LIFE INSURANCE AND RETIREMENT PRODUCT DEVELOPMENT

ASSIGNMENT SEMESTER 2 2019

Preamble

The main purpose of the assignment from your perspective is to help you develop skills required to pass examinations at Fellowship level. These skills are also required by employers.

The specific skills that are being developed, and examined, are:

- being comfortable with basic manipulation of spreadsheets;
- the ability to apply the subject material in an unfamiliar context;
- the necessity to state the obvious in a manner appropriate to the audience;
- understanding the business requirement for your material to be neat and tidy; and
- the ability to write so that the reader can follow your logic, with a coherent beginning, middle and end to your story.

The assignment will require you to create a set of sensible assumptions. Consequently, there is no single right answer, but we want to understand *how* you derive your assumptions. It is important that you describe what you did as the marker will want to understand if you are able to apply knowledge to the specific situation described in this assignment.

There are no marks for describing what happens in Australia. This is because the Life Insurance and Retirement Product Development course teaches generic principles rather than application in an Australian context. To be successful you will need to apply the bookwork to the retirement system described in the 'Assignment context' section.

A key actuarial skill is to obtain a grasp of the qualitative nature of outputs from models and describe them in a non-technical manner. This assignment avoids complicated modelling and is designed to test your ability to deduce, and communicate, product features and issues using simple models.

Marking guide

This assignment represents 20% of the available marks for the Product Development subject. Your assignment mark will be combined with your exam mark to determine your overall grade for the subject.

If you choose not to submit an assignment you are still entitled to sit the examination, but it is unlikely that you will reach pass standard.

It is anticipated that you will spend around 15 to 20 hours to complete the assignment. This is a guide - some students will spend more than this and some students will spend less.

A detailed rubric is provided with the question. The rubric has been posted on the LMS to guide you as to what is required to achieve full marks for each part of the assignment.

Submission

The deadline for submission is 8 a.m. (AEST) on 19th August 2019.

In general, late submissions will not be accepted. You should anticipate potential delays by preparing and submitting 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: 2019_S2_Assignment_LIaRPD_identifier.(extension for excel or pdf as appropriate).

The identifier will be your candidate number that will be sent to you during the semester.

Students who do not follow this format may be penalised as it creates additional work for the markers.

Plagiarism

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

Assignment context

You are a senior analyst in a mutual organisation "RetireInStyle" that manages pre-retirement and post-retirement products. RetireInStyle operates in the country "WhoWantsToLiveForever", which has a different legislative and regulatory framework to Australia. The organisation is not a life insurance company and is not allowed to sell products where benefits are contingent on human life such that mortality risks are borne by the issuer.

Retirement may occur at any age after age 60 for males and 62 for females. It is up to the individual to define when retirement occurs, but all lives are assumed to be retired if they reach age 70. No withdrawals are permitted from pre-retirement products. The first time an individual submits a request for a withdrawal, their funds are immediately transferred to a post-retirement product, provided they meet the minimum age requirements. A flat rate of tax of 20% applies to all income payments taken in the post-retirement phase.

All citizens who have not retired must contribute 10% of their gross monthly income at the end of each calendar month to a pre-retirement product of their choice. The appropriate contributions are deducted directly from the citizen's bank account at the end of each calendar month. It is the law that each citizen has a bank account. A complicated tax transfer system exists in the country such that if the pre-retirement contribution from an individual is lower than 10% of the median female monthly salary, then that individual's contribution is topped up to 10% of the median female monthly salary by a contribution from the Government. The process is fully automated. Employers do not make any contributions on behalf of their employees.

Each individual is provided with a unique number either at birth or when they become a citizen of WhoWantsToLiveForever. This number is used as part of any policy record at their retirement fund. Each employer also has a unique employer code. The retirement fund tracks all employer codes (past and present) attached to a policy record for an individual. If the individual is not in work for any period, they are allocated to the general population code 000001 for that period.

There are no pre-retirement benefits permitted, only post-retirement benefits.

Currently, there are no requirements for RetireInStyle to offer any post-retirement products. However, RetireInStyle does offer one post-retirement product that is essentially the same as the pre-retirement products: an investment-linked contract with multiple investment choices. The individual determines how much income to draw out each year as a pension. An analysis of the post-retirement experience suggests pensioners are generally conservative as they invest in ‘safe’ assets such as funds linked to high-grade bonds and cash. Further, withdrawals are relatively low and significant account balances are available on the death of many of the pensioners.

New legislation has been approved by the Government and will take effect on 1 January 2022. The lengthy implementation period is required so that product providers have time to develop suitable products. The legislation creates new post-retirement annuity products. No provider currently offers any type of annuity product in the market.

The new legislation also introduces an inheritance tax. Payments to the deceased estate that exceed $100,000 are taxed at a rate of 50%. This includes any payments on death from a post-retirement product.

From 1 January 2022, it has been proposed that pensioners should have a choice of three product types:

- **Product 1**: investment-linked funds, with a wide variety of investment options. At least 5% of the value of the fund as at each policy anniversary must be withdrawn over the following policy year;
- **Product 2:** a ‘capital-protected’ guaranteed level payment immediate annuity, where the minimum payment on death of the annuitant is the greater of zero and the purchase price less payments already made; and
- **Product 3:** a pooled immediate annuity product where payment values are linked to the survival of a defined cohort of lives. This product has no death benefit.

The meaning of 'cohort of lives' is not defined precisely in the legislation. Legal advice suggests that a cohort should be defined at employer level, but any individual may elect to remain associated with their employer or elect to be part of the general population group 000001, or some other grouping.

Mortality rates in WhoWantsToLiveForever have been remarkably stable and are not expected to change in the future. The rates are in the attached spreadsheet: mortality.xlxs.

The current government bond yield curve is upward sloping, starting at 1.5% for a one-year bond, rising to 5% for a 10-year bond and then staying constant. The longest government bond is 15 years. The yield curve has been relatively stable in the last few years but has been different in the past.

Assignment questions

You have been asked to work on initial product designs for the three product options listed above. Product 1 (the investment-linked product) has similarities to a product currently offered by RetireInStyle. Products 2 and 3 (the annuity products) are new to the market. Consequently, management are seeking further information on the products before they set up a formal project plan. RetireInStyle is concerned that many of their existing members may transfer into one or more of the new annuity arrangements.

In answering the questions below, you may ignore expenses, any product fees or charges and assume no profit margins are allowed for in the contracts.

You are asked to present the answers to the questions below as if they form part of a **report to management** of RetireInStyle. Any explanation of calculations or method is best relegated to an appendix.

1. a) Explain the benefits and risks to the customer for each of the three proposed products.

   b) Explain the risks to RetireInStyle for each of the three proposed products.

2. a) Estimate the amount that the "average" male would be expected to have available to invest in a post-retirement product at 60 years of age.

   b) Using your result from 2a, estimate the first payment received for Product 1 (investment-linked account) and Product 2 (capital-protected immediate annuity) if purchased by that "average" male aged 60.

   State and justify any assumptions that you make.

   (Hint: In answering this question, you may need to use reasoning to justify assumptions where information has not been provided in the assignment context.)

3. a) Develop a deterministic model which projects expected payments to the customer for Product 1 (the investment-linked account) and Product 2 (the capital-protected immediate annuity) under the following four scenarios for a **male life aged 60 years** who retires at age 60 and dies during the year after they turn:

   - age 65;
   - age 75;
   - age 85; and
   - age 100.

   State all assumptions that you make and outline why they are sensible.

   You should include the probabilities of each of the four scenarios occurring.

   b) Comment on your results with reference to the risks and benefits for customers.

   c) Discuss the weaknesses of a customer using this type of analysis to compare products.

4. Assuming a cohort of **20 females all aged 62 years**, develop a deterministic model which projects payments to the 20 customers for Product 3 (the pooled annuity). For each year, you should consider the components of the payment – return of the initial investment, investment returns and mortality credits.

   State, and justify, any assumptions that you make as well as the method you've used.

   (Hint: You should not be thinking of a complicated model. Instead we want you to model how the product would work in practice. This mean you need to determine how many actual females are alive at each age and explain your reasoning.)

5. Perform four sensitivity tests on your model from question 4) that demonstrate how payments can be affected by random mortality events.

   (Hint: you are being asked to show how payments vary if the pattern of deaths is different than expected.)

   Explain your results.

   Explain whether it is necessary to perform sensitivity tests on any other risk factors.

6. Update your model from 4) assuming a cohort size of 1,000 and 1,000,000.

   a) Comment on the impact of the size of the pool on potential payments.

   b) The regulator is seeking industry input into the definition of a cohort. The legal advice is to base cohorts on employer at the date of retirement (or date last worked).

      What are the pros and cons of this definition?

c) Propose an alternative cohort definition and justify your answer.

7. As a product provider, what changes could you make to product design to make Product 3 (pooled annuity) more attractive to the market?