Actuaries Institute Australia

LIFE INSURANCE AND RETIREMENT VALUATION

ASSIGNMENT SEMESTER 1 2020

Education Program
ACTUARIES INSTITUTE

Education that Counts

MAC

PREAMBLE

The main purpose of this assignment is to help you develop skills required to pass examinations at Fellowship level (formerly Part III). These skills are also required by employers.

The specific skills that are being developed and assessed, are the ability to

- apply subject material in an unfamiliar context;
- plan a model;
- build and manipulate a spreadsheet model;
- determine appropriate assumptions;
- communicate relevant points in language appropriate to the audience, in a logical and coherent manner;
- meet business standards for presentation of work, both spreadsheets and written materials.

You will be required to apply knowledge to specific situations in the time-constrained end of semester examination. This assignment provides an opportunity for you to think more deeply and spend more time preparing a detailed answer. This assignment will also help you self-reflect on your writing skills. Whilst there is ample time to write up any required report for the assignment, you should ask if you need to spend more time improving your writing skills to help you pass the examination.

The main learning objective covered in the assignment is:

'Describe the different pace of funding associated with different valuation approaches and recognise that valuation methods do not affect actual experience'.

You may wish to refer to the video in Module 1 "Revision of Life Contingencies" regarding multiple decrement tables.

MARKING GUIDE

This assignment represents 20% of the available marks for the Life Insurance and Retirement Valuation subject.

Marking will be completed using a rubric system. The rubric will be posted on the learning management system to guide you as to what is required to achieve full marks for each part of the assignment.

The assignment requires you to create a set of assumptions. Consequently, there is no single right answer, but your answer will be tested for consistency with your stated assumptions.

SUBMISSION

The deadline for submission is **9:00 a.m. (AEDT) on Monday, 2 March 2020**.

In general, late submissions will not be accepted. You should anticipate potential delays by preparing your work in advance of the deadline.

The submitted documents should consist of a pdf file and an excel file. Files in other formats will not be marked. The naming convention for both files is: '*2020_S1_Assignment_LIaRV_candidate number*'. (extension for excel or pdf as appropriate). Your candidate number will be sent to you during the semester. Marks will be deducted if the file name does not follow the required naming convention as that will incur additional work by the marker.

PLAGIARISM

By submitting you work, you are implicitly stating that the work is your work. You may include references to other sources, if required.

ASSIGNMENT CONTEXT

You have been employed as the scheme actuary for a proposed defined benefit scheme.

The scheme is for a medium sized firm with just under 1,000 employees. Each employee is either in Grade B (manual) or Grade A (professional).

DATA

The details are listed in the table below and a soft copy is in the accompanying spreadsheet, '**LIaRV_Sem_1_2020_Defined Benefit Data.xlsx**'.

Age at start of year	Number of employees	Average Salary $	Grade
30	210	78,000	B
30	20	100,000	A
40	220	87,000	B
40	15	150,000	A
45	240	95,000	B
45	30	175,000	A
50	180	103,000	B
50	25	185,000	A
55	50	103,000	B
55	10	250,000	A

You may assume that the scheme is about to launch at the start of the next calendar year and the data in respect of age is in relation to the employees' age at the start of the next calendar year.

The average salary given is based on ordinary earnings, that is, excluding overtime and any bonuses.

DESIGN RULES

The rules for the DB scheme are:

- The DB scheme only applies to ordinary earnings.
- **Membership** commences from the scheme's launch date (current employees) or date joined employer (future employees).
- **Normal Retirement Benefit** is a lump-sum
  - Accrual rate times years of completed membership (pro-rata) times ordinary earnings at retirement date.

- **Normal retirement age** ('NRA') is:
  - 60 for Grade B and benefits do not accrue post NRA; and
  - 50 for Grade A and benefits continue to accrue post-NRA for those Grade A employees who do not retire at NRA.
- **Accrual rate**
  - Grade B: 5% of ordinary earnings per year of service, pro-rata for any incomplete year.
  - Grade A: 10% of ordinary earnings per year of service, pro-rata for any incomplete year.
- **Withdrawal benefit** is a lump-sum:
  - any exit prior to reaching NRA is a withdrawal benefit; and
  - benefits on withdrawal are mandated by law to be equal to 75% of the actuarial reserve held at the date of exit, using the assumptions determined by the scheme actuary.
- **Contributions** are payable only by the employer.

The withdrawal benefit is a function of the actuarial reserve, which is not necessarily the actuarial liability used to calculate the contribution rate.
We'll define the withdrawal benefit a little more explicitly and simply by defining the actuarial reserve:
The withdrawal benefit is 75% of the actuarial reserve held at the date of exit.
The actuarial reserve is the PV of the expected future normal retirement benefit payment, applying past service (to date of withdrawal) only.

ASSUMPTIONS GUIDANCE

In a future year (time t) you know the category accrual rate, completed past service, years remaining until normal retirement and you apply your assumptions to determine the salary at time t, the actuarial reserve as defined above at time t, and the withdrawal benefit at time t. Then you can apply your assumptions to get an expected present value time 0.

You may ignore pre-retirement mortality and morbidity.

There is no tax payable on contributions, earnings or benefits.

The assignment requires you to create a set of assumptions. Consequently, there is no single right answer, but we (the reader) want to understand *how* you derive your assumptions.

QUESTION (Total 100 Marks)

The Board of Trustees want to understand different paces of funding and have asked you to model the evolution of the scheme using both the Projected Unit Credit (PUC) method and the Entry Age Normal (EAN) method.

1. Determine an **initial** contribution rate for each Grade using the PUC method and the EAN method.

Need to treat the two grades as completely seperate and therefore obtain 2 different SCRs.

- **a.** Create a set of assumptions common to both methods. Identify any additional assumptions required for only PUC or only EAN. **(10 marks)**
- **b.** Develop a flowchart that shows the calculation logic for the determination of the initial contribution rate using the PUC method. **(5 marks)**
- **c.** Write your model in excel for both methods and both Grades. **(15 marks)**

term "funding position" in Q2 as the level of accumulated funds as well as the sufficiency of these accumulated funds compared to the actuarial liability.

2. Determine the scheme's funding position (for accrued past service benefits) in 15 years' time, using your original assumptions and under each of the following scenarios:

- **a.** Contributions are calculated each year using PUC method determined at commencement and updated every three years.
- **b.** Contributions are calculated each year using the EAN contribution rates determined at commencement.
- **c.** The scheme closed to new entrants three years after it was launched, and assuming contributions use the EAN method.
- **d.** A large-scale redundancy occurred at the start of year 10, also assuming contributions use the EAN method. **(20 marks)**

Be clear on any additional assumptions that you use in your modelling or any changes in assumptions as a result of the scenarios.

You may elect to measure fractions of a life to make the calculations easier.

3. Identify 10 other scenarios that might affect the progression of the scheme and contributions required. **(10 marks)**

4. Write a business memo to the Board of Trustees outlining different speeds of funding and explain how conflicts between different stakeholders may be managed. You need to incorporate your results and observations from questions 1, 2 and 3 into your memo. **(20 marks)**

1. Potential events that affect the funding of the scheme.
2. What do you think Trustee needs to know before they select a funding approach?

5. Write a two-page magazine-style article explaining aspects of the scheme relevant to the Grade B employees in preparation for the launch. Note: If the length of your article is longer than two A4 pages, you will be marked based on the first two pages. **(20 marks)**

END OF ASSIGNMENT