

Actuarial Society of India

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1 *Scaled premium method.*

The scaled premium method is a partially funded method where calculation of contribution rate lies between the extremes of PAYGO and GAP. There are different formulations of the method. (1)

One possible approach is to calculate the equalized contribution rate over a long control period. Before the end of the control period is reached, when the fund starts to fall, the contribution rate is recalculated for another control period with the constraint that the fund at the end of the new control period must not be smaller than it is now. This process is then repeated. (1)

Advantages and disadvantages.

The scaled premium method enables the building up of a fund but without requiring the scheme to be fully funded. (1/2)

The level of the fund is less than that for a GAP system and therefore may be more acceptable given the investment capacity of a particular economy. (1/2)

The appropriateness of the method depends upon whether there are sufficient suitable assets available in the country that can be invested in. (1/2)

If the assumptions are borne out, the marketability of assets is less important than in GAP method since it is the income stream from the assets that is sufficient to meet outgo. (1)

The contribution rate for this method increase as the population ages. However, this is in stepped increases and the control period can be chosen to give longer or shorter periods of a level contribution rate. (1)

It can be complicated to operate, if particular given assumptions are unlikely to be borne out in practice. (1/2)

[Total 6]

2 *Merits and demerits of the proposal.*

- i. It aims to provide additional security to the employees.
- ii. Depending on how these extra assets are invested, the actual security from the employees' perspective can be ascertained.
- iii. In case of default of an employer these extra assets can be used towards any deficit.

- iv. The issue is who bears the cost.
- v. If the schemes are contributory, will the employees have to contribute more?
- vi. If the cost is passed on to the employees, the employees do not get any extra benefits for the additional contributions.
- vii. If the employers are to bear the cost, will they be able to provide the extra assets?
- viii. Who is the owner of these extra assets?
- ix. Any distinction depending on the size of the schemes.
- x. Will there be a period, of say 5 years, for compliance within which these extra assets will be provided to the pension schemes.
- xi. The suitability of 5% as a measure of security.
- xii. Tax issues.

[½ marks for each point up to a maximum of 5]

3 *Asset-liability modelling techniques:*

Specification of the objectives:

- Maximise the return on the pension fund assets.

subject to:

- (a) The value of the scheme assets to exceed that of the value of the liabilities by at least 5% at all times.
- (b) The contribution rate should not increase by more than 1% over any 5-year period.

1. The above two restriction should be stated more accurately in terms of probability statements depending on the risk appetite of the sponsor. For example, each of the above two constraints can be said to have been met with a probability of 0.95 or 0.99.
2. Decide on the time horizon.
3. Set investment strategy.
4. Set starting contribution rate.
5. Decide on the variables which will be varied stochastically and which will be treated as deterministic.
6. Decide on the distribution for the stochastic variables.

7. Set the values for the deterministic variables and set the parameters for the distribution of stochastic variables.
8. Decide on the number of simulations e.g., 10,000 runs. Generate the values of the stochastic variables for all times for every simulation.
9. Calculate the values of the assets, the values of the liabilities and cashflows for each time point for every simulation.
10. For each simulation, if at any time point, the constraint (a) is breached, try and adjust the contribution rate within the limits of constraint (b) to meet constraint (a).
11. Check how many out of the 10,000 runs, the constraints could not be met. If it is within the tolerance limits the investment strategy is stored.
12. Vary the investment strategy and perform the same exercise.
13. Examine which investment strategy achieves the objective.
14. There might be a number of strategies which might satisfy the stated objective.
15. A subset of sensible investment strategies should be drawn up.
16. Sensitivity of the results to the assumptions should also be checked.
17. Judgement will be required to make the final recommendation.
18. Discussions with different parties involved e.g. sponsors and trustees will be useful before making the final recommendation.

[½ mark for each point, Total 9]

4 The answer to each part of the question is given below.

(i) Factors to consider while setting contribution rates.

- i. What the employer can afford.
- ii. The scheme of competitors in the same industry, and to a lesser extent, competitors in the same geographical location.
- iii. The target benefit for each employee after an agreed period of service.

- iv. Are there different categories of member in the scheme, for whom different levels of benefits are to be targeted?
- v. The effective target accrual rate.
- vi. The definition of pensionable salary.
- vii. Volatility of earnings including overtime, bonus and commission.
- viii. Integration with state benefits.
- ix. The level of annuity increases.
- x. The level of spouse's or dependants' pension.
- xi. Allowance for expenses.
- xii. Administrative complexity.
- xiii. Legislation.
- xiv. Likely annuity rates for conversion of members' account to pension at retirement.
- xv. Once the total contribution rate has been determined the split between the employer and the employee needs to be determined.
- xvi. The employer should consider whether and how frequently the rates will be reviewed in future if they are not meeting the target.

[½ marks for each point, Total 8]

(ii) Main economic assumptions.

- i. Assumptions should be best estimates ...
(½)
- ii. unless the employer wants to err on the cautious side ...
(½)
- iii. to reduce the probability of pensions at retirement being less than the members expected ...
(½)
- iv. which will provide much more generous and hence costly benefits.
(½)
- v. The important economic assumptions are:
 - a. Investment income – i. (½)
 - b. Salary inflation – e. (½)
 - c. Expense inflation – f. (½)

- d. Annuity increases – r. (½)
- vi. The gaps between assumptions are more critical than absolute values. (½)
- vii. The value of i-e can be estimated from historical relationships, but judgement will be required. (½)
- viii. In setting i-e, expenses should be allowed for. (½)
- ix. The value of i-f will depend on the mix of assets. The higher the equity content the higher the value of i-f. (½)
- x. The value of e-f will depend on how the productivity is expected to improve in future. (½)
- xi. The value of i-r depends on the level of pension increases the employer wants to provide for the employees. (½)

[Total 7]

(iii) Investment considerations.

- i. Profile of the liabilities – Matching in terms of nature, term and currency.
- ii. Sophistication of members – Offer limited options or “default” options for workforce with limited experience.
- iii. Legislation – Any restrictions like self-investment or overseas investment.
- iv. Limitations on holdings – Minimum and maximum holdings of different investment types to achieve diversification and reduce mismatching.
- v. Investment costs – The more options offered the higher the cost. Also specific investment vehicles incur high expenses.
- vi. Direct provision vs external provider – External provider can give access to expertise but may involve additional costs.
- vii. Lifestyle switching.
- viii. Size of the scheme – The amount of assets available for investment may limit the kind of investment, e.g., direct property investment may be possible for very large schemes.

- ix. Frequency of switching – Limits may be imposed to reduce costs.
- x. Competition – Investment options offered by competitor schemes.
- xi. Ease of valuation.

[1 marks for each point up to a maximum of 11]

(iv) Information to be disclosed.

- i. Information to be disclosed may be dictated by legislation.
- ii. Basic member details e.g. salary, date of birth, date of joining scheme, normal retirement age.
- iii. Members' account value at the start and at the end of the period and contributions (along with employer-employee split) during the period.
- iv. Policy for reviewing contribution rates.
- v. Additional amounts paid into the account, if any, e.g., contributions for previous employment.
- vi. The amount taken in charges, if any.
- vii. The current transfer value.
- viii. Projected fund at retirement based on current account value plus future contributions.
- ix. Expected annual annuity (based on different types of annuity) that can be bought with the projected fund.
- x. Key assumptions for the projection should be disclosed.
- xi. Sensitivity of the results on different investment assumptions.
- xii. Appropriate risk warnings to highlight that the benefits are not guaranteed.
- xiii. Details of any changes to the scheme benefits or the scheme's operation.
- xiv. General investment performance of the scheme for each investment option, including the following:
 - e. Returns achieved over the period.
 - f. The main investments held and the split of these investments.
 - g. Any changes in investment strategy.
 - h. Performance of the managed fund relative to benchmarks.

[$\frac{1}{3}$ marks for each point up to a maximum of 5]

5 **The answer to each part of the question is given below.**

(i) Criteria to be met.

- i. Be fair to both parties.
- ii. Be simple for the members to understand.
- iii. Low cost for schemes to comply with.
- iv. Not jeopardise the security of the scheme.
- v. Be unambiguous for the courts.
- vi. Deal with the vast majority of the cases and all types of schemes.

[1 marks for each point up to a maximum of 3]

(ii) Comments on the proposal.

- i. *Positive features.*
- ii. The approach is transparent and it will be perceived as fair.
- iii. If the transfer values are regulated, this will give confidence to the ex-spouse.
- iv. Benefits are no longer linked to the original member, so the benefits do not depend on any future developments.
- v. *Negative features.*
- vi. If the transfer value ignores future salary growth and only a low level of revaluation, the ex-spouse loses out on the link to final salary.
- vii. The generosity of the transfer value depends upon the basis used e.g., allowance for discretionary benefits.
- viii. It will be difficult for the ex-spouse to determine if the transfer value is correct as it may be different from the annual illustration, which could lead to confusion.

[1 marks for each point up to a maximum of 6]

6 **The answer to each part of the question is given below.**

(i) Ways of modifying the scheme.

- i. Reduce the pension accrual rate.
- ii. Review the definition of pensionable salary.
- iii. Review the definition of pensionable service.
- iv. Close down the scheme for new entrants.

- v. If non-contributory, make the scheme contributory where the employees contribute to the cost.
- vi. Switch from defined benefit to defined contribution.
- vii. Review withdrawal benefit structure.
- viii. Cap pension increases up to maximum, say 4%.
- ix. Make pension increase discretionary.
- x. Remove or reduce any other benefits.
- xi. Increase normal retirement age.
- xii. Review eligibility requirement.
- xiii. Buying insurance products e.g. annuity will remove uncertainty in cashflows.
- xiv. Review investment policy to maximise returns.
- xv. Achieve diversification.
- xvi. Consider asset-liability mismatch.
- xvii. Review funding methods.
- xviii. Reduce administrative expenses.
- xix. Utilise tax efficiency, if there is any.
- xx. Consider the spread of surplus, if any, so as to reduce contribution and/or manage cash flow.

[½ marks for each point up to a maximum of 10]

(ii) Issues to consider.

- i. Actual salary level.
- ii. Net salary in the different circumstances.
- iii. The difference is the cost of extra pension – is it affordable?
- iv. Current age and time to retirement.
- v. Any tax relief or rebates towards the extra cost.
- vi. How long is the employee planning to stay with the company?
- vii. How is the withdrawal benefit calculated under the various options?
- viii. Other sources of post-retirement income:
 - a. State pension.
 - b. Personal pension provision.

- c. Deferred pension from previous employments.
- d. Other investments.
 - ix. Risk appetite of the employee – might prefer moving to DC scheme.
 - x. What are the investments available in the DC scheme?
 - xi. Complexity of the DC scheme? Level of financial sophistication of the employees.
 - xii. If annuities are bought with the accumulated funds of DC scheme, what are the current rates?
 - xiii. Charges/expenses.
 - xiv. Treatment of additional voluntary contributions.
 - xv. How will the benefit from current DB set-up and the new DB/DC set-up be combined at retirement?
 - xvi. Taxation issues on benefits at retirement.
 - xvii. Death benefits under various options.
 - xviii. Other alternative investment vehicles available.

[½ marks for each point up to a maximum of 10]

7 The answer to each part of the question is given below.

(i) List of demographic assumptions.

- i. Rates of pre-retirement mortality.
- ii. Rates of post-retirement mortality.
- iii. Rates of spouses' mortality.
- iv. Proportion married.
- v. Age difference with the spouse.
- vi. Levels of new entrants.
- vii. Withdrawal rates.
- viii. Age retirement rates.
- ix. Ill-health retirement rates.
- x. Promotional pay scale.

[½ marks for each point, total 5]

(ii) Choosing the demographic assumptions.

- i. Assumptions used in the previous valuation. Changes are only appropriate if they can be justified.

- ii. Investigations of past experience but note that the scheme size is small. Discussions with the employers and trustees regarding the assumptions might be more useful. Also look at the industry experience.
- iii. A standard mortality table can be used for in-service mortality. The rates can be modified to take account of the occupational hazards. Allowance for improving trends in post-retirement mortality may be allowed.
- iv. Early, late or ill-health retirement rates can be ignored if the benefits are cost neutral. Withdrawal benefits are less valuable than retirement benefits, so it is inadvisable overstate the withdrawal rates.
- v. The employer should have a good idea of the promotional salary scale for different classes of employees. Past trends should also be taken into account.
- vi. Age difference of spouse and proportion married are likely to be based of population data. But given the scheme size is small, actual data could be used.

[1 marks for each point, total of 6]

(iii) Economic assumptions.

i. List should include:

- i. Interest rate – i.
- j. Salary growth excluding promotional salary scale – e.
- k. Dividend growth – g.
- l. Dividend yield – d.
- m. Revaluation rate for deferred benefits – r.
- n. Increases to pension in payment – p.
- o. Price inflation – f.
- ii. The relationships are best explained with reference to inflation.
- iii. For e-f, look at historical data. Salary inflation will probably exceed price inflation by a small percentage every year.
- iv. For i-f, look at the return on pension scheme assets. Unless there is a real return there is no point in funding for pensions.
- v. To obtain i, use the relationship $i=d+g$. Real dividend growth tends to be positive in the long run.

It is usually taken to be less than the salary inflation, although the two could be expected to be same if the rewards of improved productivity are shared equally between the wage earners and the capital providers.

- vi. By scheme rules, $p=f$, and $r=\text{minimum of } f \text{ and } 5\%$.

[½ marks for each point up to a maximum of 6]

(iv) Other information.

- i. For price inflation, an appropriate index can be examined.
- ii. For salary growth also, an appropriate index can be found.
- iii. For salary growth, published salary surveys may be available.
- iv. For investment returns, yields on appropriate market index can be obtained.
- v. For investment returns, increases in dividends of market index can be examined.
- vi. For investment returns, yields on conventional and index-linked government bonds can be examined.

[½ marks for each point, total of 3]