As an actuary, first I must consider whether I am qualified to give advice

- Professional integrity
 - give known advice
- Qualification std
 - am I qualified to lead this discussion
- Std of practice apply
 - will go through more later
- Conflict of interest
 - should disclose to all parties
 - in this case, should let both parties know that I'm employed by the chairman
 - they must all agree and be comfortable in this
 - must act fairly
- Rates used to discount future cash flows
- Liabilities in funding valuations used to determine cash contributions to trust fund
- For accounting: discounted liabilities used to calculate pension expense on income statement
- The funding interest rate should be appropriate individually (stand-alone), and in aggregate with other assumptions
- can be derived in building block approach
 - risk free rate
 - inflation
 - risk premium
- or derived on cash flow approach
 - the discount rate that is consistent with a hypothetical bond portfolio with expected payment similar to the plan's payment
- usually there is a reasonable range of int rate assumption
 - can consider input from employer (ER)
 - some company would prefer to have more margin in case of adverse derivation
 - result is higher liability and greater contribution
 - if it is within reasonable range, we can make adjustment

Solution 1 (continued)

- under traditional approach
 - it must also in line with the underlying asset portfolio
 - it would include equity risk premium
 - also policy-driven margin included
 - is a long-term view
 - intend to level out contribution rate in the long-term
 - no credit risk included, i.e. probability of non-payment of benefit
- Though, there are recently another school of thought from finance economical principles
 - the rate should base entirely on current market rate
 - no equity risk premium, (recognized when it is actually realized)
 - is intended to value liability accurately at any given time
 - with no policy driven margin
 - with credit risk
 - not a standard yet, but an interesting approach
- The funding rate should be based long-term view to avoid short-term volatility
- Increasing rate is possible if it is within reasonable range
- Or, if invested heavily in equities, then the expected ROR is higher, could argue for higher rate
- but must understand that the promised benefit is not changing. The total cost of the plan at the end is the same no matter where and when you find it
- changing rate would only affect short-term contributions
- if company is short of cash, then maybe a good way (given that the increase is reasonable)
- The interest rate for accounting purposes must be in line with the accounting standard
- if in Canada, then it must be the high quality bond yield rate, (usually AA bonds)
- depending on the duration of the liability, the rate would be slightly different
- however, the increment would be small, say 0.25% range
- the interest rate for accounting purposes must be appropriate
- It can be different from funding rate as funding rate represents a long-term view, whereas, accounting rate kind of reflects the current market yield
 - The accounting must be passed through the auditor too

Solution 1 (continued)

Interested parties:

- consider increasing funding rates, the liability goes down
- improve surplus position
 - either less deficit, or more surplus
- Contribution requirement comes down

Employee:

- want benefit security
- less secure, may affect morale
- on the other hand, improve surplus position could mean benefit improvement
- or surplus distribution, if wind-up or partial wind-up

Employer:

- want greater flexibility in contribution
- less contribution requirement
- can use the cash somewhere else
- better if after tax ROR better than pretax ROR in the fund
- less tax deductible contribution
- be careful of union/EE demanding benefit improvement if funded position improves

Shareholder:

- more liquid cash
- can improve business, or expansion, (possible acquisition)
- want the money to be best use
- want the value of the company improving
- love to see less compensation/operation expense

Government:

- want more income
- love to see more non-tax deductible
- also consider less secured benefits
 - may put pressure on government plan

Taxpayer:

- more tax coming from corporation
- better public service
- less likely to raise taxes

Solution 1 (continued)

PBGC/PBGF

- want to see maximum security
- want the plans to be fully secure
- like to see more contribution to the plan

Retirees:

want maximum security

The accounting interest has no impact on some of these groups but affects

ER

- affect financial statement
- may affect their bonuses

Investor and Shareholder

- concerns only financial impact
- the accounting rates have big impact on the premium expenses.

- (a) The investment policy statement (IPS) include the following:
 - 1. Purpose
 - 2. Plan overview and investment implication
 - 3. Investment beliefs
 - 4. Investment objective
 - 5. Investment manager instruction and mandate
 - 6. Investment manager objective
 - 7. Permitted investment constraint
 - 8. Derivative policy
 - 9. Relocating policy
 - 10. Asset mix and ranges

The plan overview and investment implication can help the CFO in his evaluation since it is important to know the nature of the liabilities to determine how asset should be invested.

Investment objective will also help \rightarrow should qualify expected return on asset, should also incorporate risk tolerance of plan's sponsor. By regarding what were the expectation could help in his evaluation.

Investment manager objective → should explicitly qualify, should determine benchmarks and performance expectations.

Permitted investment constraint → could be set as minimum rating or minimum or maximum investment in a asset class.

Investment manager structure and mandate → what was the structure: style, term structure, inflation component, market cap bias.

The CFO could also use the performance attribution method to evaluate performance → if split between policy strategic decision asset allocation decision and securities selection decision. Can also use risk adjusted rate of return to assess performance (that is the best method)

Asset allocation (asset mix policy and ranges) is the most important part of IPS, affect 90% of the return

Solution 2 (continued)

(b) Risk adjusted rate of return:

$$R_{p} = \infty + R_{c} + \beta \left(R_{m} - R_{f} \right)$$

$$\Rightarrow \infty = \left(R_{p} - R_{f} \right) - \beta \left(R_{m} - R_{f} \right)$$

2003:
$$\infty = (0.2 - 0.04) - 0.9(0.21 - 0.04) = 0.7\%$$

2002: $\infty = (-0.03 - 0.05) - 0.85(-0.05 - 0.05) = 0.5\%$

2001:
$$\infty = (0.02 - 0.04) - 0.8(0.01 - 0.04) = 0.4\%$$

(c) Treynor measure: $T = \frac{R_p - R_f}{\beta}$

2003:
$$\frac{0.2 - 0.04}{0.9} = 0.17$$

2002:
$$\frac{-0.03 - 0.05}{0.85} = -0.094$$

2001:
$$\frac{0.02 - 0.04}{0.8} = -0.025$$

- (d) Risk adjusted rate of return is the best method to determine performance
 - A positive ∝ indicate that the investment manager has beat the market
 - We can see that he has increased his performance from 2001 to 2003
 - The treynor measure suppose risk is systematic
 - Assume perfect diversification
 - It indicates the return per unit of risk
 - Here 2003 is clearly the best

In looking at β (the measure of risk) the fund is actually taking on less risk than the market as β <1 in 2003

In order to truly evaluate the performance of the CFO should look at the Statement of Investment Policies & Procedures to see what the objectives are and if they have been met.

Solution 2 (continued)

To further analyze the performance I will use the performance attribution method

Rate of return (%)		Weight %		Portfolio (%)		
Policy (benchmark)	<u>Portfolio</u>	Policy (target portfolio mix)	<u>Portfolio</u>	<u>Policy</u>	Allocated	<u>Actual</u>
30	25	35	25	10.5	75	6.25
47	30	25	25	11.75	11.75	7.5
4	5	25	35	1	1.4	1.75
39	40	10	10	3.9	3.9	4
9	3	5	2	0.45	018	0.06
1	1	0	3	0	0.03	0.03
				27.6	24.76	19.59

loss of 27.6-24.76=2.84% due to asset allocation decision and loss of 24.76-19.59=5.17% due to securities selective decision

(e) This is not a good position

- Should look at what are the objectives of the plan, the risk tolerance of the plan sponsor, plan policy etc...
- The asset should be diversified to reduce risk which would not be the case with 100% in fixed income
- Also need some liquidity to pay benefit payment and expense
- The plan got post-retirement inflation so need to hedge inflation real estate good for this

The CFO should compare performance against the appropriate benchmarks and relative to similar portfolios. He should <u>not</u> look just at absolute returns.

The CFO should look at the fund performance over a full market cycle as oppose to just 3 years. The CFO is looking at past performance only and not the economic environment during period.

CFO needs to consider the asset mix relative to its liability structure. Need to do an asset/liability study.

(a) Vesting: employee may leave before being vested and does not get any employer-provided value pension benefits

Loss of purchasing power: in final average DB plans, the benefit is based on pay at termination and not retirement. Not frequent for DB frozen pension to be indexed between termination and retirement.

If lump sum transfer allowed, employee might spend it instead of saving it until retirement.

DC plans are not as affected since entitled to full value of contributions at termination (unless employee is not vested). Can continue to earn investment returns until retirement.

Employees may loose post-retirement non-pension benefits

Career average plans and flat dollar plans: loose on potential future upgrades or flat benefit increases

Subsidized early retirement benefits may be loss in a DB plan

(b) Allow lump sum transfer in DB and DC plans but on a locked-in basis only

Require DB benefit at termination to be indexed between termination and retirement

Establish portability clearinghouse to transfer money from one pension plan to another and ensure that benefit for service with prior employer will be based on pay at retirement. Will work well if plans are similar.

Require lump sum transfer to be locked-in like in Canada

Allow employees to buy-back past service

Allow and encourage reciprocal transfer agreement

Allow and encourage Hybrid plan design such as pension equity, cash balance, DC with a floor DB

Immediate or more rapid vesting

Solution 3 (continued)

Establish government sponsored pension plan

Establish a standard for the calculations of lump sum transfer values at termination

(c) Locked-in lump sum will ensure that benefits received at termination are not spent before retirement

Pre-retirement indexation protects employee from erosion of benefit due to inflation prior to retirement

Allowing lump sum transfers will give employee the chance to earn investment returns over and above the inflation

Portability clearinghouse and reciprocal transfer agreement ensure that all service is based on pay at retirement. Protects against inflation and productivity increase before retirement.

Earlier vesting will ensure that more mobile workers are entitled to a benefit at termination.

DC plans and Hybrid plans pay a higher termination benefits than regular DB plan

A standard for calculated DB lump sum transfer values will ensure consistencies and fairness between plans

(d) If these policies are adapted by the Govt, then NOC will have to adapt its plans to comply with the new policies

Portability clearinghouse and reciprocal transfer agreement will increase the administration complexity

Plan document will have to be amended and changes would have to be communicated to employees

Will likely increase turnover since termination benefit would be better

Solution 3 (continued)

May need to review investment policy since more liquidity needs

Earlier vesting and pre-retirement indexation would increase funding and accounting liabilities resulting in an increase in cash contributions and pension expense.

Increase plan benefit cost as more members are vested

(a) <u>Problems with Current System</u>

- Accounting conceals risk and volatility and anticipates unearned risk premiums
- Pensions are mispriced in negotiations and compensation decisions
- Participants bear creditor risk they can't evaluate or diversify
- Assumption selection process influences investment decisions
- Does not incorporate FE principles
- Transfers risk to future generations
- Hypothetical gains conceal real economic losses
- Conceals risk by smoothing
- Extended amortization

FE Model

- \$ million of equities has same value as \$ million cash or bonds
- fair trade of assets occurs at market price
- all parties entitled to full current information on market price of assets and liabilities
- liabilities valued like assets traded index/liquid market
- rewards earned/risks become by individuals, not institutions

Debt model is inadequate for pensions because

- duration not found in market
- benefit payments are not known in advance
- no market for pension liabilities other than for retirees or terminating plans
- sponsors concerned about costs not liabilities
- if pensions considered debt then so are other contingent payments

Traditional model vs. FE model

Traditional: anticipates risk premium

- contains margin
- designed to level contributions over time

FE: based on current market rates

- contains discount for probability of non-payment
- consistent with return of reference portfolio
- designed to accurately value plan at specified time

Solution 4 (continued)

- (b) Move to a FE approach
 - Liabilities valued using unit credit
 - assets valued at market value
 - expected return on assets replace with actual investment gain or loss
 - remove corridor
 - shorter amortization periods for gain and losses and prior service costs, or immediate recognition
 - Application of rigor/discipline in selection of assumption
 - Liabilities should be valued at rates to match the assets
 - pensions resemble debt and should be valued that way
 - use discount rate applicable to debt of similar credtworthiness
 - No salary scale used, but might include contractually determined future salaries
 - Show sensitivity of results to assumption changes
 - The operating cost of a defined benefit plan is the value of newly earned benefits
 - The financing cost of the plan is the decrease in accrued benefit surplus, before contribution and newly earned benefits

(a) Exec has security that benefit will be there

Exec not taxed on benefit accruals until benefit is funded

Employer can invest assets internally while exec is active, more flexibility with cash prior to termination

LS would preserve benefit if exec in poor health

LS gives the exec more flexibility

not funded until termination, susceptible to bankruptcy risk and employer's refusal to pay prior to termination

no security prior to retirement

Employer can't deduct vested accruals until benefits funded

Employer still has to recognize an expense each year

No asset return offset or lower liability that will eventually be moved

potential for large payments in short amount of time if multiple execs retire at same time

takes assets out of employers hands after retirement

what happens if you purchase too much coverage for employee?

issues with lump sum

longevity risk for employee

employee may squander

employer susceptible to adverse selection

Solution 5 (continued)

(b) Lump-sum option

After-tax SRP benefit= $(1-40\%)\times(100,000) = 60,000$ Lump-sum value = $60,000 \times \text{after-tax}$ annuity factor = $60,000 \times 13.5 = 810,000$

Gross-up pymt to account for immediate taxes = $\frac{810,000}{1-40\%}$ = 1,350,000

Insured annuity option

Annual payments from insured annuity are split in two

- taxable part
- tax-free part

We want after tax payment of 60,000 so the annual amount that should be purchased (A) is determined as follows:

tax-free annual payment =
$$\frac{10 \times A}{20}$$

after-tax annual payment=60,000

$$\Rightarrow 60,000 = A - 40\% \left(A - \frac{10A}{20} \right)$$

$$=A-40\%\times\frac{A}{2}$$

$$=80\%A$$

$$\Rightarrow A = 75,000$$

Gross-up payment =
$$\frac{750,000}{1-40\%}$$
 = 1,250,000

Cost differential:

It will cost 100,000 more if Pat chooses lump sum

(a) Group A: all employees with age 55 and 5 years of service by 1/1/05 and <20 years at 1/1/04

Group B: all employees not in A,C, or D

Group C: all employees with less than 30 years of service at retirement and at least 20 years of service at 1/1/2004

Group D: all employees with at least 30 years of service at retirement and at least 20 years of service at 1/1/2004

Assumption: All age/svc cells are (uniformly) evenly distributed across all

Group A: Boundaries: <20 years at 1/1/04 so all in 5-10, 10-15,<5 and 80% of 15-20

 \geq 54 and \geq 4 so all in >65,55-65 and 20% of 45-55 excluding 80% of <5 column

Group C&D combined: all ≥ 20 years at 1/1/04

$$\begin{array}{rrr} \underline{15\text{-}20} & \underline{>20} \\ 16\times20\% & \\ 224\times20\% & 258 \\ 370\times20\% & 768 \\ 55\times20\% & 365 \\ 5\times20\% & 8 \\ =134 & =1399 & \text{so total } 1533 \end{array}$$

Break out C&D based on svc at retirement

Solution 6 (continued)

Valuation assumption is age 62 for retirement (not supported by plan experience, ie. large gains, but use for this purpose as conservative estimate)

25-35 now, with 20+ years, assume all have 30 years at retirement 35-45 now, with 20+ years, assume all have 30 years at retirement 45-55 now, with at least 20 years, assume 90% gave 30 years at retirement 55-65 now, with 20+ years, assume 60% have 30 years at retirement >65 now, with 20+ years, assume 20% have 30 years at retirement

Group D Count:
$$(16 \times 20\%) + (224 \times 20\% + 258) + (370 \times 20\% + 768) \times 90$$

+ $(55 \times 20\% + 365) \times 60\% + (5 \times 20\% + 8) \times 20\% = 1291 2$

Group C Count = 1533-1291.2=241.8

Group B Count =4293-341.8-1533=2418.2

- (b) Curtailment=significant reduction in future service
 - Group A: This is not a curtailment of benefits for the portion that does not retire by 1/1/05. Based on valuation retirement assumption, not many will retire
 - Group B: This a curtailment of benefits for all in this group
 - Group C: The plan amendment that reduces benefits for group C would create a negative unrecognized prior service cost. I am assuming that the curtailment would be recognized first, as the PSC would not reflect the group that is curtailed.
 - Group D: No special accounting since no change for this group

The curtailment noted above would result in a gain in the APBO (don't know accrual method, so can't estimate) that would be partially offset by unrecognized losses. There is no PSC, so nothing to be recognized.

Solution 6 (continued)

(c) NOC would have to recognize a large gain the first year and would see decreased expense for following years for the retiree medical plan.

They may see increased withdrawal if younger employees see medical benefit as valuable and competitor is still offering benefit

COURSE 8RU: Fall 2004
Retirement Benefits

25

- (a) Asset Return
 - will depend on asset mix
 - look at expected rate of return of invested asset

Discount rate

- rates upon which liabilities could effectively be settled
- generally consider high quality bonds
- plan sponsor responsible for the selection
- governed by FAS87((US)/CICA3461(Canada)
- need auditor approval

PBO
$$1/1/05 = (560,919+27,169)(1.06)-11,258(1.06)^{5} = 611,782$$

Assets $1/1/05 = (380,679+33,000-11,258+31,324)=433,745$
 $31,324 = 380,679 \times .08 + (33,000-11,258) \times .04$

1/1/2005

Exp PBO
$$1/1/05 = (5560,919)-27,169(1.06)-11,258(1.06)^{0.5}$$

= 611,782

Exp SC
$$1/1/05 = 27,169 \times 1.06 = 28,799$$

IC = 28,999(0.6)+611,782(.06)-12,100
$$\left(\frac{.06}{2}\right)$$
 = 38,072

Solution 7 (continued)

Amort PSC for 2005 = 3837
Amort G/L =
$$\frac{107,015-10\% \text{ or } Ax(611,782,433,745)}{11.5}$$
 = 3986

2005 expense:

(c) Increase in discount rate

affect Sc, IC & loss amort

decrease in discount rate: reverse

change in EROA assumption

consider difference of actual assets vs. expected

- EROA will change
- amortization/loss may also change

- A Key design feature to address
 - 1. What are the eligibility conditions to participate in the plan?
 - a. Will they differ from current plan (i.e. immediate participation)?
 - b. Add age and service conditions?
 - 2. What compensation to include?
 - Base pay or include overtime and bonuses?
 - b. Include deferrals for plans similar to 401(k) or 125 plans?
 - 3 How is service for vesting and benefit eligibility calculated?
 - a. Require a minimum number of hours to receive vesting /eligibility service?
 - b. Require a minimum number of hours to receive an annual contribution?
 - 4. Retirement
 - a. What are the normal/early retirement requirements?
 - i Same as current plan?
 - b How is monthly benefit determined from cash balance?
 - c. Offer early retirement subsidies?
 - Subsidized and non-subsidized benefits depending on age and service?
 - ii. How are early retirement benefits calculated?
 - iii Could have subsidized/simplified annuity conversion factors based on age
 - d. How are benefits adjusted for late retirement?
 - 5. Forms of payment
 - a. How is monthly benefit determined?
 - b Will lump sum be paid?
 - i. How will lump sum be determined?
 - (1) Just account balance?
 - (2) Project account balance to NRA, convert to annuity and apply 417(e) type rates? What assumptions?
 - (3) Reflect early retirement subsidy?
 - (4) Whip-saw issues?
 - c. What other optional forms will be allowed?
 - d. How will optional benefit amounts be calculated?
 - 6. Withdrawal
 - a. Continue 5 year cliff vesting, or change to immediate or graded vesting?
 - b. Provide cash balance as lump sum?
 - 7. Disability
 - a. Will there be a separately defined disability benefit?
 - b. What are the eligibility requirements to receive a disability benefit?

Solution 8 (continued)

- c. When will disability benefit payments begin?
 - i. May want to coordinate timing with group disability benefit
- d. Can receive continued accruals at last pay rate while on LTD until retirement
- 8. Death
 - a. QJSA and QPSA must be offered
 - b. Pay entire balance, instead of QPSA?
 - c. Can beneficiary be a non-spouse?
 - d Provide additional post-retirement lump sum benefits?
- 9 Will a minimum benefit be provided?
 - a Based on entire service or earned each year?
 - b. Restrict only to participants with a minimum period of service?
 - c. Top Heavy provisions/benefits addressed?

B Proposed transition options

- 1 Several options are possible
 - a. Grandfathering select groups or benefits for a select period
 - b. Offering choice
 - c. Set benefit as current accrued benefit plus future cash balance accruals
 - d Calculate cash balance plan as if new plan was always in effect, with current accrued as a minimum benefit that is worn away
 - e Specific options chosen are shown below
- 2. Option 1
 - a Opening balance equal to PV of accrued benefit payable at age 65
 - Use 6% interest rate and standard mortality table
 - b Employees near or over early retirement age will be losers without special transition benefits
 - i. Current plan provides unreduced benefit at age 62, and 0.25% per month reduction for commencement before age 62.
 - c. Special transition for employees over age 50 at transition date
 - i. Increase opening account balance to reflect early retirement subsidy on accrued benefit
 - ii Provide transition contributions (over 5% pay credits)
 - d. Force conversion on all employees
 - i. Choice of cash balance or current plan not offered
 - ii. Choice too expensive
- 3. Option 2
 - a. Opening balance calculated as above, without special credits
 - b. For anyone over age 45 at conversion date (grandfathered group)
 - i. Allow accruals to continue in FAP plan for 10 years
 - ii Benefit is greater of cash balance and FAP benefit

Solution 8 (continued)

- c Non-grandfathered participants can only receive the cash balance benefit
- C Expected effect of transition options on benefits of certain participants
 - 1 No reduction in the accrued benefit under either option
 - 2. Option 1
 - a. Without special transition credits, older employees will see smaller benefit accruals and less value in the early retirement benefit
 - 3. Option 2
 - a. For younger employees (non-grandfathered), there will be no change from Option 1
 - b. For grandfathered employees, there will no change from current plan for 10 years, then there will be a wear-away period where they would accrue no benefits
 - c Grandfather provision especially helpful for older employees, employees with large amount of past service, and employees whose earnings grow faster than average during transition period
 - 4. For both options
 - a. Termination benefits will likely be higher for young, short service employees
 - b. Mid career employees may be hit especially hard in moving to a cash balance plan transitions somewhat soften the impact of the change
- D Expected effect on 2004 expense
 - 1 PVFB likely to decrease due to:
 - a. Loss of early retirement subsidy
 - i Impact partially reduced by special transition provisions
 - b Projected benefits less dependent on future pays
 - c Loss of early retirement subsidy likely to be greater than increase for higher withdrawal liability
 - 2. PBO anticipated to decrease as PVFB decreases
 - 3. Lower PBO results in lower interest costs
 - 4. Service cost most likely to decrease
 - No change in assets (other than slightly different benefit payment), so no significant change in expected return on assets
 - 6. Decrease in PBO set up as unrecognized prior service cost and amortized over future working lifetime of active employees expected to receive benefits
 - 7. Unrecognized loss will not change, still inside corridor, and no amortization charge

Solution 8 (continued)

- 8. ABO will not decrease, since accrued benefits can't go down
 - a Additional opening balance may cause ABO to increase
 - b. However, ABO not used to calculate expense
- 9 Not expecting special curtailment or settlement issues
- 10. Overall expect expense to decrease

(a) All the risk is shifted to the individual in a defined contribution scheme Including ancillary benefits that are basically funded by the individual

There is also a risk that individuals will invest in less risky assets and not get close to the expected return

Asset management firms need to be regulated with regard to available investments as well as fees/

DC schemes have higher expenses as illustrated by Chile's program.

Other issues with DC schemes include no wealth redistribution meaning the government needs to guarantee a minimum benefit

There are also issues with how the transition will be funded if there is a legacy program. Will the current generation pay for two generations of benefits. If the plan is prefunded the prefunding might be raided.

- (b) Suggested modifications to the proposal include adding:
 - a minimum benefit
 - the ability for companies to contract out if they provide a comparable plan
 - an insurance component for ancillary benefits
 - investment options with lifestyle funds

Asset management firms and Annuity firms need to be regulated.

Earlier and later retirement should be allowed and phased withdrawal should be allowed as well.

Inflation protected annuities should be mandated in retirement

(c) Under the current plan the labor cost will have increased and this proposal will drop the overall cost of the retirement program to be in line with original cost.

There will be winners and losers and transition has not been addressed.

Since defined contribution plans do not integrate well with defined benefit plans the CFO should consider an offset plan. The defined benefit plan could remain in place with the addition of an offset from the social security benefit based on ad expected return