Institute of Actuaries of India

Subject SP4 – Pensions & Other Benefits

November 2023 Examination

INDICATIVE SOLUTION

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable.

Solution 1:

i) Investment risk

- Since employer is responsible for making investment decisions, no investment risk for either participant for the DB plan.
- For the DC plan, employer provides participants with a range of investment options. Participants are responsible for allocating their funds and individually bear investment risks; they will have less money to provide income in retirement if make poor investment decisions or if investments do not perform as well as expected.
- Participant A might not be investment savvy given their age and may make poor investment such as high stock allocation. Unfavorable event (e.g., sharp drop in stock market) is a particular concern for Participant A because he lacks enough years before retirement to recoup losses.
- Participant B bears the investment risk for a longer time and may gain greater investment knowledge over time. If he used default funds as an investment option, they would automatically shift investments from riskier assets (stocks) to more stable assets (bonds) as he progresses towards retirement and help mitigate his investment risk.

Longevity risk

- DB plan retirement benefits are typically distributed as an annuity, which hedges longevity risk.
- Under the DC plan, it is likely that most members may take the accumulated balance as a lump sum (up to the maximum permissible). Both participants face longevity risk if DC benefits are taken as a lump sum.
- Longevity risk is largely contained for Participant A if DB plan benefits are distributed as annuity. Moreover, major portion of his pension will be though the DB plan.
- After taking lump sum from the DC plan, Participant B must decide how to utilize the account to finance retirement. They may outlive their assets if they draw down the benefits too quickly. Conversely, they may unnecessarily reduce consumption and leave more wealth than intended at death if he draws down benefits too slowly.

Inflation risk

- Risk is minimal for the DB plan (pension may be adjusted to reflect increase in cost of living). Participants of the DC plan are subject to inflation risk at both accumulation and drawdown phase (the extent depends on how benefits are distributed in retirement).
- Given DB plan is frozen, Participant A is subject to some inflation risk, as the final average earnings will not reflect his final year of earnings. Less inflation risk at the accumulation phase of the DC plan for Participant A as he is fairly close to retirement.
- In contrast, Participant B's DC plan benefits will be based on average salary over virtually his entire period of service with the Company (if he works until retirement).

[Max 12]

ii)

- Voluntary contributions may result in some participants having low or no contribution balance in the plan.
- Matching contributions on voluntary employee contributions only (i.e., no core company contributions) reward only eager participants.
- May result in delayed retirement for low or non-savers.

- Withdrawals increase the risk of insufficient funds at retirement.
- DC plan exposes participants to investment risk compared to current DB plan design.
- Capital may not be guaranteed.
- DC plan may offer lump sum option at retirement, which increases risk of members not having enough when they age
- DC plan may expose participants to potential longevity risk compared to current DB design.
- Exposure to inflation risk, as pension unlikely to be linked to inflation.
- Plan may not be tax efficient, both from employee and employer contribution perspective

[Max 5]

iii)

- The DC plan should be changed to include auto-enrollment (or mandatory enrollment) so that participation is automatic and will maximize participation.
- The DC plan should be changed to not allow partial withdrawals so that retirement savings and investment returns are maximized.
- The DC plan should be changed to allow for a higher company contribution maximum so that high earners (or higher savers) get a full match on more contributions.
- The DC plan could be changed to allow the company contribution to be stretched over more contributions – e.g., could be a lower match proportion to encourage participants to contribute more to maximize the match.
- The DC plan should be changed to provide a basic level of core company contribution without requiring participants to make additional contributions to increase retirement savings potential and ensure basic level of coverage for all.
- For the first 1-2 years, employer to contribute (without requiring employee contributions) to incentivize.
- The DC plan should have auto-escalation features to maximize contributions, e.g. the absolute limit of INR 250k can be revised every year in line with inflation.
- The plan can have default investment options where equity / bond exposures get re-allocated based on age.
- Provide a minimum assured return guarantee, or at least capital guarantee.
- Have a minimum proportion of the accumulated balances paid out as annuity.
- Employer could educate employees in respect to their responsibility to save for retirement.

[Max 5]

iv) **From a Plan sponsor perspective:**

For all distribution options:

- No risk on plan sponsor, since employer is not guaranteeing payments for life

For single lump sum option:

- Aligns with desire for separated participants to completely exit the plan
- Little control of potential unexpected large payouts which will affect investment strategy and liquidity

For partial withdrawal option:

- Can set limitations on min/max withdrawal amounts each year to control expected distribution (and investment horizon considerations)
- Allows terminated/retired employees to take advantage of group investment benefits (lower fees, better access to investment managers and options)

- Need to consider fiduciary duties, and associated risks

For annuity option:

- Good option in supporting retirees' financial security by removing longevity risk away from member
- If purchased with insurer, then risk passed on to insurer
- Additional effort required for long-term management/administration of employees' retirement funds, or the need to administer and purchase group annuities

From a Plan participant perspective:

For single lump sum option:

- Need to assess options of where to move the funds, e.g. purchase own annuity, other retirement funds
- Have control over investment of own retirement asset
- Easy to understand
- Can also be risky for retirement security if retirees do not have sufficient financial awareness, and overspend early on in retirement

For partial withdrawal option:

- Offers flexibility for retirees
- Easy to understand
- Have access to funds if need it, but still can take advantage of benefits of group investment (lower fees, better access to investment manager and options)
- Can also be risky for retirement security if retirees do not have sufficient financial awareness, and overspend early on in retirement

For annuity option:

- Reduced longevity risk and better financial security in retirement
- Lack of control, and more complex; harder to understand
- May need to choose the most appropriate form of annuity
- Guaranteed income for life; can mimic a DB plan
- Can take advantage of better group annuity rates than if purchased by self

[Max 8]
[30 Marks]

Solution 2:

i)

- Cash cost of providing retiree medical benefits is increasing fast, typically faster than other company cash costs
- Medical inflation is higher than general inflation, further increasing the cost of providing such benefits
- Life expectancy has gone up, increasing the duration over which such benefits are paid
- Such benefits create a Defined Benefit Liability, which needs to be reported under Accounting Standards

- Often, no additional tax benefits available to the sponsor with respect to such plans
- Benefits are provided only if employee retires from the company. Employees are more mobile now and less focused on long-term careers and loyalty
- Because workers are less loyal and have more independence, there is less incentive for employers to feel social responsibility for providing retiree benefits
- Benefits are seen as valuable by only a minority of active employees until closer to retirement age.
- Competition is more global across many industries. As other competitors eliminate or do not establish retiree plans, it becomes easier to reduce or remove these programs

[Max 4]

ii) Option 1: cost sharing on annual premiums/costs (i.e., recommend less than 100% employer paid coverage)

- Introduce cost sharing for retirees and spouses
- Reduces health care costs as retirees contribute a portion of the cost to the plan to cover premiums
- Increases in health care costs, via rising premiums/annual costs, can be shared between retirees and plan sponsor
- Could introduce higher cost sharing for spouses to discourage spouses from participating in the plan if they have coverage elsewhere
- Introducing retiree contributions, XPCL might see lower participation rates if retirees have coverage elsewhere, which will reduce exposure to rising health care costs

Option 2: change eligibility for spouse coverage

- Recommend that spouse's coverage terminates upon death of eligible retiree
- Survivor provision where coverage continues for the life of the spouse means that the plan sponsor continues to be exposed to rising health care costs after the death of the retiree for the duration of the spouse's life
- If the spouses are on average younger than retirees, then XPCL can expect to make payments for longer, increasing exposure to rising health care costs

Option 3: introduce out of pocket costs/ fees in the benefits

- Introduce a deductible, copay or coinsurance percentage
- All three options are a form of cost sharing where the retiree or spouse would have an out-of-pocket cost associated with their claims
- Fixed deductibles are not very effective at protecting against rising health care costs if they do not increase with inflation over time (they become a smaller and smaller portion of the total claim cost)
- A coinsurance percentage may be more effective since retirees will share in the exposure to rising health care costs, so that plan sponsor does not take all the risk
- When they are sharing a portion of the claim, the retiree may be incentivized to find a lower cost provider or seek a lower cost alternative, thus helping keep health care cost inflation in check.

Option 4: cap exposure with a lifetime maximum, or maximum age up to which benefits are paid

- Implement a lifetime maximum
- A lifetime maximum limits XPCL's exposure by capping claims paid to an individual
- The lifetime maximum is usually fixed, so as health care costs increase it provides greater protection as retirees will hit the lifetime maximum sooner

- Once the lifetime maximum is reached, no further claims are paid, and XPCL is protected from further increases in health care costs
- In the case of maximum age, say 75 years, no further exposure after this age is reached. This also protects against longevity risk.

[Max 8]
[12 Marks]

Solution 3:

i)

- Given that the social security plan only covers pay up to a limit, integrating social security into the company's plan is a way of making the replacement ratio provided by the plan equitable for both high and low earners.

- Integrating social security into the plan allows the employer to account for the benefit the members receive from social security, which allows the employer to avoid giving an overly generous benefit.

- Since plan sponsors often contribute to social security, offsetting the social security benefit from the pension plan is a way to avoid "double-paying," allowing them to save on cost.

[Max 2]

ii) 1. Contribution offset

E.g. if the sponsor's original formula was contribution of 10% of pay and the expected value of the social security benefit on earnings up to the integration point was 5% of pay, the formula for the sponsor could be a contribution of 5% of pay up to the integration point and 10% of pay over the integration point

2. Ignore a portion of the member's covered earnings

E.g. if the average earnings for an employer are 1,000,000 per annum and their benefit formula is a 10% contribution, the employer could change the formula to be a 10% contribution on earnings over 500,000 (assumes value of social security benefit is ~5% of pay)

[Max 3]

iii)

- Employer's plan only covers service at employer (typically) while social security covers service across entire career
- The employer plan and social security may have different definitions of covered earnings (e.g. social security only covering earnings up to 500,000 while employer plan covering all earnings)
- The employer plan and social security may have different normal retirement dates
- The employer plan may use different compensation than social security, e.g., the employer plan may exclude bonuses/overtime while these may be included in social security earnings
- The social security benefit may change over time which can cause difficulty in integration
- The social security benefit is indexed, meaning its value will be influenced by inflation, while the employer plan benefit may not be indexed.

[Max 3]
[8 Marks]

Solution 4:

i) Reasons for analysing surplus

- Analysing surplus is part of the "Monitoring of experience" stage of the actuarial control cycle. It is one of the regular reviews that lead to an amendment of objectives and assumptions in the light of experience.
- To provide an independent check on the valuation result.
- To indicate those features of the past experience most likely to recur.
- To measure the relative financial importance of departures from what was expected.
- To provide useful background information to help when communicating to the client the reasons for changes in the funding level and contribution rate.

[Max 2]

ii) ***Surplus carried forward from previous valuation***

Any surplus at this valuation would partly be due to any surplus at the previous valuation. However, there was no surplus at the last valuation *if* assets were taken at pure market value …
… or a discounted cash-flow approach used and at that time discounted value equalled market value, or any smoothing factor was 1.

Investment experience

It would appear that there has been a good return on assets.

To estimate what that return may have been, a *much simpler approximate calculation might assume that contribution income and benefit outgo cancel each other. This approach gives a return of 14.5% pa.*

If the expected return had been achieved, we would have assets worth an estimated:
$200 \square\square(1.06)\ \text{^}3 + 3 \times (13.5 - ½ \times (10+15)) \times (1.06)\ \text{^}1.5 = 242$

In isolation, this rate of interest has therefore produced a surplus of around 58*m* over the three years against the assumed rate of 6% *pa*. The total surplus is 100*m* so it would appear that excluding this item, there is a surplus of some 42 *m*.

Of course, assets might not be valued at market value!

For an ongoing valuation, a market value of assets is usually used.

Salary experience

There is insufficient data to make a proper analysis.
Average salaries are a useful indication, but it is the salary history for those members with longer past service that is important.
The average salary has risen from 6,500 to 8,000 – an annual increase of 7.1%.
The overall effect may be a source of surplus or a source of deficit.
For example, if members with larger past service liabilities (*eg* senior managers, older members) have received higher than average salary increases at the expense of the other members, salary experience would be a source of deficit and *vice versa*.

New entrant experience

Scheme membership has increased given that the number of pensioners have increased as well, which suggests there are new entrants. This could be a source of surplus or deficit.

For example, it would be a source of surplus if the Projected Unit Method has been used with an implicit assumption of a stable population, since contributions are coming if the average age of the scheme decreases.

Withdrawal surplus / deficit

The effect of withdrawal experience depends on the relative values of the benefits paid on withdrawal and the reserves held in the scheme if the employee had remained an active member of the scheme.
The benefits on voluntary withdrawal are typically less than the reserve in the scheme, since the link to salary is lost, so withdrawals are typically a source of valuation surplus.

However, whether or not withdrawal experience is a source of surplus on the valuation basis will depend on the level of withdrawals assumed versus those experienced.
A larger than expected number of withdrawals would produce a surplus on the valuation basis, whilst a lower number than expected would produce a deficit.
Many employees have joined this scheme over the period and have left as well (Net impact is zero in contributing numbers), but these may also have occurred through retirement, death or a one-off redundancy exercise.
The number of pensioners and deferred pensioners increased by 2,000 over the period.
Without knowing what rate of withdrawal is assumed in the valuation, we cannot say whether this item gave rise to surplus or deficit over the period.
An educated guess based on the relative reduction in active members of the scheme in comparison to the increase in the pensioners and deferred suggests that there may have been more withdrawals than expected, and so this was an item of surplus.

Mortality surplus / deficit

For *deaths in service*, this item may give rise to:
a major release of surplus (if the benefits are fully insured)
a major source of deficit (if benefit is uninsured and exceeds member's reserve)
or have little impact if:
– the benefits are partially insured
– the death benefit is similar to the reserve held, or
– the actual number of deaths is close to that assumed.

In this case, as stated in the question, the death benefit in service is fully insured and hence the death benefit might have contributed as major source of surplus.

In this case, *pensioners* account for a very large proportion of total liabilities, and so pensioner mortality experience may be significant for the scheme's finances.

A larger number of such deaths in excess of those expected would give rise to a surplus; lighter mortality than anticipated would produce a deficit.

The numbers of people involved are fairly large. This would be expected to give rise to a fairly stable number of deaths.

Therefore, if the scheme basis is realistic, the item is unlikely to be a significant source of either surplus or deficit.

However, if the scheme basis is cautious (*eg* mortality too low for pensioners) then the item could be a significant source of surplus.

Retirement experience

Normal retirements should not usually give rise to a surplus or a deficit on the valuation basis because they are expected to occur.

Early retirements can have a significant impact on the financial condition of the pension scheme.

A surplus may occur on a member's early retirement if the value of the early retirement pension is less than the reserve held for the member (*ie* penal early retirement factors used). Conversely a deficit will occur when early retirement pensions are generous (*eg* when the accrued pension is paid without reduction).

For the scheme as a whole, a surplus on early retirements could arise in one of two ways:

- if individual retirements were on generous terms and *fewer* were experienced than were expected, *or*
- if the terms were penal and *more* were experienced than were expected.

Pensions payable to members retiring on grounds of ill health are often more generous than on voluntary early retirement, so each case of ill-health retirement may be a source of deficit.
However, the effect on the scheme as a whole will depend on the number of ill-health retirements expected. If there are fewer than assumed, this may be a source of surplus.

There appears to have been a large number of retirements from this scheme, so this may have had a large impact (depending on the terms for early and ill-health retirement).

Pension increases

Increases to pensions in payment that are not provided for in the valuation basis will have a significant impact – particularly in view of the fact that the pensioner liability probably accounts for over 50% of the total liability.
Have there been any discretionary increases to pensions in payment? If these were not allowed for in the previous valuation, the item could be significant.
For example, if 2*m* of the 5*m* increase in pensions was unexpected, this could account for a deficit of approximately 30*m* (assuming an average annuity for pensioners of 15).

Contributions paid

We do not know what contributions have been paid into the scheme. If these were less than the value of liabilities accruing, this could be a significant item of deficit.
If the contributions were calculated using a funding method that generates a surplus (and those contributions were paid) this would lead to an improvement in the funding position.

Benefit changes

Benefit changes which are for future service only will have no effect on the past service liability, or the financial position as shown in the question.
Changes which affect past service benefits may have a large impact on the financial position of the fund (*eg* promising more generous pension increases).

Changes in valuation assumptions

A change in the valuation assumptions since the previous valuation could have had a major impact on the scheme.
For example, the gap between *i* and *pension increases* will have a major impact on all liabilities, whilst a changes in the gap between *i* and *salary growth* would have affected the active liability greatly. Other changes would also have an effect.

Change in valuation method

A change from, for example, the Entry Age Method to the Projected Unit Method can substantially alter the level of the actuarial liability. However, the words "past service liability" normally refer to a Projected Unit Method or Attained Age Method actuarial liability, so this item is unlikely to be relevant here.

Conclusion
Looking at the market value of assets, the most important item of those listed above was almost certainly the favourable investment return relative to salary growth.
Further information is required to be more definite on the individual impact of the other items, which probably collectively reduced the surplus.

[Max 18]

iii) The difference between actual and expected investment returns may be due to:

- actual running yield (eg dividends from shares) different to that assumed
- actual growth of capital values different to that assumed
- actual growth of income stream different to that assumed
- actual reinvestment rates different to those assumed
- change in portfolio of assets
- the borrower defaulting
- changes in tax rates
- changes in expenses.

[4]

iv) When a surplus is revealed following the valuation of a final salary pension scheme, the scheme's trustees and sponsor (usually the employer) must decide how to manage the surplus. The course of action they take will depend on various factors, including the scheme's rules, legal requirements, and the specific circumstances of the scheme.

When a surplus is revealed following the valuation of a final salary pension scheme, particularly due to higher-than-expected investment returns, one specific action that the scheme may consider is:

Benefit Improvements:

Increase Pension Benefits: The scheme trustees may choose to use the surplus to increase the pension benefits provided to members. This can include raising the pension payment amounts or providing additional benefits, such as cost-of-living adjustments or early retirement options.

Example: If the scheme initially projected to provide members with a fixed pension amount upon retirement, the surplus could be used to increase the pension payments, providing members with a more comfortable retirement income.

Reduction in Member Contributions: Alternatively, the surplus could be used to reduce or eliminate member contributions temporarily, giving members a break from their pension contribution obligations while maintaining their benefits. However, they must be cautious not to undermine the long-term sustainability of the scheme by reducing contributions too aggressively.

Benefit improvements can be a way to reward scheme members for the scheme's strong performance, and it can enhance the attractiveness of the pension scheme, making it more competitive for both current and potential members. However, the decision to increase benefits should be made carefully, taking into account the long-term financial sustainability of the scheme and the potential impact on the sponsoring organization. Additionally, legal and regulatory requirements must be considered when making such changes to a pension scheme.

Here are other possible courses of action, along with comments on their suitability:

Leaving the Surplus in the Scheme:

This approach involves keeping the surplus within the pension scheme, which can help to strengthen the scheme's funding position and provide a buffer against future funding deficits.
This is suitable particularly in cases where the surplus has been arisen due to one-off event e.g. higher than expected interest rates
It may be suitable if the scheme's rules allow for this option and if the trustees and sponsor believe that maintaining a healthy surplus is prudent.

Additional Funding for Scheme Improvement:

Trustees and sponsors may decide to use the surplus to fund measures that improve the scheme's long-term sustainability, such as implementing a more conservative investment strategy or reducing scheme risks.

Some schemes may offer members the option to exchange future pension increases for a higher initial pension lump sum. This approach can reduce the scheme's long-term liabilities and may be suitable if members are willing to make this trade-off voluntarily.

Legal and Regulatory Compliance:

Whatever course of action is chosen, it must comply with legal and regulatory requirements. Trustees and sponsors should seek legal and financial advice to ensure their actions align with applicable laws and regulations.

Communication and Transparency:

Regardless of the chosen course of action, transparent communication with scheme members is essential. Members should be informed about the surplus and any decisions made, as well as the potential impact on their pensions. The suitability of each course of action will vary depending on the specific circumstances of the pension scheme, its funding level, the preferences of scheme members, and legal constraints. Trustees and sponsors should carefully consider these factors and seek professional advice to make informed decisions that protect the interests of both scheme members and the long-term sustainability of the pension scheme.

[Max 10]
[34 Marks]

Solution 5:

i) How summarized information along with the financial records of a funded pension scheme can be used to check valuation data

In some cases, it may be appropriate to use summarised data instead of detailed membership data.
However, it should be recognised that the reliability of the values will be reduced as full validation of the data will be impossible. Additionally, the summarized data may miss significant differences between the nature of benefits that have been grouped together.
Examples where summarised data may be used include:

- provisional advice is needed in a hurry before full data can be supplied, eg approximate cost of benefit improvements
- approximate checks on the financial position of a scheme are required and reliable summarised data is available.

The financials provide an independent check to validate the valuation data.
The sponsor's and members' contributions should be consistent with both salary roll and the contribution rate.
Sponsor's and members' contributions should be consistent, eg if members pay 5% and sponsor pays 20% then the sponsor contributions in the financials should be four times the member contributions.
Total pensions paid (with adjustments for deaths and new pensioners) should be consistent with the pension payroll in the valuation.
Membership numbers should tally.
Membership movements should tally with new pensions, new cash sums, death benefits paid and leaver benefits paid.
Asset data should be consistent with investment income.
The value of assets should correspond with the investment managers' performance, contributions paid, monies paid out and the latest valuation of assets.

[6]

ii) *The pitfalls of using summarised data include:*

The summarised data may actually be incorrect.
Rigorous data validation will be impossible. This will mean that the actuary may not detect errors in data.
Summarised data that is suitable for one purpose (*eg* valuation of current benefits) may be unsuitable for another (*eg* costing a benefit change).
Summarised data may not allow an investigation of the scheme experience. This may weaken confidence in the suitability of valuation assumptions.
Summarised data is unsuitable to value complex benefits, *eg* if there is a money purchase underpin. To assess this benefit accurately, individual calculations need to be carried out for each member.
Summarised data is therefore only suitable if such inaccuracy is recognised by those who are using the results of the calculations.
The actuary should clarify the quality of the data upon which any advice is based, particularly if summarised data has been used because of time constraints. Ideally, such advice should be verified once full data is available. Note also that the actuary should disclose the *source* of data in any advice. If the actuary has any reservations regarding the accuracy of the data provided, this should be mentioned in the report.

[4]

iii) ***Reasons why the premium may have increased***

- There may have been an increase in scheme membership or in the salaries of members, leading to an increased premium in absolute terms although not in real terms.
- Being a small scheme, a recurrent single premium basis is only really used for small schemes (*eg* up to 100-150 lives) as a default option, because the alternatives would be unsuitable. Hence based on the membership data, the rates might have been revised in line with the membership profile of the scheme in the current year.
- The membership of the scheme may be ageing, leading to a higher premium.
- The experience of schemes in general may have worsened over time, for example a new illness may have emerged leading to heavier mortality experience, and this is being reflected in the premium rates. However, the higher premium for this might have been offset by the lower premium required to buy the annuities of the members.
- The experience of this particular scheme may have worsened over time and this will be reflected in the premium rates if an experience rating approach is being used.
- There may have been a change in the insurance pricing structure or the provider may no longer be competitive.
- The increase in rates may reflect the position in the insurance cycle, *ie* the market may be less competitive than in the past and so insurers can incorporate larger margins for profit, expenses and contingencies in their pricing basis …
- …. this may particularly be the case for the partner's annuity for which the market is less competitive.
- Insurance companies may have made losses in the past that they are now aiming to recoup.
- The premium for immediate annuities reflect:
- expected investment return over the period for which the annuity would be paid, if future investment returns are expected to be poor then the premium will increase
- the life expectancy, mortality improvements may increase the cost of purchase.
- There may have been a recent benefit improvement, *eg* lump sum death-in service benefit from five times salary to ten times salary.
- There may have been changes to legislation or taxation being factored into pricing.

[6]
[16 Marks]

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