Subject ST4

Corrections to 2014 study material

Comment

This document contains details of any errors and ambiguities in the Subject ST4 study materials for the 2014 exams that have been brought to our attention. We will incorporate these changes in the study material each year. We are always happy to receive feedback from students, particularly details concerning any errors, contradictions or unclear statements in the courses. If you have any such comments on this course please email them to ST4@bpp.com.

You may also find it useful to refer to the Subject ST4 threads on the Actuarial Discussion Forum. (You can reach the Forums by clicking on the "Discussion Forum" button at the top of ActEd's website, or by going to www.acted.co.uk/forums/.)

Important note

This document was last revised significantly on 5 June 2014. The date on which any subsequent corrections have been added is noted below.

Revision Notes

Booklet 4

Question 6 from the September 2012 exam and its solution are missing from Booklet 4. The question and solution are reproduced on the following pages:

Question

A defined benefit pension scheme completed a funding valuation as at 1 April 2011, using the basic form of the Projected Unit Method. The results and main assumptions are shown below:

- Active liabilities £150*m*
- Standard Contribution Rate (SCR) 20% of pensionable salary
- Normal retirement age 65
- Average age of Actives 45
- Pre-retirement discount rate 6% per annum
- Earnings increases 4% per annum
- Pre-retirement decrements None

The scheme closed to new entrants on 1 April 2012. One of the scheme's trustees has heard that a different funding method should now be used to calculate the Standard Contribution Rate (SCR).

(i) Discuss the suitability for this scheme of each of the four main funding methods used to determine the SCR. [6]

The standard formula for the SCR is:

$$\left\{ f.Y.S.\frac{r_{65}}{l_x}(1+r)^{65-x-Y}(1+e)^{Y}v^{65-x}a^{r}_{65} + AL.\left[\frac{(1+e)^{Y}-(1+r)^{Y}}{(1+r)^{Y}}\right]\right\} \div Sa^{(i-e)}_{\overline{Y}|}$$

(ii) Define *f*, *Y*, *S*, *r* and *e*, including how they may vary for each method. [6]

(iii) (a) Suggest the most appropriate funding method, based on your answer to part (i).

(b) Calculate the new SCR using this method. [3]

[Total 15]

Solution

(i) ***Suitability of the four funding methods***

General points

- All methods are acceptable as long as all parties involved understand how the SCR may change in future
- The sponsor is likely to have a preference for a stable SCR …

  ... whereas the trustees will generally prefer a method offering the greatest security

Projected Unit funding method

- Reflects the cost of benefits accruing over the control period (*eg* over the next year) based on projected salary to retirement
- Expect the average age of the membership to increase over time in the closed scheme, therefore the SCR will increase over time ...

  ... therefore may not be appropriate for long term planning

Attained Age funding method

- Contribution rate reflects the average future cost of benefit provision for the current membership (weighted by age, sex and salary) ...

  ... allowing for projected salary growth to retirement
- The method may be particularly suitable given the scheme is closed to new entrants, since:
  - from the trustees' perspective may lead to surplus
  - from the employer's perspective can lead to a stable MCR over the future working lifetime
- The accrued liability will be the same as already calculated under the PUM

Entry Age funding method

- Contribution rate reflects the rate applicable to a typical member at an assumed entry age
- The EAM accrued liability is likely to be inconsistent with existing PUM accrued liability
- Unlikely to be suitable – the scheme will not have new entrants as it is closed!

Current Unit funding method

- The SCR doesn't allow for future salary growth in accrued liabilities ...

  ... this leads to a lower accrued liability than under the PUM until the scheme is sufficiently mature ...

  ... the contribution rate will then increase significantly as the membership ages

(ii) ***Definition of terms and how they may vary***

f = pension accrued per year of service as a percentage of final salary

Y = number of years' service to be included in the calculation of the contribution rate

S = current salary

r = revaluation in deferment

e = salary growth

How the terms may vary

- Under the basic form of the Current Unit method: $Y = 1$ and $r = 0$
- Under the revaluation adjusted form of the Current Unit method: $Y = 1$ and $r \neq 0$
- Under the basic form of the Projected Unit method: $Y = 1$ and $r = e$
- Under a "Unit" method using a control period: Y = length of the control period
- Under the Entry Age method: $r = e$ and Y = all potential service from assumed entry age
- x is the entry age
- Under the Attained Age method: $r = e$ and Y = all future service from age x

(iii) ***The most appropriate funding method***

The most appropriate method is likely to be the AAM ...

... since it can produce a stable SCR for this closed scheme, as long as the assumptions are borne out …

… whereas the PU and CU standard contribution rates would increase over time.

We are told that the basic form of the PUSCR was employed, *ie* a one-year control period was used. Assume that:

- the term to retirement is 20 years on average
- there are no pre-retirement decrements.

From above:

$$AASCR = \frac{\frac{20 \times S}{A} \times \left(\frac{1+e}{1+i}\right)^{20} \times a'_{65}}{S \times a_{\overline{20}|}} \qquad PUSCR = \frac{\frac{1 \times S}{A} \times \left(\frac{1+e}{1+i}\right)^{20} \times a'_{65}}{S \times a_{\overline{1}|}}$$

Compare the two formulae:

$$AASCR = PUSCR \times \frac{a_{\overline{1}|}}{a_{\overline{20}|}} \times \frac{20}{1}$$

($a_{\overline{1}|}$ and $a_{\overline{20}|}$ are at a net discount rate of 6% – 4% = 2%)

So $AASCR = 20\% \times \frac{0.9804}{16.35} \times \frac{20}{1} = 24.0\%$

