

DP-RU Model Solutions

Spring 2012

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

Learning Outcomes:

- (1a) Describe the structure of the following plans:
- Fixed dollar and pay-related defined benefit plans
 - Hybrid plan designs such as, cash balance, pension equity, and floor offset plans, target benefit plans
 - Defined contribution plans including 401(k) plans and capital accumulation plans
 - Retiree Health Plans
- (2b) Explain and apply restrictions on plan design features to a proposed plan design.

Sources:

Allen, Chapters 7 – 10

McGill, Chapter 11

Commentary on Question:

In this question, candidates are asked to demonstrate their knowledge of defined contribution plans. They are required to find similarities and differences among three common types of DC plans.

A well prepared candidate should be able to describe the features of each plan along with the basic details of the similarities and differences of each type of plan.

In part (a), a large number of candidates failed to mention catch-up contributions, and quite a few neglected to mention the Roth 401(k) option that some plans provide.

In part (b), most candidates offered a list of features for each of the three types of plans. However, they did not specifically identify the similarities and differences. Therefore, full credit could not be given if a feature was mentioned, for example, on the candidate's 401(k) and 403(b) lists, but not on his or her 457(b) list.

1. Continued

Rather than regurgitate memorized lists, successful candidates pulled together their knowledge of all three types and summarized that knowledge with a description of similarities and differences. Also, there are some ways in which the plans are similar (e.g., they all allow catch-up contributions) and different (403(b) plans allow catch-up contributions for employees with 15 years of service, even if they are under age 50).

Solution:

- (a) Describe the types of employee and employer contributions that may be made to a 401(k) plan.

Types of employee contributions include:

- Elective contributions – These are pre-tax deferrals authorized by an employee. They are subject to annual limits, which increase each year with inflation.
- Catch-up contributions – These are additional pre-tax deferrals allowed for participants age 50 or older.
- After-tax contributions – These are contributions made in excess of the annual pre-tax limit.
- Roth contributions – Post-tax deferrals that grow tax-free and are not taxed upon distribution. These are also subject to annual limits.

Types of employer contributions include:

- Matching contributions – These are contributions made to match an employee's deferral. The match may use a flat or graduated formula.
- Non-elective contributions – These are contributions made without regard to an employee's deferral election.
- Profit sharing contributions – These are contributions made according to a predetermined formula or at the company's discretion. The company is required to have a defined contribution allocation method.

- (b) Compare and contrast 401(k) plans, 403(b) plans, and 457(b) plans.

Similarities include:

- These are all tax-efficient ways to save for retirement
- Pre-tax contributions
- Pre-tax investment returns
- All have annual contribution limits
- Catch-up contributions are allowed
- Rollovers are allowed

1. Continued

Differences include:

- Plan sponsor eligibility
 - Only public educational institutions and certain nonprofit tax-exempt organizations are eligible for 403(b) plans.
 - Only government employers and certain tax-exempt organizations are eligible for 457(b) plans.
- Roth option
 - 401(k) and 403(b) plans have Roth options that allow you to contribute on an after-tax basis and receive distributions tax-free, 457(b) plans do not.
- Non-discrimination testing
 - 401(k) and 403(b) plans must be tested to make sure they don't discriminate in favor of highly compensated employees; 457(b) plans have no such requirement.
- Funding
 - 401(k) account balances must be held in a trust for the sole benefit of the employee.
 - No trust is required for 403(b) plans, though the benefit must be secured through the purchase of an annuity contract through either an insurance company or a mutual fund.
 - Funding requirements for a 457(b) plan depend on the plan sponsor. For government organizations, all assets are required to be held in a trust, custodial account, or annuity contract. For non-government, tax-exempt organizations, deferred amounts and earnings must remain the sole property of the employer until made available to participants.
- Loans
 - Loans are allowed in 401(k) plans, 403(b) plans, and government-sponsored 457(b) plans. No loans are allowed in 457(b) plans sponsored by non-government, tax-exempt organizations.

2. Learning Objectives:

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

Learning Outcomes:

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

Sources:

Allen, Chapters 6, 8, 17, 21

McGill, Chapter 11

R-D101-07

Commentary on Question:

In this question, candidates were asked to demonstrate their understanding of the key features of cash balance and profit sharing plans as well as the various transition approaches that can be used when converting from a defined benefit plan. Finally, candidates were asked to demonstrate an understanding of the wear-away phenomenon that affects cash balance plans.

A well prepared candidate would have been able to list the plans' features that address management's objectives and concerns as well as list and explain the various transition approaches a plan sponsor could use when making changes to their pension plan. Finally, a well prepared candidate would have been able to describe the wear-away provision.

In part (a), successful candidates noted that sponsors of cash balance plans were still exposed to interest rate and investment return risk, while sponsors of profit sharing plans were not.

In part (b), successful candidates listed a number of ways that benefits of current plan participants could be treated. Less successful candidates listed one or two ways and described them in great detail, while failing to mention other options.

2. Continued

In part (c), successful candidates described wear-away and also described its implication for changes to *both* a cash balance plan and a profit sharing plan. Many candidates commented on the implications to a cash balance plan, but failed to comment on the profit sharing plan implications.

Solution:

- (a) Compare and contrast the key plan design features of cash balance plans and profit sharing plans, in light of management's concerns.

Cash balance

Cash balance plans are defined benefit plans that are meant to resemble a defined contribution plan from the participant's perspective. Participants earn pay credits that accumulate with interest in a notional retirement account. Upon retirement, the benefit is paid as a lump sum or an annuity.

In light of the volatility and level of contributions, the cash balance plan will help control these as compared to the current final average pay defined benefit plan. However, the plan sponsor is still exposed to investment and interest rate risk. The plan is still subject to minimum funding requirements under ERISA. Therefore, the contributions will still have some volatility and unpredictability.

In light of benefit adequacy, plan participants can easily estimate their benefit in advance since the pay credit and interest credit are usually specified in advance. Also, the benefit is portable.

Profit sharing

Profit sharing plans are defined contribution plans. Participants have their own account balance, and they are usually in charge of the account's investments. Participants may take loans against their balance, and the benefit at retirement is paid as a lump sum.

In light of the volatility and level of contributions, there is great flexibility and predictability. The contribution is often set as a percentage of company profits, but it can also be a discretionary contribution (though contributions must be substantial and recurring). The contributions are not affected by changes in interest rates.

In light of benefit adequacy, the plan participants bear the investment risk, so the benefit adequacy is, in part, based on the investment returns achieved by the account. Also, the benefit depends on the level of contribution made by the employer, which can't be predicted in many cases. Like the cash balance plan, the benefit is portable.

2. Continued

- (b) Describe the various transition approaches that could be used by your client with respect to the current DB plan participants.

One option is to freeze the current plan and move all employees to the new plan (either the cash balance or profit sharing plan). The plan sponsor would also have to decide if only service would be frozen, or if both pay and service would be frozen. Freezing service only, but allowing pay to increase, would provide some inflation protection.

Another option is to grandfather certain participants in the old plan, and move everyone else to the new plan. The grandfathering criteria could be based on age, service, or points. Usually, the plan sponsor would want to target those employees most negatively affected by the plan freeze.

A third option is to freeze the current plan and move all employees to the new plan, but give a transition benefit to those negatively affected. For example, the plan sponsor could provide additional DC contributions to those over a certain age at the freeze date.

A fourth option would be to close the plan to new entrants. Current DB participants would remain in the FAP plan until their retirement, but all new hires would enter the new plan (either cash balance or profit sharing). This would result in no impact to current participants' benefits, but it also would result in minimal savings for the plan sponsor in the first few years.

Finally, the plan sponsor could offer a choice to current DB participants between the current plan and new plan. This gives more flexibility to participants, but it also increases the administrative requirements and the cost in the first few years, as participants will likely choose the most valuable plan.

- (c) Describe "wear-away" and its implications on your client's plan design decisions.

After the conversion from a traditional DB plan, a participant's benefit could be defined as the greater of the pre-amendment accrued benefit or the benefit determined by applying the new benefit formula to all of a participant's years of service before and after the amendment creating conversion. When a participant's pre-amendment accrued benefit was greater than the benefit provided under the new formula, there may have been a period during which the participant would not accrue any additional benefits. Therefore, for these participants, the accrued benefit could stay level for several years, resulting in no accruals until the new formula results in higher benefits than the "frozen" accrued benefit under the current plan. This phenomenon is known as "wear-away" and will most likely affect older employees more than younger employees.

2. Continued

For the change to the cash balance plan, there will be no wear-away impact because PPA no longer allows it. PPA now requires an A+B approach.

For the change to the profit sharing plan, there will be no wear-away impact because a profit sharing plan is a defined contribution plan. Therefore, wear-away does not apply.

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

Learning Outcomes:

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

Sources:

Yamamoto, Fundamentals of Retiree Group Benefits, Chapter 4

Yamamoto, Fundamentals of Retiree Group Benefits, Chapter 9

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

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

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

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

Commentary on Question:

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

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

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

3. Continued

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

Solution:

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

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

Introduce retiree contribution

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

Redefining eligibility requirements

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

Reduce Benefits Level

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

3. Continued

Introduce Provision to Managed/Reduce Health Cost

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

Other Plan Design Strategies

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

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

Health Care Trend Rate

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

3. Continued

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

Retiree Contribution

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

Plan Participation

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

Retirement & Termination Rates

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

Discount Rates

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

4. Learning Objectives:

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

Learning Outcomes:

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

Sources:

Allen, Chapter 24

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

Commentary on Question:

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

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

Solution:

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

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

Advantages to using a consultant include:

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

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

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

4. Continued

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

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

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

4. Continued

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

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

Two most popular forms of passive investing:

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

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

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

4. Continued

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

Government Bonds

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

Recommend as appropriate or not

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

Derivatives

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

4. Continued

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

Recommend as appropriate or not

Potential topics candidate may address in recommendation:

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

Real Estate

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

5. Learning Objectives:

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

Learning Outcomes:

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

Sources:

2009 Selection of Actuarial Assumptions - Mercer Resource Manual

ASOP 27 – Economic Assumptions

ASOP 35 – Demographic Assumptions

Yamamoto, Chapter 20

Commentary on Question:

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

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

Solution:

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

Commentary on Question:

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

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

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

5. Continued

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

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

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

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

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

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

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

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

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

5. Continued

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

Commentary on Question:

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

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

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

Important reasons for variance include differences in:

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

6. Learning Objectives:

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

Learning Outcomes:

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

Sources:

SN: GAO – State and Local Government Plans – Structure and Funded Status

Commentary on Question:

In this question, candidates were asked to comment on the recent trend in public and private retirement plan design and to demonstrate their understanding of the differences between public and private DB plans. A well prepared candidate would have commented that the public sector is dominated by traditional final average pay DB plans and the private sector has shifted from DB to DC. In addition, a well prepared candidate would have been able to discuss two to three differences between private and public plans as it relates to benefit structure, protection of benefits, funding approaches and investment policies. Some candidates misinterpreted the question and responded with differences in company-sponsored plans and the Social Security program. However, the question dealt with plans sponsored by private companies and public entities.

Solution:

Explain the differences between US public and private sector defined benefit plans with respect to the following:

- (i) Benefit Structure

Public – Most public entities have a DB plan as their primary plan. Some have a complimentary DC plan, but very few have a DC plan as their primary plan. Most public DB plans are final average pay plans.

6. Continued

Private – Many companies have begun to shift from final average pay plans to either hybrid plans or defined contribution plans. The DB plan is often frozen, and in many cases, the DC plan is the company's primary plan.

(ii) Protection of Benefits

Public – Most public plan benefits are protected by state or local laws. Benefits are not protected from bankruptcy, but the justification is that governments are assumed to never go bankrupt, as they have the ability to raise taxes to meet their financial needs.

Private – Private plans are protected by ERISA regulations, which define vesting requirements and participation requirements. ERISA also protects the accrued benefit, meaning it can't be reduced by plan sponsors. In the event of bankruptcy, benefits (up to a certain level) are protected by the PBGC. Companies pay premiums to the PBGC depending on the participant counts and the plan's funded status.

(iii) Funding Approaches

Public – Most public plans require employee contributions, which are tax deductible. Plans target roughly an 80% funded status, as excess funds may be used for other purposes. Contributions can be spread over 30 years, and the entity does not have to contribute the Annual Required Contribution.

Private – Employee contributions are much less common, as they are not tax deductible. Plans target a 100% funded status, and contributions to fund the shortfall are spread over seven years. Plans must meet the Minimum Required Contribution as determined by the annual actuarial valuation.

(iv) Investment Policies

Public – Assets are managed by a board of trustees. Assets may be used for purposes other than paying plan benefits in many states. Certain standards should be in place to describe how the retirement system should be funded.

Private – Assets are managed by the plan sponsor / trustee. Assets must be invested in the participants' best interest, and they can only be used to pay benefits and certain expenses.

7. Learning Objectives:

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

Learning Outcomes:

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

Sources:

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

R-D108-07

Turner – Pension Policy – Chapter 5

Commentary on Question:

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

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

Solution:

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

Commentary on Question:

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

Full-Time participants:

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

7. Continued

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

Part-Time participants:

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

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

Commentary on Question:

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

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

7. Continued

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

Commentary on Question:

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

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

8. Learning Objectives:

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

Learning Outcomes:

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

Sources:

R-D123 - 07

Maginn and Tuttle – Chapter 12

Commentary on Question:

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

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

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

Solution:

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

Commentary on Question:

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

1. Performance measurement

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

2. Performance attribution

- For Macro level analysis, we need the following inputs in order to value the return on a macro level:
 - Policy allocations
 - Benchmark portfolio returns
 - Fund returns, valuations and external Cash Flows

8. Continued

- For Micro level analysis
 - Sector weighting/stock selection attribution
 - Fundamental Factor Model attribution
 - Fixed Income attribution
 - 3. Performance appraisal
 - Goal is to determine if performance luck or talent
 - From the previous 2 steps
 - Determine the risk adjusted performance appraisal measures
 - Use quality control charts
 - Interpret quality control charts
- (b) Calculate the following performance ratios
- (i) Ex post alpha (Jensen's alpha)
 - (ii) Treynor measure
 - (iii) Sharpe ratio

Commentary on Question:

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

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

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

10.2800%

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

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

9.0000%

Alpha (definitions in [])

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

-0.12%

Treynor (definitions in [])

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

6.90%

Sharpe (definitions in [])

$$(R_a [\text{portfolio return}] - r_f [\text{risk free = cash}]) / \text{standard deviation}$$
$$(0.1028 - 0.02) / (0.25 \wedge 0.5)$$

8. Continued

- (c) Compare and contrast the different ratios.

Commentary on Question:

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

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

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

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

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

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

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

9. Learning Objectives:

8. The candidate will be able to evaluate the actuarial considerations in plan options and administration.
11. The candidate will be able to apply standards of practice and the guides to professional conduct.

Learning Outcomes:

- (8b) Assess the impact of applicable regulation.
- (11d) Explain and apply all of the applicable standards of practice related to valuing retirement obligations.

Sources:

ASOP 34

Commentary on Question:

In this question, candidates were asked to demonstrate their understanding of what an actuary should consider in expressing an opinion about whether a DRO is a QDRO, what the key elements are in the selection of an allocation method to determine the marital portion of benefits under a DRO, and how to calculate the marital portion of the accrued benefit under a DRO.

A well prepared candidate would have provided a response to these items consistent with ASOP 34. A well prepared candidate would list most of the main points as described in ASOP 34 concerning considerations about whether a DRO is a QDRO. In addition, a well prepared candidate would discuss the key elements in selecting an allocation method and provide some detail about the different methods. A well prepared candidate would be able to use the data provided to calculate the marital portion of the accrued benefit two different ways using the direct allocation tracing method and/or the fractional rule allocation method.

Solution:

- (a) Discuss the considerations for an actuary in expressing an opinion as to whether a Domestic Relations Order is a Qualified Domestic Relations Order.

Commentary on Question:

Credit was not given for stating the precepts of the Code of Conduct or for simply stating that an actuary needs to follow the ASOPs.

An actuary may offer an opinion as to whether an order meets the qualification requirements. The actuary should clearly state the scope of such opinion and indicate if it is limited to technical content. The actuary should not provide a legal opinion unless the actuary is also a lawyer. To be a QDRO, a DRO must satisfy the statutory requirements (of the IRC and ERISA).

9. Continued

The division of benefits must be pursuant to something legal (a judgment, decree, or an order under the laws of the state).

- (b) Describe the key elements in the selection of an allocation method to determine the marital property portion of defined benefit plan retirement benefits under a domestic relations action.

Commentary on Question:

This question asked for elements in the selection of an allocation method and not key data elements needed to determine the benefit and spouse's portion.

Different allocation methods may be used to determine the portion of the benefit that is marital property. Different allocation methods can produce significantly different results. The allocation should be reasonable and legally acceptable under the jurisdiction of the parties involved. The actuary needs to consider how to allocate age or service dependent benefits if the covered party has not yet satisfied the age or service conditions. The actuary should be prepared to justify any selection, to educate the client about the different methods, and to explain the general financial impact of different methods.

- (c) Calculate the portion of the accrued benefit that is marital property under two allocation methods.

Commentary on Question:

There was inconsistent service data included in the text and chart for this question. Answers that included a correct calculation based on either part of the data provided received full credit. There were more than two possible ways to allocate benefits, for example the fractional method could be based on service or salary.

The direct tracing method can be used (marital portion equals accrued benefit at date of divorce less accrued benefit at date of marriage).

\$5,710 (accrued benefit at date of divorce) minus \$2,775 (accrued benefit at date of marriage) equals \$2,935 (portion of benefit that is marital property)

The fractional rule allocation method based on elapsed time can be used (marital portion equals accrued benefit at allocation date times a fraction where the numerator is the time accruing benefits while married and the denominator is the total time over which benefits accrued).

\$9,930 (accrued benefit at term) times 3 (service during marriage) divide by 10 (total service in plan) equals \$2,979 (portion of benefit that is marital property)