SEMESTER 2, 2019 PART III ASSIGNMENT

Subject Title: C2B Life Insurance

Due Date: Monday, 19th August 2019

Instructions:

Type your answers to the questions using Microsoft Word and ensure that there are no links to spreadsheets.

There is **one** spreadsheet accompanying this assignment. It is named:

"**C2B_Sem_2_2019_Assignment_Spreadsheet.xlsx**".

In your answers, include your candidate number in the header and footer on each page of the document.

You must submit your Excel answer file and note clearly all working and assumptions you have made in the spreadsheet or in the accompanying assignment document.

Question	Marks
a)	5
b)	7
c)	30
d)	8
e)	10
f)	10
g)	5
h)	10
i)	15
Total	**100**

1. non-participating investment account business with a discretionary participation feature;
2. Treated as insurance contracts;
3. Crediting rates are not affected by non-investment experience as profits from these sources are allocated entirely to shareholders.

Green Life, an Australian life insurance company, offers an ordinary Investment Account product with a fixed term.

The account balances of policyholders are credited at each year-end based on a declared crediting rate for that year.

An interim return is credited to death claims and lapses during the year at x% of the previous year's crediting rate, where x is calculated as 75% of the previous year's crediting rate multiplied by 1/12 for deaths and lapses in January, 2/12 for deaths and lapses in February and so on.

Green Life maintains an Investment Fluctuation Reserve, with the reserve reflecting:

- Investment returns earned during the year but not yet credited to policyholders' account balances; and
- Any excess returns above the crediting rate earned during the life of the policy.

At the end of the policy term, a maturity benefit, equal to the policyholder's share of any remaining balance in the Investment Fluctuation Reserve and their remaining Account Balance, is paid to the policyholders.

The product is invested in a fund consisting of:

Asset Class	Gross Expected Return (p.a.)	Standard Deviation	Proportion of Fund
Equities	8.5%	14%	15%
Property	7.0%	15%	15%
Corporate Bonds	6.5%	10%	20%
Government Bonds	4.5%	6%	20%
Cash	2.5%	1%	30%

As the valuation actuary, you are in the process of performing the year-end liability valuation for the latest tranche of business that has been sold which has a fixed term of 15 years.

Note: The accompanying spreadsheet template for this assignment is named "C2B_Sem_2_2019_Assignment_Spreadsheet.xlsx".

a) Estimate the expected return and volatility of the fund based on the fund details in the table above. **(5 marks)**

Spreadsheet Guidelines

- Complete part (a) in the worksheet labelled "(a)" filling in the missing formulae (in the cells that are shaded in green) as needed to derive the expected **monthly** fund return in cell C10 and **annual** standard deviation of the fund return in cell D9.
- Allow for correlation between asset classes using the correlation matrix provided in range B12:G17 in the same worksheet.

b) Discuss the factors that Green Life might consider in its crediting philosophy used to determine crediting rates for this product. **(7 marks)**

c) Using the spreadsheet provided, project the cashflows and calculate the present value of future profits. **(30 marks)**

Spreadsheet Guidelines and Assumptions

- Complete part (c) in the worksheet labelled "(c)" filling in the missing formulae (in the cells that are shaded in green) as needed to derive the present value of future profits in cell "AI3". You should not add any additional rows or columns to the spreadsheet.
- Calculate the interim crediting rates in the sheet "Assumptions", range "D22:D33" (highlighted in green).
- Show that the gross profit can be calculated in two ways by using both the "fees less expenses" approach (column AK) and using the total cash flow less the change in reserve (column AI) – the check cell AL3 should equal zero if this is done correctly.
- All the assumptions required are provided in the sheet labelled "Assumptions"; check that your formulae use all of the assumptions (e.g. fees, expenses, commission, mortality etc.).
- Assume that the fund earns the return calculated in (a) above, and that the crediting rate in the sheet "Assumptions" cell C17 is applied to policy accounts annually.
- Any additional returns should be credited to the Investment Fluctuation Reserve. Assume that any remaining balance in the Investment Fluctuation Reserve is credited to the remaining policies at the end of the projection period.
- Calculate the policy liability (column AF) using the accumulation method.
- Calculate the DAC at the start of each year and the change in DAC on an annual basis. That is the DAC should not change within a calendar year in the projection.
- Candidates should assume that the model point information provided in the table "Details of new business sold" (sheet "Assumptions", range G3:I9) is a reasonable proxy for the latest tranche of new business. Candidates should assume that all sales occurred at the end of the year (31 December 2019).
- Decrement rate tables are provided in separate sheets labelled "Annual Mortality Rates" and "Annual Lapse Rates".
- Mortality and lapse rates have been derived so that the monthly equivalent of these rates in the "Annual Mortality Rates" and "Annual Lapse Rates" apply to the number of lives enforce at the beginning of the month.
- Assume that deaths and lapses occur in the middle of each month.
- Use monthly time-steps. In the projections, candidates may assume each month is exactly one-twelfth of a year.
- For the purpose of the cashflow projection, ignore any commission claw back which may apply under the Life Insurance Framework.
- Assume that the expense assumptions provided cover all policy related expenses, including claim related costs. All initial expenses are incurred in the first month and all renewal expenses are incurred on each annual renewal date (i.e. the beginning of the first month each year – month 13, 25, 37 etc.).

d) Discuss the advantages and disadvantages of having the Investment Fluctuation Reserve that Green Life maintains. In your answer, consider both the reasons that Green Life holds this reserve and the potential impact on policyholders of holding this reserve.

(8 marks)

e) After 5 years, the assets in the equity class lose 20% of their value due to a sudden market crash.

Comment on the impact of this loss on Green Life's policies including comments on:

i. The Profit and Loss statement of Green Life for the period

ii. Policy liabilities

iii. Account balances for each policyholder

iv. Future crediting Rates **(10 marks)**

f) Explain how you would calculate the Prescribed Capital Amount for this investment account product and comment on the key items that need to be considered in producing this calculation. Note that no calculations are required in your answer. **(10 marks)**

The CFO, who is not an actuary, of Green Life proposes that the investment account product be modified to provide a guaranteed minimum return of 2% above CPI (current CPI is 2%). The CFO believes that this will have very little financial impact on Green Life and that it will provide policyholders with an attractive product that is sure to increase sales.

g) Draft an email to the CFO explaining how the financial reporting treatment of the guaranteed investment account differs in Green Life compared to a company that is not a life insurer or friendly society (e.g. a fund management company). **(5 marks)**

h) Draft a memo for the Green Life Board outlining:

i. The risks that Green Life faces in providing this guarantee

ii. The factors and actuarial guidance that Green Life should consider to calculate the cost of the guarantee provided by Green Life **(10 marks)**

The CFO of Green Life has suggested that the overall level of risk in the fund is too high and has suggested that the investment mix be changed to reduce this risk.

i) Write a memo to the CFO outlining the factors that Green Life should consider in making this change, as well as the steps required to implement this change in investment mix. In your memo, also discuss the impact that this change will have on the following factors and the implications of this change:

i. The expected return and volatility of the fund

ii. The best estimate of future smoothed returns

iii. The capital requirements **(15 marks)**

END OF ASSIGNMENT