DP-RU Complete Illustrative Solutions
Fall 2010

1. 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.

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

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

(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.

(6e) Evaluate the appropriateness of actuarial assumptions using both a traditional and a financial economics perspective.

Sources:

Yamamoto pp. 57-68 and pp. 287-294

SN "Measuring Terminable Post-retirement Obligations"

Grader Commentary:

In this question, candidates were asked to demonstrate their understanding of the reasons employers are eliminating retiree benefits and to discuss possible refinements to the current actuarial model to take into account this ability of employers to unilaterally change future cash flows.

1. Continued

A well-prepared candidate would have been able to identify and briefly explain three to four of the six main reasons employers cite to reduce or eliminate future retiree benefits. A well prepared candidate would have also been able to describe the three refinements to the current actuarial model.

Solution:

(a) **Employers do not receive full credit for tax effective retiree benefit plan**

- Hidden costs of their subsidy to plan
- Discount value due to employer ability to change plan design

Benefits are valuable to minority of active employees

- Long duration till benefit eligibility/Not seen as valuable benefit until employee nears retirement

Sense of social responsibility of employer to provide benefits diminishing/Move away from paternalistic philosophy; Retiree should share cost

Long term career employment diminishing/Workers Independence/Lack of Loyalty

- Benefit not portable

Reduction in Cost to Stay Competitive

- Global competitors and newer industries tend not to provide these benefits
- As more of the competition eliminates retiree benefits, makes it easier to drop or reduce coverage

(Cash) Cost increasing faster than any other item for most companies

- Accrual cost required by FASB is a significant measure/Accounting cost/liabilities too volatile/large
- No longer a nominal financial commitment
- Health care inflation outpaces general inflation
- Life expectancy continues to increase
- Number of retirees is growing (baby boomer)

Recent negotiating ability with respect to unionized retiree benefits

- Value of deferred benefits traded for something more valuable to current workers
- Legacy costs difficult to maintain and partially responsible for companies' financial difficulty

1. Continued

(b) **1. Risk adjusted discount rate**

- Rate will be higher than risk-free rate
- Reflects rate associated with plan change
- Aggregate present value using this rate should be same as derived under other two refined methods
- Discount rate should be selected by plan sponsor and not mandated by market
- Should select discount rate without regard to funded status
- Acknowledges uncertainty more than the other two refinements
- Easily fits into financial economics
- Fits easily into realm of financial reporting (i.e. FAS 106, only need to change reference to high-quality long-term bonds as determinant of discount rate)
- Preferred approach

2. Plan termination decrement

- Explicitly assumes a bimodal distribution of either continuing unchanged or termination
- Plan termination decrement of t (i.e. 5%) per year
- Plan survival probability of that period is $1 - t$ and would have cumulative effect over the years

3. Specific estimates of future reductions

- Quantifies probability, amount and timing of reductions and reflects in aggregate present value
- Plan sponsor would specify timing and proportion of future reductions
- Most labor intensive
- Used to establish most likely path for plan payments (benefit levels) in light of major uncertainties involved
- Assumes plan sponsor knowledge of projection results of traditional actuarial model for particular plan on period-by-period basis

2. 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:

(2d) Test for plan design restrictions intended to control the use of tax incentives.

Sources:

Allen Ch. 31 - pp. 579-592

Grader Commentary:

In this question, candidates were asked to demonstrate their knowledge of the taxation of various forms of retirement plan distributions. In particular, the question focused on the taxation of death benefits and possible penalty taxes.

Solution:

(a) **Lump Sum:**

1. Distribution to beneficiary from a qualified plan after age 59½ will entitle the beneficiary to favorable tax treatment.
   The favorable tax treatment is granted if:
   - The distribution represents the full amount credited to employee's account, and
   - Provided it is received within one taxable year of the beneficiary, and
   - Paid to an individual born before January 1, 1936.

2. In determining the net amount of gain subject to tax, the beneficiary's cost basis will be the same as the employee's.

3. The pure insurance passes to the beneficiary free of income tax:
   - If any portion of the distribution consists of life insurance proceeds,
   - And the employee either repaid the insurance cost or reported this cost as taxable income.
   - Pure insurance is the excess of face amount of contract over cash value.
   - If the employee has not paid the insurance cost or reported the cost of insurance as taxable income, the portion of the insurance proceeds consisting of pure insurance will be considered as taxable income to the beneficiary.

2. Continued

4. When an employee dies after retirement and after having received periodic payments, a lump-sum death payment to the beneficiary could qualify for favorable tax treatment.
    - The beneficiary's cost basis will be reduced by an amount that the employee had recovered free from income tax.

Periodic Form of Payments:

Death before retirement:

1. The periodic payments will be taxed in accordance with the annuity rules of IRC Section 72.
    - The beneficiary's cost basis will consist of the amount that would have been the employee's cost basis had the employee lived and received the payments.

2. If any part of the periodic payments arises from pure life insurance, the proceeds are divided into two parts – cash value and pure insurance.
    - The portion attributable to the cash value element will be taxed to beneficiary under the annuity rules.
    - The portion attributable to the pure insurance element will be treated as insurance proceeds under IRC Section 101(a).

Death after retirement:

3. The taxation of payments to the beneficiary after periodic payments have begun depends on whether the employee had a cost basis as well as on the method of payment involved.
    - If the employee had no cost basis, each periodic payment would be considered taxable upon receipt by the beneficiary.

4. Modified rules would apply if payments were being continued as part of a join and survivor annuity form.

(b) **Taxation on Early Distributions**

There is an additional 10% tax on any taxable amounts received before age 59½ from a qualified retirement plan.

Exceptions:

1. In the case of death, disability or termination of employment after age 55.
2. Distributions that are part of a series of substantially equal periodic payments made for the life of the employee or the joint lives of the employee and beneficiary.

2. Continued

3. Distributions used to pay medical expenses that exceed 7.5% of the adjusted gross income.
4. Distributions used to pay health insurance premiums after separation from employment.
5. Certain dividend distributions made from an ESOP.
6. Payments to alternate payees under a QDRO.
7. Distributions used to pay qualified education expense.
8. Distributions for the purchase of a first home (up to $10,000).
9. Distributions used to pay an IRS tax levy or a timely corrective distribution from the plan.

Taxation on Late Distributions

1. Participants must commence benefit payments by April 1st of the calendar year following the calendar year in which they reach age 70½ after terminating employment.

2. The penalty for failure to make a required distribution of (at least) the correct amount is a nondeductible excise tax of 50% of the difference between the minimum required amount and the actual distribution.

3. 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:

(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

Sources:

Allen Chapter 3

Allen Chapter 5; pp 80-85

Grader Commentary:

The candidate is being asked to demonstrate an understanding of the key characteristics and differences of defined contribution and defined benefit plans, and how each design type may support the company's key objectives. One specific area of focus is the impact of retirement income of participants under a defined contribution structure. We are looking for candidates who can apply the concept of DB vs. DC to the question rather than just providing a list. A well prepared candidate would have been able to discuss three to four of the key objectives and how DB and DC plans meet the objective.

Solution:

(a) **1. Single Plan Should Cover All Salaried Employees**

DC Plans

Covers all employees

DB Plans

Can be designed to cover all employees

FAP plans can have minimum hour requirement preventing benefit accruals for part-time employees

NOC Key Objectives

Key Issue #1: Both DC and DB plans can be designed to cover all salaried employees

3. Continued

2. Plan Should Minimize Cost Volatility

DC Plans

Employees bear investment risk
Typically contributions allocated to employees based solely on pay
ER contributions can be defined (i.e. flat % of Pay or can be at ER's discretion but must define how contributions are allocated to members)

DB Plans

Investment risk borne solely by employer

NOC Key Objectives

Key Issue #2: Minimizes cost volatility if ER contribution is defined since contribution amount known
Key Issue #2: Movement to DC plan (whether by close or freeze) should address cost volatility as NOC will have less responsibility for shortfalls in assets relative to liabilities

3. Plan Should Be Attractive to New Employees

DC Plans

More level accruals over career
More favorable to mobile, short service employees as greater benefits provided to employees who terminate early in career
Employers may opt for age/service/points-based design to allow for greater accruals later in employee's career to mimic DB plan accruals
Benefits at retirement can be taken as lump sum – Portability

DB Plans

Accruals early in employee's career are small with significant accruals in later years
Greater accruals in later years due largely to final average pay designs and subsidized early retirement
Benefits at retirement must be taken as a pension

NOC Key Objectives

Key Issue #3: May be attractive to some members
Key Issue #3: DC plans are typically more attractive to new employees than DB plans due to large allocation of employer contributions (e.g. higher accruals in early years)
Key Issue #3: Accrual patterns in DC plan are more attractive to potential new employees (especially younger hires) and younger current employees

3. Continued

4. Plan Should Encourage Retention of Current Employees

DC Plans

May have allocation based on age/service in graded designs
Integration with Social Security possible, but less common and less efficiently than DB plans

DB Plans

Contributions allocated based on employee's age, past service and pay under plan formula
Relatively common to integrate with Social Security using estimated Social Security benefits or covered compensation

NOC Key Objectives

Key Issue #4: Depending on DC plan design, retention of current employees could be a problem if the larger DB accruals or subsidies no longer exist in a new design
Key Issue #4: Move to DC Plan without inflation protection may hurt employee retention of older employees
Key Issue #4: Since allocations in DC plans are based less on age and service, employee retention is at greater risk in a DC plan
Key Issue #4: Contributions structured around age/svc; can provide higher contributions as approaching retirement and thus may encourage retention
Key Issue #4: Integration could enhance retention of higher paid employees since diminishing Social Security income will be accounted for in the NOC plan

5. Employees Should Share Responsibility for Retirement Income

DC Plans

Pre-tax and after-tax contributions permitted (i.e. voluntary costs)

DB Plans

Only after-tax contributions permitted
May provide matching contributions

NOC Key Objectives

Key Issue #5: Allowing/requiring employee contributions shifts more responsibility of retirement income to employee
Key Issue #5: Greater employee responsibility for retirement income may require employees to earn greater investment returns to make up for lack of inflation protection; result may be more aggressive investments and potential for volatile retirement income levels
Key Issue #5: Move to DC plan will shift more responsibility of retirement benefits to employee

3. Continued

Key Issue #5: A significant portion of employee responsibility for retirement income is managing investment risk in DC plans
Key Issue #5: NOC may consider expanded education initiatives to assist employees in event of design change to DC
Key Issue #5: Matching contributions encourage employee savings and sharing of responsibility

6. Plan Should Protect Retirement Income for Existing NOC Employees

DC Plans

Investments which are too conservative over career may result in less than adequate retirement income
Investments which are to aggressive over career may result in volatility and uncertainty in retirement income approaching retirement
Provide benefits which may fail to meet or which may exceed intended targets
Benefits dependent on employee savings patterns, investment returns, inflation
No pre-retirement inflation protection since benefit accruals are more career-average in nature
No post-retirement inflation unless indexed annuity option is available at retirement (rare)

DB Plans

Can be designed to meet employer's specific income replacement objectives
Pre-retirement inflation exists in final average pay plans since benefits may be based in pay in 3 – 5 years immediately prior to retirement

NOC Key Objectives

Key Issue #6: One method to protect accrual patterns and subsidies is to grandfather all or some of the current DB plan participants
Key Issue #6: Without grandfathering of DB plan, an age/service tiered DC design could protect a portion of the escalated accruals later in an employee's career

(b) **Contributory Nature of DC Plans**

Retirement income will be heavily dependent on employee's ability and willingness to save for own retirement
More critical in plans where sole benefit is an employer match

3. Continued

Length of Service
Employees who join a DC plan later in career are likely to have less retirement income from the plan due to:

- Shorter period of employee and employer contributions
- Less interest compounding of investment returns

Benefit Accruals
DC accruals are career-average in nature
Retirement income may not be adequate due to lack of pre-retirement inflation protection that may exist in final-average DB plan

Form of Payment
DC Plans typically pay benefits in lump sum form

- Requires participant to manage investment of funds as well as withdrawals whereas each are managed automatically if benefits paid from DB annuity

Participants are more likely to either outlive lump sum benefits or spend lump sums on expenses not related to retirement

Uncertainty of Benefits
Employee's benefit can only be estimated even approaching retirement since benefits are heavily dependent on investment returns and contribution levels – difficult for retirement planning

4. 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.

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

Learning Outcomes:

(1b) Describe the process and apply the principles of conversions from one plan type to another.

(3c) Integrate a plan for executives with the basic benefit plan.

Sources:

Allen Chapter 3

Allen Chapter 14

Allen Chapter 17

Grader Commentary:

Candidate should address the key aspects of the proposed plan designs for the combined company. This discussion should highlight how the various employee groups at the two companies will fair under the design alternatives. Based on those advantages/disadvantages, along with corporate objectives, candidates should provide a recommendation of the best alternative for the combined company. This should be specific to the key objectives and kept at a high level.

A well prepared candidate would have provided both advantages and disadvantages under each proposal. Many candidates only provided answers under one proposal or only provided either advantages or disadvantages under both proposals. We were looking for a balanced answer.

Solution:

(a) **<u>Proposal 1 – Advantages</u>**

NOC Salaried employees and SERP participants

- No loss or change in retirement benefits (i.e. protecting legacy of NOC employees)

ABC employees near retirement

- Entire retirement benefit will not be susceptible to investment risk
- Greater early retirement subsidies provide more valuable benefit
- Greater portion of benefit protected from pre-retirement inflation through use of final average pay formula

4. Continued

All other ABC employees

- More valuable benefit if remain working for NOC for years after acquisition
- Greater portion of retirement benefits subject to less investment risk and/or pre-retirement inflation risk

ABC SERP participants

- Greater benefit in NOC SERP (2% FAP5 vs. 1.5% FAP3)

NOC

- No communications/employee relations issues through benefit changes
- Given demographics of ABC group, newly acquired employees would likely be less expensive under a DB plan in the first few years after the transaction
- All employees would be covered under a single benefit plan; avoids maintenance of two separate plans
- Ability to retain current employees remains intact through early retirement subsidies in DB plan
- Ability to provide early retirement subsidies provides vehicle to impact employee behavior (i.e. early retirement windows)

Proposal 1 – Disadvantages

NOC Salaried employees and SERP participants

- None apparent

ABC employees near retirement

- Disruption of benefit structure will require additional communication and education
- NOC DB plan is more complex and difficult to communicate (monthly benefit vs. account balance)
- Question of past service with ABC counting toward vesting, early retirement in NOC plan – if not, must stay with NOC to earn benefits and early retirement subsidies
- Question of pay definition in current ABC plan – if total comp, then loss of benefits since NOC plan uses base pay only

All other ABC employees

- DB benefit is less valuable for employees who leave NOC prior to early retirement; accruals are likely less than 4% of pay in early portion of career

ABC SERP participants

- None apparent unless pay definition is different

4. Continued

NOC

- Action contradicts concerns over cost volatility as more participants are brought into an unfunded DB plan. Will need to incorporate some form of pension risk management (LDI) as part of the plan investment structure.
- To attain full funding, greater returns will be necessary (absent significant discretionary contributions) which may lead to increased asset volatility and, thus, increased cost volatility
- Maintaining an open DB plan will likely not attract new, younger employees
- Retention of ABC employees may be difficult with DB plan where vesting and early retirement eligibility may/may not include past service with ABC; employees may not value the DB benefit as much as the flexibility of the DC benefit
- NOC responsible for greater share of employees' retirement income (EE's are not sharing in retirement income responsibility)
- Increased level of administration and recordkeeping
- Not targeting overall retirement program objectives, including: volatility, attracting new employees, retaining new ABC employees and employees sharing in responsibility for retirement income

Proposal 2 – Advantages

Young, short service NOC Salaried Employees

- DC benefit carries greater value in early part of career than DB plan
- Less constraint to remain with NOC; more benefit goes with employee in job change
- Greater understanding and appreciation of retirement benefit
- Employees feel empowered through control of retirement investments; opportunity to grow retirement income through investment earnings
- If new plan is profit sharing, employees can feel greater link to company success

Other NOC employees and SERP participants

- Participants having reached age 62 (earned full ER subsidy) may receive greater accruals in DC plan since NOC DB accruals will have diminished
- Even with frozen NOC benefit, employees will likely have ability to grow into subsidies
- If DC plan is age and/or service-based, employees with seniority will earn greater benefits that may allow for closer matching of NOC DB plan
- Grandfathering a segment of population will allow employees to retain current benefit structure
- A DC SERP fits the retirement program objectives better than the current design

4. Continued

ABC employees

- Smooth transition of benefits from current ABC plan
- Age/service based plan will reward older, longer service employees more than current flat DC contribution plan
- Younger employee population has greater appreciation for DC plan
- Greater benefits earned more quickly which may help if workforce reductions are imminent as part of transaction

NOC

- Greater cost stability going forward (addresses issue 2)
- Greater appreciation of retirement benefits for younger NOC population after ABC acquisition
- DC benefits are more attractive to new hires; current workforce trends indicate new hires are more mobile (addresses issue 3)
- In later years, cost volatility of NOC DB plan should diminish greatly since no additional benefits being earned
- Shifts responsibility of retirement benefit to employee; shift even greater if new DC plan is match-based (addresses issue 5)
- Employees not only manage investments, but must save own money to earn any benefits for NOC
- Flexibility of DC benefit structure allows NOC to reward employees based on corporate objectives
- Reward long service employees: Vary DC plan accruals by age and/or service
- Incentive for company success; utilize profit sharing formula
- Promote join responsibility for retirement saving: Use match-based plan as primary retirement vehicle

Proposal 2 – Disadvantages

NOC Employees

- Older, longer service employees hurt most by change to DC plan
- Loss of benefit accruals under FAP plan which increase later in an employee's career; DC plans typically cannot replicate accrual pattern and early retirement subsidies of DB plan
- Employee bear risk for significant portion (if not all) of retirement benefit from NOC
- Without adequate education, employees will likely fall short of retirement income needs
- Loss of pre-retirement inflation protection with shift to DC plan (career average vs. FAP5 NOC plan)
- SERP participants hurt also since value of DC SERP will likely not reach value of NOC DB SERP

4. Continued

ABC employees

- Longer service employees may have wanted to enter DB plan
- New plan may be less valuable than ABC plan or may be age/service based which provides lower benefits to younger, shorter service employees
- SERP participants hurt with shift from DB design to DC

NOC

- Costs shifted from older longer service (early retirement subsidies) to younger employees (DC allocation with shorter vesting)
- Employee relations issues
  - Need to communicate and manage older, longer service NOC employees who may feel something has been taken away from them
  - Significant communication will be needed to educate employees on investment strategies to allow for adequate retirement income
- Cash contribution will be required each year under DC plan; no contribution holidays
- Grandfathering of some or all NOC ees will require additional costs
- DB plan doesn't "go away" as frozen benefits must continue to be administered and valued, volatility of costs is still an issue
- Potential workforce issues (retention issues)
  - No natural retirement points in DC plan (like age 62 in the NOC plan), so participants may be inclined to remain in service longer than expected
  - If participants have not successfully managed retirement funds, they may stay working longer than NOC wishes

(b) **Recommendation for Proposal 1**

Meets company objectives

- Covering all employees under single plan
- Avoids maintenance and costs associated with two plans

Allowing retention of longer service employees

- Maintaining the DB plan allows NOC to retain current talent through early retirement subsidies and vesting requirements

Protecting legacy of NOC employees

- NOC is protecting employees who are at or near retirement age from significant loss of retirement benefits

4. Continued

Costs

- Continuing the DB structure allows NOC to continue to efficiently provide a certain level of retirement income to its employees

Recommendation for Proposal 2

Addresses key issues

- Covering all employees under a single plan
- All employees will be covered under the new DC plan as the NOC DB plan will be phased out over time

Addressing cost volatility

- DC plans experience less cost volatility year-over-year since liabilities are not contingent on interest rates
- This lower cost volatility may be at the expense of providing higher retirement income give the level of cost

Attract new hires

- More mobile employees since benefits are earned more quickly under DC plans
- DC plans are also easier to communicate to employees
- Typically more appreciated by most employees even if they may not be equal in value to a DB plan

Shift responsibility for retirement to employee

- Asset risk is borne by the employee
- Benefits are typically not subsidized
- If the DC plan is a match based-plan, then not only is the employee responsible for managing the investments, but also is required to save their own money in order to earn any benefit from NOC
- A move to a DC plan will require substantial employee communications and education

Protecting legacy NOC benefits

- Can provide grandfathering to a select group of employees based on age/service for a certain period of time
- Another approach to protecting some of the accrued retirement income from the effects of inflation would be to grant pay run-up on past service benefits for the NOC DB plan
- Could also provide a tiered DC structure to provide higher contributions for higher ages

5. 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:

D123-07 Evaluating Portfolio Performance

D129-09 – How the Liability Benchmark is Developed and Used in Practice

Allen Ch. 24

Grader Commentary:

In this question, candidates were asked to evaluate the performance of a pension fund investment manager. A well-prepared candidate would be able to calculate the fund/benchmark performance for 2008 and 2009, and perform the calculations of the performance attribution analysis components. Finally, in addition to listing the characteristics of a market index, a well-prepared candidate would be able to recognize the characteristics of a liability that meets the market index definition.

Solution:

(a)

2008 fund	-0.30*0.41 + -0.26*0.19 + 0.08*0.32 + 0.01*0.02 = -0.146	
2009 fund	0.33*0.47 + 0.25*0.25 + 0.02*0.26 + 0.02*0.02 = 0.2232	
	(1-0.146)*(1+0.2232)-1 = 0.0446	(1+0.0446) ^ 0.5 - 1 = 0.0221
2008 benchmark	-0.33*0.5 + -0.24*0.15 + 0.06*0.35 + 0.03*0 = -0.18	
2009 benchmark	0.30*0.5 + 0.22*0.15 + 0.05*0.35 + 0.01*0 = 0.2005	
	(1-0.18)*(1+0.2005)-1 = -0.0156	(1-0.0156) ^ 0.5 - 1 = -0.0078

	2008	2009	Total	Annual
Portfolio - Actual	**-14.60%**	**22.32%**	**4.46%**	**2.21%**
Benchmark	**-18.00%**	**20.05%**	**-1.56%**	**-0.78%**
Difference with Benchmark (actual)	**3.40%**	**2.27%**	**6.02%**	**2.99%**

5. Continued

(b)

		2008	2009	
Net Contributions		0.0%	0.0%	Assumptions required
Risk Free		3.0%	1.0%	
Asset Category	wi(r benchmark -f)			Sum (asset category benchmark returns - risk free returns) using policy allocation weighs
		-21.00%	19.05%	Adjust answer based on risk free assumptions
Benchmark				Sum (manager benchmark returns - asset category benchmark returns)using policy allocation weighs, Since one manager per asset category, these returns are equal
		0.00%	0.00%	
Active	wi(r fund - r benchmark)			Sum (manager active returns - manager benchmark returns) using policy allocation weights
				Actual policy is acceptable
		1.90%	0.90%	=> Policy Allocation
		1.33%	1.40%	=> Actual Allocation
Allocation	balancing item			
		1.50%	1.37%	Active management based on policy
		2.07%	0.87%	Active management based on actual

Note: no points are rewarded if only the formula is written without any explanation.

(c)

List	**How**
Unambiguous	Liability cash flow can be replicated using swaps.
Investable	Cash flows can be replicated using physical securities making the benchmark investable.
Measurable	Discounted cash flow can be measured on a monthly or daily basis.
Appropriate	Pension plan assets exist to pay obligations.
Reflective of Current Investment Options	The LDI portfolio manager has access to detailed information regarding the component of cash flows since it is based on different information.
Specified in Advance	Actuaries estimate CF every year providing the basis for the benchmark construction.

6. Learning Objectives:

4. The candidate will understand alternative plan types that occur internationally.

Learning Outcomes:

(4b) Give examples of the structure of different plan types.

Sources:

D 104-07

Trend to a Global TCN Benefits Program for US Companies

Grader Commentary:

The successful candidate will remember the major points from the study note that covers multi-national pooling.

Solution:

(a) Multinational pooling enables the principles of experience-rating to be applied to the worldwide insurance arrangements of a multinational company. Rather than providing benefits through separate arrangements in each country, the parent company enters into a contract with an insurance network to share the profits and losses of the network's business with the subsidiaries of the parent company. Individual contracts are negotiated between the subsidiary and the local insurer. The individual contracts conform with local laws and practices. Each subsidiary company (the multinational company's local operation in a given country) makes a premium payment to the local insurance company/financial organization in return for the agreed coverage. The premium and/or the dividend may be linked to the actual benefits/claims experience of the local subsidiary. Dividends may be paid out of the insurer's profits at the end of the year.

(b) **<u>Advantages</u>**

- Reduction in overall insurance/benefits cost
- Primary means of enjoying economics of scale based on worldwide group size
- Group benefits from favorable experience and bears some of the risk of bad experience
- Cost reduction from receipt of dividends
  - When experience is unfavorable, worst case is cancellation of dividend
  - Cancellation could be for several years
- Dividends arise from the following factors : low claims, claims lower than average, pooling reduces risk for insurer, membership in network offers competitive advantage

6. Continued

- Annual accounting on centralized basis
- Centralized communication
  - Reduces administrative time and expense
- Relaxed underwriting
  - Risk of adverse experience reduced substantially, and insurance company more willing to raise/eliminate medical evidence limits

Disadvantages

- Insufficient number of ees located overseas
  - Typically, need at least 500 ees in at least 2 countries outside US and Canada
- Network's local insurer may not be competitive
- Network may not have a local representative
- In countries with blocked currencies, networks may have difficulty in pooling or in paying dividends outside the country
- Company/industry may have above average claims
- Local management may refuse to change carriers
  - Example of reason to refuse to change carrier: excellent service from existing carrier, national pride, long standing relationship
- In some countries, premium rates are extremely low, so the insurer's profit margin is low, and the risk of adverse claims experience may outweigh the expected additional multinational dividend

7. 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) The candidate will be able to 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

(1d) Given a plan type, the candidate will be able to 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

(2b) The candidate will be able to explain and apply restrictions on plan design features to a proposed plan design.

(2f) The candidate will be able to explain and apply rules governing the conversion from one type of plan to another.

Sources:

Allen Ch. 21

McGill Ch. 12

Grader Commentary:

As more plan sponsors are looking to eliminate traditional defined benefit plans, candidates should know the past issues, rules and complications of converting a traditional defined benefit plan to a hybrid defined benefit plan.

7. Continued

Well prepared candidates would have differentiated themselves by (a) describing the new hybrid rules brought about by PPA and mentioning some key points, and (b) providing a rough mathematical analysis in order to critique the two proposed plans with respect to lump sum accumulations, expected accruals during five year service periods, and expected pensions payable at normal retirement age, etc.

Solution:

(a) **Issues**

DC type benefit subject to DB rules

Definition of "rate of benefit accrual"

- Rate that benefits earned under formula
- Accrual rate measured at normal retirement age

Accrual rate at normal retirement age will always fail

- Interest credits on top of pay credits
- Older participant: Smaller accruals since less time for interest to be credited
- Younger participant: Larger accruals since more time for interest to be credited

New Testing Rules

Only applies for future years

Not discriminatory if accrued benefit is not less than it is for younger, similarly situated employee

- Early retirement subsidies are disregarded
- Determined under the terms of the plan
- Accrued benefit can be defined either as:
  - Annuity payable at normal retirement age
  - Balance of a hypothetical account, or
  - Current value of the accumulated percentage of the employee's final average compensation

(b)

(i) PPA has mandated A + B approach

- Eliminated "wear away"
- Early retirement benefit should continue to be paid as part of the pre-conversion benefit

Conversions allowed where opening account balance is not less than present value of pre-conversion benefit

- Determined using 417(e) assumptions on participant's annuity starting date
- Not the plan conversion date
- Ultimate benefit can be larger than opening account balance accumulated with credits

7. Continued

(ii) Must vest within three years of service
- Applies to all benefits, not just those from hybrid-benefit formula
- Reason for shorter vesting is presumably more mobile workforces covered by hybrid plans

(iii) Cannot credit more than market rate of return
Can provide rate that is max of fixed or variable rate
IRS has specifically approved only a limited number of rates as market rates of return
- Long-term corporate-bond rate used for funding purposes
- Rates previously specified as safe harbor rates for whipsaw calculations

PPA enacted "capital preservation requirement"
- CB account >= ER contributions at BCD

(c)

(i) Both plans offer lump sums
Attractive to younger mobile workers
More mobility for mid-career ees
Early accrual patterns improve perception of benefit

Profile 1: Benefits from portability

Profile 2: Benefits from portability

(ii) <u>Cash Balance Plan</u>
Indexed Career Average Plan
Age-neutral accrual
Benefit younger employees
Benefit employees with slower pay growth

7. Continued

Pension Equity
Final Average Pay Plan
Age weighted accrual
Benefit older employees
Benefit employees with faster pay growth ("fast tracker")

Profile 1: Benefits from CB

Profile 2: Benefits from PE

(iii) Pre-Retirement Protection
PEP protection through salary growth (FAP plan)
CB protection provided through interest crediting rate (Indexed Career Average Plan)

Post-Retirement Protection
PEP doesn't provide protection
CB protection provided through interest crediting rate

Profile 1: Young – Inflation protection valuable, preferred CB plan (current interest credit > salary growth)

Profile 2: Mid-career – Inflation protection less valuable

(iv) CB plans less correlation to income replacement because career average

PE plans directly correlated to income replacement because based on final pay

Profile 1: Larger benefit from CB plan

Profile 2: Larger benefit from PE plan

8. Learning Objectives:

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

Learning Outcomes:

(6d) Describe and explain the differences between a traditional and a financial economics perspective on the selection of assumptions

Sources:

Resource Manual on Selection of Actuarial Assumptions - 2009, pg. 20-30

Grader Commentary:

This is a question requiring candidates to explain how to use the substitution rule in the IRS proposed regulations to value expected future lump sums and other 417(e)(3) optional form payments when determining minimum funding requirements. A good candidate would be able to describe what the rule is and recommend how to use it with the lump sum and level income optional form payments, and then explain how to use the reverse substitution rule when dealing with a hybrid/cash balance plan.

Solution:

(a) Under the proposed rule, lump sums and other 417(e)(3) optional forms may be valued by "substituting" the underlying life annuity form for the 417(e)(3) form, but still using the 417(e)(3) unisex mortality in effect on the valuation date for the period AFTER the annuity commencement date.

Valued as annuity, these forms would then be valued using the applicable funding segment rates (reflecting any lookback month and phase-in option elections) or yield curve (reflecting any lookback month election for 2008 and 2009 only), not the actual 417(e)(3) spot rates.

The two option elections under the substitution rule are:

1. Phase-in election
   - Phases in the PPA 417(e)(3) segment rates over five years
   - This option is expected to increase the target liability
   - Since this would result in a higher minimum required contribution, this election would likely appeal only to employers wishing to maximize their tax-deductible pension contributions

2. Generational mortality
   - Optionally substitute a 50/50 unisex blend of the generational table for the period after the annuity starting date
   - Like the phase-in election, this alternative election will most likely increase the target liability

8. **Continued**

(b) **Lump Sum Option**

- At the payment date, the lump sum and the annuity have the same present value using 417(e)(3) assumptions.
- The 417(e)(3) assumptions and the described funding assumptions are almost the same except for the minor differences summarized below, which are either immaterial or addressed in the substitution rule:
  - The 417(e)(3) mortality table is a unisex table, but gender-specific annuitant or non-annuitant mortality tables are used for funding.
    - Because combined tables are a blend of the annuitant and non-annuitant tables, this difference should be immaterial in the long run.
    - Substitution rule explicitly addresses the gender-specific/unisex difference by switching to the unisex 417(e)(3) mortality table (or unisex generational table) at the annuity starting date.
  - After 2012, the 417(e)(3) segment rates and funding discount rates will be determined from the same corporate bond yield curve, but with different averaging periods.
    - One-month for 417(e)(3) and for plans using the yield curve vs. 24-month average for funding segment rates.
    - The difference in the averaging period should be immaterial in the long run, and is ignored by the substitution rule.
  - During 2008-2011 plan years, the 417(e)(3) segment rates reflect the phase-out of the 30-year Treasury rate.
    - In 2008-2009, the transitional segment rates reflect the phase-out of the old-law corporate composite bond rate.
    - These temporary differences also will be immaterial for most plans in the long run.
    - However, the substitution rule allows employers to optionally take the 5-year phase-out of the 30-year Treasury into account.
- Since the lump sum and the underlying annuity have the same present value on the payment date (except for the unisex mortality difference addressed by the method), they should also have the same present value on the measurement date. The easiest way to ensure this is to use the annuity substitution approach.

Recommend or not recommend.

Level Income Option

- The advantage of using the optional substitution rule for the level-income option is less apparent.
- The value of the lifetime annuity payments under a Social Security level income option (where the payment decreases at the leveling age) will be different for male and female participants.

8. Continued

- The expected future value of the Social Security level income payments for each participant would likely fall between the lump sum value using unisex mortality after the annuity starting date and the value of the straight-life annuity using gender-specific mortality after the annuity starting date.
- Theoretically, if more of the value of the benefit is paid up front (i.e., smaller benefit amount or benefit commencement age far from the leveling age), the value will be closer to the lump sum. When less is paid up front (i.e., larger benefit amount or benefit commencement age close to the leveling age), the value will be closer to the straight-life annuity.
- However, since the higher benefit participants usually control a larger proportion of the funding liability, and since the level income option is usually not utilized by a large portion of the participant population, we recommend not implementing the substitution rule for the level income option to minimize unnecessary complexity for the valuation.
  - Simply value the level-income option using gender-specific mortality based on a reasonable assumption for the conversion basis.
  - For example, the conversion basis applicable to annuities commencing during the valuation year would be reasonable to use for all future years.

Recommend or not recommend.

(c)

- The reverse substitution rule would substitute a lump sum for an annuity but then adjust the lump sum for the effect of gender-specific mortality.
- Like the substitution rule, this method helps preserve the fundamental equality between the lump sum and annuity values (but for the specific mortality adjustment similar to the substitution rule).
- This mortality adjustment would be made by multiplying the lump sum by the ratio of:
  1. An immediate factor using the funding segment rates (or yield curve) and the gender specific mortality table for funding, to
  2. An immediate annuity factor at the commencement date determined using the funding segment rates (or yield curve) and the 417(e)(3) unisex mortality.
- If most participants elect lump sums (rather than the annuity options), it may be possible to reflect the value of the annuity options in the target liability (TL) and TL normal cost by applying a loading factor to the values determined assuming all participants take lump sums.

8. Continued

- Separate loading factors should be developed for male and female participants at each potential annuity conversion age taking into account the probability of electing the annuity option as well as the difference in value between the lump sum and annuity payment forms.
- In theory, you might develop different loads by age and by date, reflecting expected changes in the segment rates over time. In practice, however, it is sufficient to develop a single table based on current funding segment rates as the mortality adjustment loads are not likely to be that sensitive to projected changes in the yield curve.

9. **Learning Objectives:**

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

Learning Outcomes:

(3a) Given a specific context, apply principles and features of executive deferred compensation retirement plans.

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

(3c) Integrate a plan for executives with the basic benefit plan.

Sources:

Allen Ch. 14

D804-09 – 409A and Non-Qualified Plan Design Considerations

Grader Commentary:

This question tests the candidate's knowledge of SERP objectives. A good candidate will not only be able to list these objectives, but also be able to use that knowledge to make practical design decisions that would accomplish the goal of mid-career recruiting. Also, the candidate must know the limitations placed on plan sponsors by IRC regulation 409A.

Solution:

(a)

- Restoring base plan benefits
- Providing additional benefits
- Mid-career recruiting
- Recognizing incentive pay or deferred comp
- Providing a uniform benefit (umbrella plan) to avoid any impact on retirement benefits due to executive transfers
- Golden handcuffs – Retention tool
- Golden handshakes – Early retirement incentive
- Uniform treatment of all executives
- Non-compete provisions

Currently in NOC's SERP:

- Restoring base plan
- Uniform benefit
- Golden handcuffs – Retention tool
- Golden handshakes – Early retirement incentive
- Uniform treatment

9. Continued

(b)

- Allowing service from the CEO's former employer to be included in the benefit calculation
- Including bonuses in the definition of pay
- Allowing lump sums to be paid at retirement
- Removing the 10-year service requirement on early retirement eligibility
- Increasing the accrual rate in the benefit formula for the first few years of employment
- Reducing the number of months in the "Best Average Earnings" definition
- Securing the benefit through a funding arrangement

(c)

- For lump sum option, election must be made within 30 days of plan entry
- Lump sum will be subject to a 60-month delay upon retirement
- Other Plan changes in part (b) are allowed under 409A but Plan would lose its grandfathered status for benefits earned prior to 1/1/2005
  - According to 409A, this happens when a plan is "materially modified"
  - Prior to the change, part of the benefit would not have been subject to 409A; now all of it is
- Establishing a funding arrangement is allowed under 409A but there are restrictions
  - Can't be established during a period of financial hardship
  - Must already have a plan provision that allows for a trust to be established
  - Benefits can't be paid out of a foreign trust
  - Contributions to a NQ trust can't be made if the company's qualified plan is not adequately funded