similar to a PBGC).
- Aggregate plans.
- More frequent valuations.
- Monitor build-up of pre-paid expense under IAS rules.
- Do valuations with margin reflecting probability of funding contingent termination liabilities.



8R – Solution #9 (Continued)

(b)

- Provide “ad-hoc” improvements to hourly plan benefit multiplier. Revise actuarial basis to reduce current accrued liability.
- Amend plan prospectively. Do not increase past service costs.
- Remove/reduce eligibility for benefits which increase termination liabilities such as:
 - Indexation
 - Early retirement enhancements
 - Lump-sum options.
- Terminate and start DC plan:
 - Fund immediately any deficiencies
 - Removes volatility of costs
 - Plan is always fully funded.
- Freeze plan
- Convert to a hybrid plan, floor plan, profit-sharing plan, a FAE plan, subject to union approval.
- Grant improvements to the extent that surplus exists.