LIFE INSURANCE AND RETIREMENT VALUATION

EXAM SEMESTER 1 2019

Subject Title: Life Insurance & Retirement Valuation

Date: Monday, 29th April 2019

Time: 10:00am – 10:15am
(Planning Time)

10:15am- 1:15pm
(Examination)

Instructions:

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

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(s) and save your work regularly.

Candidates are required to answer <u>all</u> questions.

Question	Mark
1	30
2	20
3	30
Total	**80**

This paper has **EIGHT** (8) pages (including this page).

QUESTION 1 (30 Marks)

You are the valuation actuary for a small life insurance company operating solely in Country X. In this jurisdiction, opening liabilities are calculated after incurring initial expenses and commissions but before the first premium has been received.

One product line is a level premium term insurance product that has the following features:

- The age at entry is 30 last birthday at entry and ends the day before the insured's 67^{th} birthday;
- The insured and policyholder are the same individual;
- The initial sum insured increases each year by 3% simple interest on the insured's birthday up to, and including, their 45^{th} birthday;
- The sum insured falls by 9% of the sum insured at contract outset on each birthday following the insured's 50^{th} birthday;
- Contracts always commence on the 30^{th} birthday of the insured;
- Premiums are payable at the start of the year;
- Claims and termination expenses are incurred at the end of the year;
- Renewal expenses are incurred at the start of the second and subsequent policy years; and
- Premiums cease after payment on the policyholder's 62^{nd} birthday.

Your best estimate valuation basis is:

- Renewal expenses are $50 per annum, inflating at 2% per annum;
- Termination expenses on death are $1,000 per annum, inflating at 2% per annum;
- The government produces a mortality table (as shown in the attached spreadsheet), which you believe understates actual claims by 5% at each age;
- Renewal commission is 5% of each premium, excluding the premium in the first policy year;
- The discount rate is set equal to the 10-year government bond yield and is currently 4%;
- Lapses are 10% per annum.

Note: The accompanying spreadsheet is titled "LIRV_Sem_1_2019_Q1_Level_Premium_Term_Assurance"

a) State a possible marketing reason for the changing sum insured throughout the life of the contract and provide one criticism of your suggested reason. **(2 Marks)**

b) Explain why the premium payment term differs from the benefit term. **(2 Marks)**

c) Using the accompanying spreadsheet, calculate a best estimate liability for a 30-year old, paying a premium of $1,100 for an initial sum insured of $500,000. **(4 Marks)**

d) State the expected profitability of the contract, assuming that initial commission is 90% of the first year's premium and initial expenses are $300. You may ignore solvency capital. **(1 Mark)**

The accounting standards in country X dictate how profit is reported. There are no restrictions on what cash flows may be considered but under the accounting standards the definition of policy liability at any point in time is *"the greater of zero and the best estimate liability at that time"*.

e) Compare and contrast the annual emergence of profit under Country X's accounting standards with a method that allows the use of a best estimate liability. Your argument should start with a definition of profit. **(4 Marks)**

The company has recently employed a Chief Financial Officer ('CFO'), who has no prior experience in life insurance. The CFO is aware of how annual profits are derived in Country X. He is aware that alternative methods exist across the world and is interested in understanding more about how profit could be spread 'more appropriately' across the life of a contract.

f) You have been asked to draft a report that explains, without using jargon, how profits may be spread over the life of a contract. Your response should include a discussion on:

- **i.** Any changes in the definition of the liability;
- **ii.** Appropriate reserving methods;
- **iii.** Two(2) different metrics that may be used to spread the profit over the life of the contract;
- **iv.** Three(3) different ways to treat the initial costs in the calculation of profits;
- **v.** Outline the shape of a graph of the profit arising in future years under the two (2) different methods in **(e)** above and one method that spreads acquisition costs over the life of a contract. (The shape of the graph is the important consideration and detailed calculations are not required. You may choose to write an answer or draw using the draw tools in Word.)
- **vi.** The effect of the three methods in **(v)** on the company. **(12 Marks)**

g) Over 75% of the policies were sold through one large broker group. They are facing financial difficulties and would like to negotiate an up-front payment of outstanding renewal commissions. Explain the changes you would you make to the best estimate basis in order to place a value on all of the renewal commission. Briefly outline how you would alter your calculated value of the outstanding renewal commission when negotiating the value of the up-front payment? **(5 Marks)**

END OF QUESTION 1

QUESTION 2 (20 Marks)

A country that has had almost no retirement products is in the process of creating the mechanism to promote retirement savings to individuals. The government has just introduced legislation allowing individuals to contribute up to 20% of their gross of taxation income to pension plans. A pension plan is defined as a tax-preferred deferred annuity with the following features:

- The savings phase must be in unit-linked funds;
- The policyholder has the right to choose when to move from a savings phase to a 'spending' phase but the policyholder must be aged between 62 and 65 at the start of the spending phase;
- At least 50% of the policy at the start of the spending phase must be used to purchase a lifetime annuity;
- Death benefits pre-retirement are limited to return of premiums;
- The contract cannot be surrendered although it may be transferred to another provider.

If the conditions are met, then the policyholder may pay premiums to a qualifying policy from their gross income. Investment returns pre-retirement are also tax-free. Maturity proceeds are taxed at 20%.

You work in the risk management function of a medium-sized well-capitalised proprietary life office that has been successful in selling a wide range of traditional savings and protection products but has not sold other product types and the Board has never previously expressed any appetite for considering other products.

The company has embraced the concept of enterprise risk management (ERM); has a developed Risk Management Framework; has adopted a three-lines of defence model; and has developed an internal model to measure and monitor capital usage.

Note: There is no accompanying spreadsheet for this question.

The directors are now considering entering the new pension market. You have been tasked to draft a report to the directors that considers the impact of the proposed strategy on the risk management function and how that function may help in the successful execution of the strategy. Produce your draft report that explains:

a) The role of the risk management framework ('RMF').
You should consider how risk is currently managed in the company and what changes will need to be made to the company's RMF documentation. **(5 Marks)**

b) How the RMF can be used to assess the material risks in the proposed retirement market. **(6 Marks)**

You should begin with a brief description of what the RMF will require you to do and then concentrate only on the identification of the material risks. The directors need to understand why the risks matter and the risks need to be relevant to the proposed strategy.

c) How the RMF can be used to assist with a successful delivery of the project.
This is from the perspective of how risk will be managed. You do not need to discuss wider issues such as the impact on product design. **(3 Marks)**

d) The potential impact on the company's risk-based capital requirements. **(6 Marks)**

END OF QUESTION 2

QUESTION 3 (30 Marks)

Note: The accompanying spreadsheet is titled "LIRV_Sem_1_2019_Q3_Appraisal_Value"

a) Write down the components of an appraisal value for a life insurance company.
(1 Mark)

A new niche company commenced operations in 2016. Its only product line is a three-year level annual premium term assurance contract to female lives aged 50 exact at the date of purchase, which is the 1st January (Hint: you may assume that all profits are retained by the company as it is still in growth phase).

Expected claims are 70% of the $600 annual premium payable and expenses are 10% of each premium. Claims and expenses occur on the last day of the policy year. The expected mortality rate is a constant 0.3% per annum.

The company earns 5% on its assets and the shareholder requires a 10% return. You may ignore taxation.

The number of contracts sold in prior years was:

Year	Number of policies
2018	4,500
2017	3,500
2016	2,000

5,000 policies are expected to be sold in 2019, and 6,000 in each subsequent year.

You should use the spreadsheet '***LIRV_Sem_1_2019_Q3_Appraisal_Value***' to complete **parts (b)**, **(c)**, **(g)** and **(h)** and then copy you answer to your Word Document.

b) Calculate the cash flow each year from 1st January 2019 for business in force as at the end of 1 January 2019. State the profits at the end of the next three years assuming no lapses and that the regulator does not allow negative reserves (Hint: premiums exceed claims and expenses each year so you should deduce that you do not need to calculate policy reserves).
(3 Marks)

The solvency requirements are calculated by assuming mortality is 100% higher than best estimate and expenses are 10% higher than best estimate. Prudential regulations force insurance companies to assume assets backing solvency capital have a 0% return.

Total assets on the 1st January 2019, including premiums paid on the 1st January, are $25m in cash although $1m of claims from 2018 have not yet been paid.

c) Calculate the appraisal value as at 1 January 2019. State any further assumptions that you have used to calculate the components of the appraisal value. **(6 Marks)**

d) Briefly explain the reasonableness of the components of the appraisal value. You should concentrate on the underlying assumptions. **(4 Marks)**

e) Without performing any calculations, explain what will happen to the appraisal value if the best estimate mortality assumption is altered. **(3 Marks)**

f) Explain, without performing any calculations, the impact of increasing the prudence of the solvency capital assumptions and allowing for a best estimate 10% per annum lapse rate on the AV. **(3 Marks)**

At the end of 2019, the company had sold 4,800 policies in 2019 (as 200 polices cancelled within a cooling-off period), earned 6% on assets, experienced 20 deaths and 7% of polices due to expire at the end of 2020 lapsed. All other movements were in line with the start of year basis.

g) Calculate the value of existing business as at the start of 2019 but using the above experience items. **(3 Marks)**
*(**Hint**: when analysing the death experience you may ignore the change in the future number of contracts in-force on the grounds of materiality.)*

The CFO has asked for a short memo on whether the best estimate basis should change.

h) Write a brief memo on whether the experience in 2019 supports a change in basis. You should include an analysis of changes as shown in the table below:

Total change:	$X
- comprising changes in:	
number of polices sold	$X
earning on assets	$X
number of deaths	$X
lapsed policies	$X

(7 Marks)

END OF QUESTION 3

END OF EXAMINATION