Actuaries Institute Australia

LIFE INSURANCE AND RETIREMENT PRODUCT DEVELOPMENT

TUTORIAL 4 SEMESTER 1 2020: VALUATION

Education Program
ACTUARIES INSTITUTE

Education that Counts

Question 1 [12 marks] (ST4 April 2018, qn 2)

DB scheme

The ABC Pension Scheme is a multi-employer final salary pension scheme that is closed to new entrants but open to future accrual for current members. A funding valuation is currently being undertaken and the actuary, having performed an analysis of recent scheme experience, is considering what assumptions to propose to the trustees.

(i) Outline the issues that the actuary should consider concerning the credibility of recent mortality experience for the purpose of setting assumptions. [3]

down

The trustees have asked for an explanation of how the key assumptions to adopt for the valuation might be derived and what issues should be considered.

(ii) Set out the points the actuary might make in her response. Your answer should cover the following: [9]

- general principles;
- discount rate;
- pension increases;
- salary increases;
- mortality assumptions;
- withdrawal rate.

Answer

(i)

- fluctuations in experience [½]
- changes of the experience with time [½]

- Specifics known past events [½]
- changes in the way in which the data was recorded [½]
- potential errors in the data [½]
- Relevance e.g. changes in the balance of any homogeneous groups underlying the data heterogeneity with the group to which the assumptions are to relate [½]
- Particularly as closed to new entrants [½]
- Volume of data [½]
- size of scheme [½]
- heterogeneity of group [½]
- particularly as a multi-employer scheme [½]
- Cost of analysis v benefits to the valuation (materiality) [½]

[Max 3]

(ii)

General

- As it is a funding valuation we might expect there to be some prudence in the assumptions [1]
- Depends on the objectives of the interested parties [½]
- For example – the choice of valuation method [½]
- Credibility of assumptions (e.g. size of scheme, quality of data) [½]
- The same assumptions for every individual employer or use scheme wide assumptions [½]
- How much external experience may be able to be used [½]
- Actuarial standards / any legal requirements [½]
- The assumptions need to be consistent with each other [½]
- And considered together (eg discount vs inflation, inflation vs salaries, with the 'gaps' being more important than absolute values) [½]
- Reference to Trust Deed and rules [½]

Discount rate

- Will depend on the valuation method [½]
- Investment strategy, actual and notional could be relevant [½]
- As well as anticipated changes to the investment strategy over time [½]
- Fund manager expectations [½]

- Market expectations of future returns [½]
- How to set the discount rate? [½]
- and allowance / link to the strength of the employer covenant [½]

Pension Increases

- What guaranteed increases are provided? [½]
- If inflation linked, what measure of inflation are the pension increases linked to, is there any modification to the index (e.g. a cap or a floor) [½]

e.g. CPI

- What has inflation been historically, are there any trends that may need to be taken into account. [½]
- Duration of liabilities [½]
- Proportion of liabilities across Active, Deferred, Pensioners [½]
- Practice of granting discretionary increases [½]

Salary Increases

- The level of recent salary increases from employers [½]
- Future expectations, maybe ask employers [½]
- GDP expectations [½]
- Trends in specific sectors [½]
- Promotional salary scale considerations [½]

Mortality

- Recent experience both in the scheme, and more widely [½]
- Type of industry, is standard mortality appropriate or should there be something industry specific [½]
- Future improvements expected [½]
- Derive own mortality table or adjust a standard table [½]
- Post code / geographical allowance [½]

Withdrawals

- Level of recent withdrawals from the scheme [½]
- Any future changes that might impact this such as a redundancy exercise [½]
- Split of voluntary and involuntary withdrawals [½]
- Importance of withdrawals for liability calculations (e.g. Benefit level on withdrawal) [½]

- Likelihood of having enough data to do a scheme-specific analysis (benefit v cost of analysis) [½]

[Max 9]

Question 2 [17 marks] (past UK CA subject)

A major retail company sponsors a well-funded final salary pension scheme. Recently the costs of the scheme have been increasing dramatically. The finance director of the company has set the objective of reducing the future volatility of the contribution rate, without making any changes to the scheme's benefit structure.

(i) Outline the options that are available to achieve the finance director's objective. [7]

Reduce the volatility of the contribution rate without changing benefit structure.

The company decides to control the costs of the scheme by limiting the growth in pensionable salary. Increases in pensionable salary will be restricted each year to the rate of price inflation, and non-pensionable bonuses will form a larger element of overall remuneration.

If an employee is promoted, their pensionable salary may be increased to reflect their new responsibility. This promotional increase would be in addition to the annual inflationary increase.

(ii) Comment on the practical issues that will need to be addressed in order to implement this strategy. [4]

(I would not ask this in the valuation exam but want you to gain experience of dealing with odd questions.)

It is now three years since the strategy was implemented. The inflationary increases to pensionable salary in the last three years have been 1.8%, 0.8% and 3.3% respectively.

The following tables are excerpts from the membership data for the actuarial valuation due to be carried out this year, and from the actuarial assumptions used in the last valuation.

Table 1: details of average pensionable salaries by age for members who have been in service continuously from the last valuation to this valuation

Age nearest x	Average pensionable salary at this valuation for members aged x at this valuation ($)	Average pensionable salary at last valuation for members aged x at this valuation ($)
38	31,374	28,980

39	28,841	25,776
40	57,894	53,646
41	37,640	34,676
42	32,415	30,160

Table 2: promotional salary scale assumption s_x used in the last valuation

Age nearest x	s_x
35	223
36	228
37	233
38	238
39	243
40	247
41	250
42	253

The promotional scale s_x excludes any allowance for annual inflationary increases to pensionable salary.

. (iii) Extend Table 1 to show calculations for the following figures in respect of the above scheme membership over the triennial inter-valuation period:

- actual promotional salary growth
- expected promotional salary growth
- the actual/expected percentage for promotional salary growth

Include details of the formulae you have used. [6]

(Hint: extend table 1 to include the 3 additional columns as requested by the question. The mathematics involved is extremely simple but you need to have a clear head. A key actuarial skill is working in the correct units. Salary three years ago compared with salary today involves inflation and promotion. Make sure you compare like with like.)

(iv)

(a) Comment on the results in part (iii), and

(b) Describe the further investigations and actions that might be appropriate.

[7]

Hint:

"Comment on results" questions are often the easiest ones set, as there are a lot of marks for simply describing the results achieved. The analysis covered a few age groups – what else could be done?

Answers to (iv)(b) often highlight a general lack of understanding of the purpose of the exercise. The aim is to assess the salary scale used for the valuation to see if it is still suitable. The whole focus of the question is on the pension scheme and not on the company's remuneration policy. Students often seem to regard the point as to assess whether the new remuneration practice was fair or working properly – and no marks are available. The general point that will repeat time and time again is the desire for students to narrow down an answer to what they think is a fair situation rather than demonstrate the wide variety of possible answers.

Answer

(i)

- Consider a spread of surplus over a long period to reduce the volatility of employer's contributions.
- Consider buying out existing liabilities e.g. existing pensions in payment or deferred pensions to reduce risk carried by the employer.
- Ensure that any risk benefits are insured.
- Amend remuneration structure to control pensionable salary growth.

- Consider an Asset/Liability model to look at any asset-liability mis-match, and amend the investment policy to minimise this.
- Review the following items and consider whether a change would impact the volatility of the contribution rate:
    - The level of risk accepted by the Investment Policy, in particular the diversification of assets and the asset types held.
    - Currency mismatching risk between assets and liabilities.
    - Closing to new entrants by amending employment contracts.
    - The Funding method and funding assumptions adopted e.g. advance funding to reduce volatility.
    - Any policy for awarding discretionary benefits - for example, discretionary pension increases or early retirements at the company's discretion.
    - The policy on transfers in and out of the scheme.
    - The charges made by the advisors to the scheme, possibly requiring fixed fees.

(ii)

It is necessary to consider:

- The impact this strategy is projected to have on the costs of the scheme.
- Which price index to use.
- Whether the company can maintain such control on the salaries.
- How best to communicate this strategy to the employees.
- Avoiding any disputes with any unions.
- Achieving employee agreement.
- When the strategy can commence.
- Whether new administration/payroll systems will be required.
- Whether the strategy will affect recruitment.
- Or retention of employees.

. (iii)

A	B	C	D	E	F
Age nearest x	*Average pensionable salary at this valuation for members aged x at this valuation ($)*	*Average pensionable salary at last valuation for members aged x at this valuation ($)*	*Actual promotional salary growth over the period (B/C)/1.06* 1.06 = (1+1.8%)*(1+0.8%)*(1+3.3%)	*Expected promotional salary growth over the period* = s_x / s_{x-3}	*A/E % (D/E)*
38	*31,374*	*28,980*	*102.1%*	*106.7%*	*95.7%*
39	*28,841*	*25,776*	*105.6%*	*106.6%*	*99.0%*
40	*57,894*	*53,646*	*101.8%*	*106.0%*	*96.0%*
41	*37,640*	*34,676*	*102.4%*	*105.0%*	*97.5%*
42	*32,415*	*30,160*	*101.4%*	*104.1%*	*97.4%*

(iv) (a)

Additional data is required to assess the credibility of the analysis, for example, membership numbers and/or total salaries.

The A/E figures are all reasonably close to 100%, but they are all below 100%. This indicates that the promotional scale has overstated the promotional salary growth experienced by this slice of the membership over this period.

The overstatement is roughly 1 % pa for these members, which may result from the intentional use of a smooth or prudent scale.

(b)

A full salary analysis should be considered over the whole membership, isolating special one-off features from long term trends.

It might be possible to consider national statistics or industry data.

If the analysis indicates that the experience of this membership extract is representative of the experience of the whole membership and if the recent experience can be taken as a guide to the future long term expectations then there may be a case for reviewing the assumption for the promotional scale.

This would be in conjunction with discussions with the company regarding any stated intent on the anticipated pattern of promotions, the level of pensionable salary increases awarded on promotion, and the desired level of prudence in funding the pension scheme.

Question 3 (19 marks) (past UK CA question)

A country has a large horseracing industry. Horses generally start racing between the ages of two and five. Most horses are retired from racing when they reach the age of thirteen. A very small number of horses are retired at younger ages for breeding. Revenues from breeding fees can be very high but are very volatile.

could be immaterial in terms of setting decrements for this

It has been proposed that a proportion of all breeding fees should be used to provide contributions to a general fund that will be invested in order to provide benefits to look after horses in retirement.

All horses actively involved in racing would be covered by the fund.

Benefits would normally only be payable when horses retire from racing aged thirteen.

Benefits would only be available in respect of retirement before age thirteen if the horse is certified as injured by a registered vet.

No benefits would be payable on the death of the horse either before or after retirement.

(i) Outline the demographic information that would need to be considered when determining the cost of any retirement benefits. [5]

Two possible forms of benefits have been proposed:

(a) **Benefits for each horse will be paid out of the general, overall resources of the fund**
DB

Benefits will be calculated as a cash amount for each year of a horse's racing career to be paid as an annual income from retirement until the horse dies. This amount will be the same for all horses and will be increased each year, both before and after retirement, in some way to allow for inflation.

(b) **Benefits for each horse will be provided from individual accounts held within the overall fund**
DC

A proportion of each year's contributions will be allocated to each horse. These contributions will form individual accounts for each horse. The value of these accounts will grow in line with investment returns earned by the general fund. On retirement, the accumulated individual accounts will be used to provide appropriate benefits.

In both cases, any proceeds would be payable to the horse's owner who would use them on behalf of the horse. Measures would be taken to ensure that any payments are actually used to provide care for horses and not taken by their owners.

(ii) Discuss the relative attractions of each proposal in terms of providing suitable benefits for horses retiring at age thirteen or on earlier certified retirement. [10]

As an alternative to proposal (a), it has been suggested that instead of paying income until the horse dies, the fund will reimburse the cost of housing the horse at a "retirement farm" approved by the fund.

(iii) Describe the additional risks that the fund may face if this alternative were adopted. [4]

Hint: You do not need to know anything about horses or horseracing to answer this question. It looks unusual but isn't it merely superannuation provision wrapped up in an unusual context?

Answer

(i)

The starting point will be the existing racehorse population. Considering the development in the population the key assumptions will be:

- How many horses will still be in training at age thirteen.
- This will depend on expected rates of death and retirement at each age up to age thirteen.
- The rate of "ill-health retirement" certified by registered vets will be required. This assumption would be less significant if horses that retired early due to injury had benefits reduced on a cost neutral basis.
- If benefits are not increased on a cost-neutral basis if horses race beyond age thirteen an assumption on late retirement rates may also be needed.
- How long horses are expected to live after age thirteen.

The assumptions will need to be broken down into homogenous groups of racehorses, for example assumptions will vary according to:

- Current age of horse.
- Sex of horse.
- Training centre, or quality or racehorse (if for example horses at elite training centres or quality racehorses may retire early for breeding).
- Type of racing undertaken, for example jump racers may be more likely to be injured and retire at younger ages.
- In order to determine how future costs may develop, it will also be necessary to make assumptions about new horses entering training at each age. These will also need to be considered in homogeneous groups as suggested above (by age, sex etc.).

(ii)

Proposal (a)

This is broadly a **final salary scheme (i.e. defined benefit** where the benefit relates to the salary at retirement) with a uniform salary for all members.

As such, the owner has more certainty over the benefit which will be payable in retirement, making it easier to plan and put arrangements in place.

Investment risk falls on the fund and not on the owner/member.

Benefits are in the form of pension and so are not dependent on annuity rates at retirement.

The suitability of this proposal crucially depends on the basic amount of benefit provided for each year of a horse's racing career. If the benefit is significantly less than the cost of care then the proposal may be unsuitable.

Clarification will be needed in respect of ill-health benefits. In particular whether accrued benefits be reduced to allow for early payment, or will be increased to allow for prospective racing career.

For horses that retire due to injury after a short career, an accrued pension may be too low to provide adequate benefits, particularly if cost of care for an injured horse is higher than normal.

The inflation factor will also affect the suitability of benefits.

The costs of providing for retired racehorses may not increase in line with general inflation or salaries. For example animal welfare issues may mean a higher inflation in costs than is expected.

Contributions are linked to breeding fees, so if benefits increase at a different rate to those fees the contribution rate may become volatile or unaffordable.

The increase in costs of breeding (contributions based on breeding fees) may lead to fewer horses being bred. This could mean lower contributions to the fund than anticipated. This would impact on the sustainability of the contribution rate and scheme. This could be a particular problem at inception of the scheme as benefits to existing racehorses rely on funding based on future breeding fees.

Changes in demand for breeding (number of breeding fees) and cost of breeding fees will result in the contributions fluctuating. This could impact on the stability of the contribution rate, although there would be a lag between breeding fees (contributions) and future racehorse retirements (benefits).

This highlights the main risk- solvency of the fund (and hence security of benefits) and the reduction in benefits if the fund was unable to fulfill its benefit promises.

It is unclear where extra contributions would come from if the fund ran into a deficit. It may be difficult to meet a shortfall if, for example, breeding fees are falling.

Proposal (b)

This is a variant on a **traditional money purchase scheme (i.e defined contributions)**. As such there will be less certainty over the expected level of retirement benefits.

In particular, investment risk falls on the member/owner but there is also a possible upside from good investment returns.

Investment performance (and risk) will depend on the fund management choices available. A range of options would give flexibility, but having a . single fund for all members/owners may be more practical given the ownership/membership profile.

Given the short term to retirement, a conservative investment policy may be appropriate, although this would lead to lower benefits (but involve less risk).

Complexity with investment options or administration could increase expenses (and lead to reduced benefits).

The benefits are in the form of a cash sum. As a result there is risk due to unknown costs of converting this cash into an income until the horse dies.

It is less likely that enhanced benefits would be payable on ill-health, likely payment would just be payment of allocated accumulated fund. Hence horses retiring early due to injury may not have suitable benefit provision.

Inflation protection is implicit with a direct link to invest proceeds. However, the risk of volatile contributions now falls on the member.

Breeding fee inflation will directly influence contributions and hence the level of benefits. This may not correlate with costs of retirement provision.

Contribution rates may need to vary by category to provide a similar level of benefit since costs could be very different across the population.

(iii)

This option is likely to significantly increase risks to the fund and probably contributions required. This is because the level of benefits to be paid is under the control of a third party.

There is less certainty over both the initial cost and how it will increase in payment. The risks of rising costs of retirement provision are now transferred from the owner/member to the fund.

In particular, increased costs due to regulation (more likely with formal providers) will be passed on to the fund.

It is possible that retirement farm providers will inflate costs to boost their income. There is also greater risk of fraud/collusion between horse owners and providers.

More formal providers will also look to make profits, which will increase costs.

Expenses will be incurred in monitoring and approving farms and in checking that claims are valid and reasonable. These expenses could be high.

Even so, should any farm provide poor care, there is a reputation risk to the fund as they may get the blame. Expenses could be incurred in sorting out any problems.