2016 PART III EXAMINATIONS

Subject Title: **C10 Commercial Actuarial Practice**

Date: **Thursday, 20 October 2016**

Time: **9:00 am – 5:00 pm**

Time allowed: Eight (8) hours

Instructions: Type an answer in Microsoft Word. Only your MS Word Document will be marked. Do not link data from spreadsheets. Spreadsheets must be embedded in your MS Word Document.

Number of Questions: **Five** (5)

Candidates are required to answer only **ONE** question.
This paper has **Sixteen** (16) pages (including this page).

ENTERPRISE RISK MANAGEMENT

QUESTION

Governments fund a variety of "human services" to their citizens, over and above income support such as welfare or pensions, including:

- Employment services
- Police, Justice and Corrective services
- Children and family services including Child Protection services
- Housing services
- Disability services

These services may be provided either by Government directly or by not-for-profit or for-profit service providers.

Recently governments have started using social impact investments (SII) for a number of reasons. These include innovation in these human services to address social challenges, improved partnership between the public and non-government sectors and ultimately better value for taxpayers. These are achieved by focusing on long term results, driving greater contestability and innovation in service delivery, and only paying when results are delivered.

One of the most common forms of SII is the Social Impact Bond (SIB).

Social Impact Bonds are among the first and best known social impact investment products. They were developed in the UK in 2010 and have since been used across North America and Europe.

A Social Impact Bond is a financial instrument that pays a return based on achieving agreed social outcomes. It is a special type of payment-by-results contract, where private investors provide working capital to a service provider to deliver an intervention. If the provider achieves the agreed social outcomes, this can result in savings to the government in the form of future avoided costs. Part of these savings is then used to repay the upfront investment plus a financial return.

Social Impact Bonds can be structured in different ways and involve different types of participants. The image below is an example of how private investment and government funding can be used in SIBs:

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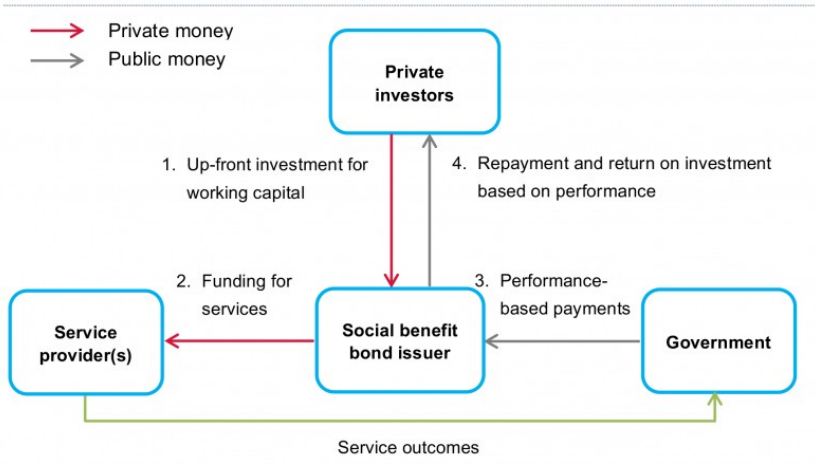

Adapted from J Liebman (2011). *Social Impact Bonds: A promising new financial model to accelerate social innovation and improve government performance*. Centre for American Progress

The Government of Capland is proposing to develop an SIB that is targeting services for young people exiting out-of-home care (OOHC), e.g. foster care, at high risk of homelessness.

Your client is the non-government organisation (NGO) FreshStart. They have requested your advice to design and price an SIB and advise them on risks to investors and their own risks in entering into this structure with Government.

FreshStart has an innovative programme for the target population that has been shown to be effective overseas and they wish to establish it in Capland.

The costs of the programme and the planned number of participants over the first 6 years are shown in Appendix 2 (and in the attached spreadsheet). Additional information on the costs to the Australian government of the target population can be found in Appendix 1. You may assume these costs are the same in Capland.

FreshStart is confident that at least 45% of participants will not only successfully complete the programme but go on to fully realise the benefits including reduced costs to government. This will be measured by the proportion of participants in employment, education or training 12 months after programme completion.

The Capland Government will provide a lump sum equivalent to 50% of the total expected additional lifetime fiscal costs for a young person exiting OOHC, in excess of those incurred by the average person who was not in OOHC, based on the figure provided in Appendix 1. The lump sum will be paid to FreshStart 12 months after the young person has completed the programme, on condition they are still in employment, education or training.

Investors will fund an SIB with a 6 year term, but wish to understand the proposed structure of the SIB and all the risks associated with full or partial default of the SIB.

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FreshStart has asked you to provide a report that:

- Proposes a bond structure (principal amount, structure of coupon rate and triggers for higher or lower rates, structures and triggers for return of principal) for investors.
- Estimates the Internal Rate of Return over 6 years of the programme allowing for the Government payoff.
- Identifies and describes the key risks for investors and provides quantification of each of these risks where appropriate.
- Considers the risks for the provider and suggests possible mitigation strategies for these risks.

You may ignore taxation issues.

Prepare your report.

Attachments

Appendix 1: Australian Costs
Appendix 2: Costs and planned participants
Spreadsheet: C10_ERM_S2_2016.xlsx

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APPENDIX 1 – Australian Costs

"Compared with the overall population who accessed specialist homelessness services in Australia in 2013-14, young people presenting alone were more likely to be identified as needing assistance with:

- Living skills / personal development (35% compared with 21%)
- Education (19% compared with 9%)
- Employment (16% compared with 7%)
- Training (13% compared with 5%).

This correlates with qualitative evidence on the long term needs of young people who have experienced homelessness and the future costs to government. The evidence shows that young people experiencing homelessness are at a high risk of developing a range of negative health, social and economic outcomes, including:

- Increased susceptibility to substance abuse and dependence
- Mental health issues
- Medical problems
- Violence and victimisation
- The burden of harms linked to youth homelessness can cause significant cost to individuals, families and the community
- Homelessness in later life, and chronic and repeat periods of homelessness.

These have cost impacts to government including more service utilisation across all sectors, including child protection, justice, employment, health and mental health services. Other costs to the community include the opportunity cost of people not being engaged in the community, poor economic participation, social exclusion and poor family functioning.

A study on OOHC leavers in Victoria estimated that this cohort costs state government approximately $738,741 more over their lifetime than the average person who was not in OOHC. This figure includes costs to the police and justice portfolio and the child protection and housing areas. It is considered by the researchers to be a conservative estimate."

Source: Request for Proposals: Social impact investment transactions, NSW Office of Social Impact Investment

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APPENDIX 2: Program Costs

Capland dollars = Australian dollars						
Total costs						
Development	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
(6 months)						
$464,351	$2,834,107	$3,814,437	$4,315,966	$4,315,966	$3,822,098	$2,797,557
No participants	50	95	138	138	88	43
No. participants completing program			43	43	43	43
No. participants still in program			95	95	45	0

50 participants enter each cohort.
The programme last 3 years for each cohort.
There is attrition over the programme such that only 43 participants are expected to successfully complete the programme from each cohort of 50.
Over 6 years, 4 cohorts will complete the programme; one cohort enters in each of years 1 to 4.

END OF QUESTION

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GENERAL INSURANCE

QUESTION

It is 9 am on Thursday 20th October 2016, and you are Anne Actuary, a pricing actuary specialising in home insurance for Insurecorp, a direct insurer in Capland. Insurecorp is a public company listed on the Capland stock exchange. Your boss, Yuri Boris, one of Capland's finest actuaries, is an industry leader in pricing techniques. Yuri was the first to respond to the rapid growth in market share of insurance aggregators in Capland, adapting Insurecorp's pricing strategy and processes to optimise Insurecorp's prices for individual customers, using price elasticity models to selectively push up premiums for some customers. As a result, Insurecorp's profit margins on home insurance have steadily increased from 1% of premiums to 15% of premiums over the past 5 years, while the rest of the industry suffered declines in profit margins and struggled to break even. Average premiums have increased by an average of 7% pa over the past 5 years, compared to an inflation rate of 3% pa. However, these high profit margins have been at the expense of market share, with Insurecorp's homeowner policy count dropping from 11 million to 10 million over the past 5 years. Also, the profit improvements have slowed, with the profit margin for the past 2 years remaining steady at 15%.

Yesterday, Insurecorp's CEO suddenly announced that he will retire at the end of the year due to his declining health, and that he will be on sick leave for the next 2 months. The market consensus is that he was a successful CEO, reporting steadily increasing profits each year. Insurecorp shares are down 4% on this news. It has also been announced that Catherine Everton-Overton, the Chief Risk Officer will be the acting CEO in the short term, and that a new CEO will be announced before the end of the year. The market reaction to Catherine is mixed – she is known to be a great risk manager, but has no track record in growing a business.

At 9 am Catherine calls you up to her office. She wants you to meet Winky Grey, the CEO of CREAS (Capland Retirees Elderly Action Society), which is a society created for the benefit of older citizens of Capland, and boasting a membership that includes 1 in every 2 Caplandians aged over 65 (i.e. almost 10 million members!). CREAS is a strong political lobby group, fighting for fairer treatment of elderly Caplandians, and also using their bargaining power to obtain discounts for various goods and services for its members. Catherine has just discovered that for the first time ever, CREAS is looking for an insurer to provide a CREAS endorsed home insurance product. CREAS members have a history of buying CREAS endorsed products – and Winky expects that 2 million of her members will purchase CREAS home insurance in the first year, with numbers expected to increase as the baby boomer generation retires over the coming decade. To back up her estimates, Winky shows you a report from Axel Economics, a highly respected economics and market research firm, which estimates 2.1 million CREAS policies sold in the first year, increasing to 4.5 million CREAS policies sold in the fifth year of the scheme. Submissions close today. Insurecorp must file its tender submission by 6 pm this evening. Catherine wants a report from you by 5 pm, with your recommendations, and with the completed tender form included in the appendices, and as you leave she mentions to you that she needs to win this account.

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Yuri Boris is currently trekking in Nepal, and unable to be contacted. It is actuarial exam time. All of your staff are away on study leave, and they normally do all of the detailed work and data extraction for you! Today you are on your own, and you will have to do your best with only spreadsheet software, and some summary report data that is already on your laptop. You will not have access to Insurecorp's fancy price optimisation software or data warehouse.

The Capland government regulates policy wordings of home insurance, so all home insurance products are the same, and all include both buildings and contents cover. The only differences are customer service, brand value and price. Capland is a very safe place, with no natural catastrophes and low crime rates. Most home insurance rating factors make less than 2% difference to the risk premium.

Note 1: Insurecorp has a December financial year. All of the data in the spreadsheet attachment is by calendar year, except "2016 YTD" which represents data from 01-Jan-2016 to 30-Sep-2016.
Note 2: The data only shows customers up to age 90. Higher ages can be ignored.

Attachments

Appendix A : CREAS Tender Form
Appendix B : Extracts from CREAS web page
Spreadsheet: C10_GI_S2_2016.xlsx

APPENDIX A – CREAS Tender Form

Item 1: Detail your proposed premium rates for CREAS home insurance. What average premium will you charge?
Item 2: How do these average premiums compare to your usual premiums?
Item 3: What is your planned profit margin on CREAS policies? How does that profit margin compare to your average planned profit margin for all home insurance business? How does that CREAS profit margin compare to your competitors?
Item 4: How will you meet CREAS' fairness, equality and disclosure requirements?

APPRENDIX B – Extracts from CREAS Web Page

Membership:

- Must be aged 65 and over
- Must be a resident of Capland

CREAS Values:

- We want fair treatment for older Caplandians, with equal access to products and services.
- We are a non-profit organisation, and we exist solely for the benefit of our members.
- We will not profit from any products we endorse.
- We believe in trust and therefore we provide full disclosure of all our finances.
- Our suppliers must be trusted. We require reasonable and adequate disclosure from any supplier that we endorse.

CREAS Achievements in the Past Year:

- Successfully lobbied the government to put wheelchair ramps in all retirement villages.
- Launched CREAS Travel – providing elderly-friendly tours and 10% discounts on all Capland Air flights, with more than 100,000 trips already sold.
- CREAS Banking now processes more than 100 million zero-fee pension transactions per annum.

END OF QUESTION

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GLOBAL RETIREMENT INCOME SYSTEMS

QUESTION

Private Health Super (PHS) has requested your advice on the design of default post retirement income products.

PHS is the trustee of a large multi-employer superannuation plan for private hospital employees in Capland. Plan members include medical professionals such as doctors and nurses, and support staff in the hospitals. Nurses and support staff are also members of their own relevant workers' unions. Unions represent their members in wage and benefit negotiations with employers.

The Plan is a not-for-profit superannuation fund, managed by a Trustee Board including independent and union appointed representatives. All Capland superannuation plans are regulated by an independent body appointed by Capland's government. Legislation requires that Trustee Boards act "in the best interests of members".

All Capland employers are required to contribute 10% of their employees' wages into a superannuation fund. Employees can choose to pay additional amounts from their wages into their superannuation fund, capped at 10% of their wages. Employees can join any superannuation fund of their choice.

Retirement income received from superannuation funds after the minimum retirement age of 60 is not subject to income tax. Incomes from all other sources are subject to a flat income tax rate of 20%.

All Capland superannuation funds, including PHS, currently provide only defined contribution superannuation benefits, payable as a lump sum on retirement from age 60, the minimum retirement age in Capland. The Capland government has previously required that 100% of the lump sum retirement benefit received by a member is used to purchase a lifetime annuity from one of the life insurance companies in Capland.

However the Capland government has recently announced that it is abolishing the compulsory annuitisation requirements and that superannuation funds are encouraged to introduce post retirement income products to cater for their members' needs. As a result PHS expects that there will be strong competition among superannuation funds for members and that well-designed post retirement income products will help PHS to retain and attract members, as well as their funds.

The Capland government provides retirees with a supplementary pension where a retiree's annual income is less than 27% of the Average Annual Income in Capland; the supplementary pension is the difference between a retiree's annual income and 27% of the Average Annual Income.

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Capland also has a universal public healthcare system which covers all basic medical needs of Capland's residents.

In anticipation of the new post retirement income products being introduced by superannuation funds, the Capland government announced that any account-based post retirement income products will be subject to a minimum annual drawdown of 5% and a maximum drawdown of 10% of the account balance at the start of each year.

You are an actuary from an actuarial consulting firm. PHS has asked for your advice on the design of PHS's default post retirement income product(s). In particular, PHS is interested in advice on the following:

- The types of post retirement income product that PHS could introduce and the advantages and disadvantages of each product.

- What default post retirement income product(s) would you recommend for PHS? Should there be different default post retirement income products for different groups of members?

- Commentary on the key risks faced by the retirees and the fund in your recommended default product design(s). Describe how any risks faced by the fund can be priced.

PHS advised that it is open to consider default products that are a combination of different products (for example, lump sum benefits; lifetime annuity; account based pension). That is it does not require a default product to be 100% in a single type of retirement income product (for example, 100% lifetime annuity).
PHS requests that you provide your recommendations and the basis for your recommendations in a report to the PHS Trustee Board.

Data

CAP_GRIS_Data_Sem 2_2016.xlsx, containing all of the following:

PHS data:

- Profile of typical members at retirement
- Details of PHS's three investment options for members to select, including a default for those who make no choice.

Capland data:

- Mortality rates for males and females (blue and white collar)
- Economic data & Average Annual Income

END OF QUESTION

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INVESTMENTS

QUESTION

Capland is a first world country with a fully developed financial market. Its currency, the Capland dollar ($C) is worth roughly the same as the Australian Dollar.

Alan Doyle has owned a successful small retail hardware store for many years. It has been profitable but he is not particularly wealthy. He has just won $C100 million in the Monster Capland Lottery.

You are the Senior Partner in Actuaries for Sound Investment "ASI", a small investment consulting firm. ASI was instrumental in the introduction of Share Price Index Futures to the Capland stock exchange and has continued its involvement by providing the stock exchange with a six monthly review of the management of the index futures product. You have been close friends with Alan since you were at school together.

He has asked you to provide advice as to the optimum investment strategy he should adopt in order to achieve the aims he has set out in the attached document with the highest probability. He is particularly interested in achieving the maximum annual income for himself and his wife.

Task

Prepare your report

Data

Attachment A: Alan's Aims

Spreadsheet: Capland_Investment_Data_Jun 16.xls

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Attachment A: Alan's Aims

Alan has three children – Hilary aged 20, Donald aged 17 and Michelle aged 13.

[1] He wants to provide each of them $C2 million at age 26**, provided** they have demonstrated that they can start and run a successful business (in any industry). He estimates that the probability of them achieving that is 60% for each of them.

[2] If they have done this, then they would be eligible to receive further amounts of $C2 million. These payments would occur every five years (ie at ages 31, 36, 41, 46 and 51), **provided** that the business has successfully expanded since the previous payment. Alan estimates that the probability of this happening is 65% on each 5 year occasion. After a total of 6 payments to any child, no further payments are to be made to that child.

[3] Once **any** payment has **not** been made no further payments are payable to that child.

[4] Alan wants to retire from his business in 10 years and from then requires the maximum annual income per annum, as is achievable while meeting the other aims. He wants this income to continue until both he and his wife are dead. The Capland population mortality tables would calculate their life expectancy from now as 30 years for Alan and 38 years for his wife.

[5] All payment amounts are expressed in today's dollars. They are to be indexed, from now, at the future rates of increase in Average Weekly Earnings.

[6] There is no requirement for there to be any balance left over after this income stream ceases.

All the probabilities are independent.

END OF QUESTION

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LIFE INSURANCE

QUESTION

Capland is a first world country with a fully developed financial market. Its economy is about the same size as Australia's.

Great Investment Life ("GIL") is a major Capland life insurance company with a market share of 12%. It specialises in fund management products with an emphasis on the group market. It also writes risk business.

Most Capland large companies run their own retirement savings schemes although the funds management and insurance is placed with life insurance companies. Retirement savings schemes in Capland are all accumulation. GIL has the largest market share of this business. The majority of large companies leave the investment strategy decisions to the life company.

CWA is Capland's largest supermarket operator with a 28% market share. GIL provides the group funds management and insurance for CWA's retirement savings scheme. CWA tenders this business every five years and GIL has won that tender each of the last 4 times. The next tender has just been put to the market.

Very Competitive Life ("VCL"), GIL's most important competitor, has been very aggressive in its pricing in recent tenders for other customers and GIL has lost a number of customers as a result. Feedback from those customers has indicated that the major reason for GIL's loss has been its investment performance and to a lesser extent to its group life pricing.

You are GIL's chief actuary and have responsibility for investment strategy as well as all group pricing in addition to the usual actuarial responsibilities.

The CEO has spoken to you about the CWA tender. "We cannot afford to lose this tender given our other recent losses. You have to do whatever it takes. The Board has now become involved and want to see your CWA tender response before it is submitted". In addition, you will need to also report to the Board on the full justification for your decisions in respect to the tender.

Task

Prepare the CWA tender response and your justification report.

Attachments

Attachment A: GIL group experience
Attachment B: GIL investment performance and related investment strategy
Attachment C: GIL standard group product design
Attachment D: CWA key tender requirements
Spreadsheet: C10_LI_S2_2016.xlsx

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Attachment A: GIL group experience

Year Ending 30 June	Overall GIL Experience – excluding CWA		CWA Experience	
	Death	TPD	Death	TPD
2016	65	115	56	102
2015	67	104	57	100
2014	63	99	55	99
2013	60	102	58	101
2012	61	98	56	96
2011	58	95	53	92

All experience is measured as Actual/Expected as a %. Expected is the same for each year and for Overall and CWA.
The overall experience has had each of death & TPD claim numbers in excess of 100 in all years. The CWA experience has had each of death & TPD claim numbers of excess of 40 in each year.
The figures are net of reinsurance recoveries. These recoveries have been less than 2.5% of the gross in all years. There have been no "catastrophic" claims events during this 6-year period.
The current CWA premiums use 59% of expected mortality and 102% of expected TPD as their base (before the 15% addition and per member expenses as per Attachment C).

Attachment B: GIL investment performance and related investment strategy

Year Ending 30 June	VCL's Experience	Overall GIL Experience – excluding CWA			CWA Experience		
	Investment Performance	Investment Performance	Investment Strategy		Investment Performance	Investment Strategy	
	% p.a.	% p.a.	Equities	Other	% p.a.	Equities	Other
2016	1.6	1.0	55	45	0.9	50	50
2015	5.0	4.0	60	40	3.6	52	48
2014	11.9	11.2	65	35	9.8	50	50
2013	16.1	14.9	64	36	12.6	52	48
2012	-3.4	-3.2	62	38	-3.2	55	45
2011	8.8	8.1	60	40	7.7	58	42

Investment performance is after investment fees. Tax is not relevant as the life company pays no tax on investment earnings for this business. VCL generally has had a higher equity allocation than GIL.

The "Other" investment component is made up of a mix of Bank Bills and 10 year Government Bonds.

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Attachment C: GIL standard group product design

Group life premium rates are expressed as a % of the Expected table (as used in Attachment A) * 1.15 plus $33 per member. The per member fees are indexed by CPI at 1 July each year. The $33 is as at 1 July 2016.

Premiums are normally guaranteed for 2 years.

Investment strategy is determined separately for each customer and is adjusted each 1 July. The specific strategy is set in accordance with each customer's particular objectives.

Investment fees are 1.0% p.a. of FuM for equities and 0.4% p.a. for Other. These are charged monthly.

Attachment D: CWA key tender requirements

The objective of the investment strategy is to achieve an annual performance after expenses of at least 2% more than the annual rate of growth in Average Weekly Earnings, averaged over each 5 year period.

The tender must set out the

- Group life premium rates and any per member expenses
- The investment fees
- The initial investment strategy and the reasons for the choice of this strategy
- Details of past investment performance
    - If the current incumbent
        - CWA performance
        - Performance for all other customers
    - If not the current incumbent
        - Performance for all customers

END OF QUESTION

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