2016 PART III EXAMINATIONS

Subject Title: **C10 Commercial Actuarial Practice**

Date: **Thursday, 5 May 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 **twenty-one** (21) pages (excluding this page).

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ENTERPRISE RISK MANAGEMENT

QUESTION

You are a qualified actuary working at Friendly Bank, a large Australian bank, as the senior risk manager reporting to the Chief Risk Officer of the bank.

Your friend Gen Ledger, an accountant, recently accepted a job with the Ministry of Finance ("MoF") in Namua, an island country in the South Pacific. You decided to spend your next annual leave visiting Gen, doing some local sight-seeing, walking and diving.

On arrival in Namua your first impressions were a new airport under construction, lots of roadworks, tropical vegetation, lots of rugby fields, friendly and cheerful people and a relaxed way of life. You quickly caught up with Gen, who was clearly working hard but still found time to accompany you to a beach and waterfall and to meet up for breakfast.

After a week you and Gen had dinner and talked about the country, the Ministry of Finance and Gen's new role. Gen now runs the Disaster Risk Financing and Insurance unit of the MoF. While the job title sounds impressive Gen has only a few support staff, but you realise quickly that it is an important role for Namua and Gen is clearly passionate about making a difference for the country. You learned that:

- Namua is a small isolated country with an economy still based largely on tourism and primary industries. It is not a wealthy country with per capita GDP about one-tenth that of Australia or New Zealand. Namua is recovering from two natural disasters, a tropical cyclone and a tsunami, in the last six years as well as the ongoing effects of the Global Financial Crisis.

- While reconstruction is now underway, there is much still to be done and the international grant funding to help reconstruction has largely been used up.

- Namua has received substantial support from the World Bank and the International Monetary Fund ("IMF") with funding but also with technical assistance such as economic analysis and advice about building a more resilient financial system to deal with future natural disasters. The advice from these organisations includes building contingency funds, reducing public debt, buying insurance against natural disasters and strengthening the local financial system. The advice largely forms the job description for Gen's role at the MoF.

- The Cabinet Minister who heads up the MoF is very supportive of the need to implement the recommendations from the World Bank / IMF and to give priority to these activities over other possible uses of government funds.

- However Cabinet is divided about what should be the priorities for Namua. Some Ministers would prefer to focus on increasing spending on infrastructure to build a stronger economy.

- In particular some Ministers support a proposal to build a new rugby stadium which will allow a combined island rugby team to host matches against the best of international teams. The stadium will cost between $US 75 million and $US 100 million depending on the level of earthquake resistance. The Ministers argue that the stadium will create employment and strengthen the tourism industry.

- Gen is concerned about this proposal. There have been no commitments from

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other islands or from the international rugby community and as a result there was no private sector interest in the project. Namua would have to finance the project through increased public debt which would weaken its resilience to natural disasters and the project might turn out to be a white elephant.

You told Gen about your risk management role with Friendly Bank and asked if you could help. Gen said:

"I have been thinking about that. Your knowledge, experience and independence would be highly regarded by our Cabinet and could help to nudge them in the right direction. I don't have a budget for you – my budget is very tight – but it would be great if you could do some work on a pro bono basis in the next couple of weeks while you are still in Namua.

The numbers here are quite small. The GDP of Namua is a small fraction of the annual profit of Friendly Bank. But the decisions we make affect the lives and livelihoods of 200,000 people.

I am currently preparing a report to Cabinet supporting the resilience recommendations from the World Bank / IMF. It would be great to have a supporting report from you based on your perspectives in managing risks for a large bank. Your bank faces risks which are financially larger than those we are exposed to, so I would really like your insights on how Namua should manage the financial aspects of its natural disaster risk.

I am also interested in your observations about the various methods of financing and insurance proposed by the World Bank. How would you suggest we should prioritise these given that we have limited resources? These have been suggested by economists but do you have other suggestions from an actuarial or risk management perspective?

Oh yes there is also one technical aspect I would appreciate your help with. The World Bank has done some analysis of our exposure to natural disasters based on simulations of possible scenarios. But the results are not in the most useful form. I will be talking to some reinsurers about catastrophe cover for very large but infrequent disasters e.g. covering losses above $US 50 million or $US 100 million in a year. Can you fit a formula to the data in the tables provided by the World Bank that will allow me to estimate the expected annual claims costs for losses above these levels?

And finally if you are able to make any comments on the stadium proposal that would be very helpful.

I will provide you with three short summarised notes so you don't have to spend the rest of your holiday reading long reports. [These are appendices to this question].

This would be a huge help to me and to Namua."

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The Task

With the benefit of the above and attached information prepare your report as requested addressed to the Namua Minister of Finance.

Appendix

1 Namua disaster risk analysis (World Bank sponsored study)
2 Namua data and trends (IMF study)
3 Disaster risk financing and insurance (World Bank sponsored study)

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APPENDIX 1 – NAMUA DISATER RISK ANALYSIS

Tropical cyclone and earthquake hazards in Namua

The Pacific islands region is prone to natural hazards. Namua is located south of the equator in an area known for the frequent occurrence of tropical cyclones with damaging winds, rains and storm surge between the months of October and May.

Namua is situated in a relatively quiet seismic area but is surrounded by the Pacific "ring of fire," which aligns with the boundaries of the tectonic plates. These boundaries are extremely active seismic zones capable of generating large earthquakes and, in some cases, major tsunamis that can travel great distances.

Risk analysis results

To estimate the risk profile for Namua posed by tropical cyclones and earthquakes, a simulation model of potential storms and earthquakes that may affect the country in the future was constructed. This model, based on historical data, simulates more than 400,000 tropical cyclones and about 7.6 million earthquakes, grouped in 10,000 potential realisations of the next year's activity in the entire Pacific Basin. The catalogue of simulated earthquakes also includes large magnitude events in South and North America, Japan and the Philippines, which could generate tsunamis that may affect Namua.

The country's earthquake and tropical cyclone risk profiles are derived from an estimation of the direct losses to buildings, infrastructure assets and major crops caused by all the simulated potential future events. The direct losses comprise the cost of repairing or replacing the damaged assets but do not include other losses such as contents losses, business interruption losses and losses to primary industries other than agriculture.

The direct losses for tropical cyclones are caused by wind and flooding due to rain and storm surge, while losses for earthquakes are caused by ground shaking and tsunami inundation. After assessing the cost of repairing or rebuilding the damaged assets due to the impact of all the simulated potential future events, it is possible to estimate in a probabilistic sense the severity of losses for future catastrophes.

The simulations of possible next-year tropical cyclone and earthquake activity show that some years will see no storms or earthquakes affecting Namua, while other years may see one or more events affecting the islands, similar to what has happened historically. The annual losses averaged over the many realisations of next-year activity are shown in the following table separately for tropical cyclone and for earthquake and tsunami.

Average annual losses ($US million)

Natural Peril	Tropical Cyclones	Earthquakes & Tsunami
Buildings	5.1	1.9
Major crops	1.6	0.0
Infrastructure	0.2	1.0
Total	6.9	2.9

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In addition to estimating average risk per calendar year, another way of assessing risk is to examine large and rather infrequent but possible future tropical cyclone and earthquake losses. The table below summarises the risk profile for Namua in terms of direct losses as defined above.

The table includes the losses that are expected to be exceeded, on average, once every 50, 100, and 250 years. For example, a tropical cyclone loss exceeding $US 134 million is to be expected on average once every 100 years. In Namua, tropical cyclone losses are expected to be substantially more frequent and severe than losses due to earthquake ground shaking and tsunami. The latter, however, remain potentially catastrophic events.

Direct losses caused by natural perils ($US millions)

Mean Return Period (years)	Average Annual Loss	50	100	250
Tropical Cyclones	6.9	79	134	258
Earthquakes & Tsunami	2.9	39	93	116
Tropical Cyclones, Earthquakes & Tsunami	9.8	110	153	266

In addition to these direct losses, there are also emergency losses which are the expenditures that the Namuan government may need to incur in the aftermath of a natural catastrophe to provide necessary relief and conduct activities such as debris removal, setting up shelters for homeless or supplying medicine and food. The emergency losses are estimated as 20% to 25% of the direct losses.

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APPENDIX 2 – NAMUA DATA AND TRENDS

Geography

Namua is composed of two large volcanic islands and several smaller islands, and has a total land area of 3,000 km^2. It is located in the South Pacific and has historical ties with Australia and New Zealand.

Population

The resident population of Namua is estimated at 200,000, with 80 percent of this number living in rural areas. The population is declining by 1% p.a. as younger people move overseas to study, play professional sport and seek better work opportunities.

Each year 100,000 tourists visit the country.

Natural Perils

Namua is exposed to tropical cyclones, floods, earthquakes, tsunamis, volcanic eruption, and drought. Of these tropical cyclones, earthquakes and tsunamis are the main concerns because of their frequency and severity. Namua was ranked 51st out of 179 countries in the Global Climate Risk Index 2012 report on who suffers most from extreme weather events.

In 2012 a severe tropical cyclone offered a distressing reminder of Namua's exposure to natural hazards. This cyclone came only three years after the earthquake and tsunami of 2009, which caused 143 fatalities and left 5,000 people homeless. It has been estimated that the public debt of Namua has increased by 15% of GDP to fund reconstruction works after these two natural disasters.

Economy

The main industries are tourism, fishing and agriculture. The country exports modest volumes of fish and agricultural products (such as coconut products) but is heavily dependent on tourism, remittances to their families from Namuans working overseas, and development grants from developed countries and development banks, especially for reconstruction after natural catastrophes.

The following table shows recent and projected economic statistics from a recent annual report prepared by the IMF.

The recent international grant assistance and development expenditure relate to reconstruction after the two major natural disasters and are expected to decline over the next few years. The projected drop in GDP in 2016 is a result of the expected closure of the largest manufacturing plant in Namua which provided components for the Australian car manufacturing industry which is closing in the near future.

The Government has committed to a balanced budget by 2017 and a reduction in public debt to 50% of GDP by 2019. The IMF has recommended that public debt should be further reduced to 40% of GDP to increase financial resilience against future economic and natural catastrophe shocks.

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Economic Data from IMF Annual Report

	2012 (Actual)	2013 (Actual)	2014 (Actual)	2015 (Actual)	2016 (Proj.)	2017 (Proj.)	2018 (Proj.)
Real GDP Growth (%pa)	-1.1	1.9	2.6	1.6	-0.8	0.8	1.5
Public Debt (% GDP)	54	55	56	56	57	55	52
Gov't Budget (% GDP)							
Revenue and grants	34	39	36	30	30	30	30
of which grants	10	13	10	5	4	4	4
Expenditure	38	44	39	33	31	30	30
of which capital expenditure	12	15	12	7	6	5	5
Overall balance	-4	-5	-3	-3	-1	0	0

The GDP per capita of Namua is about $US 5,000 compared with $US 50,000 for Australia (indicative – both numbers vary with exchange rates).

Economic Risk

The IMF report also identifies the main risks to the economic development of Namua. In decreasing order of significance these are:

- Natural disasters
- Protracted period of slower growth in world economies
- Financial stress in government-owned financial institutions
- Delay in achieving a balanced budget
- Delay in implementing structural reform to the financial system, including improving access to credit for the private sector.

In relation to the first risk, natural disasters, the IMF report comments:

IMF Risk Assessment

Source of risk	Natural disasters
Likelihood of severe impact from risk in the next 1 to 3 years	**High** – on average Namua has been hit by a major natural disaster once every five years
Expected impact	**High** – natural disasters can cause widespread damage and reduce economic resilience
Policy recommendations	Achieve a balanced budget with growth-friendly measures to replenish buffers to face future natural disasters

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APPENDIX 3 – DISASTER RISK FINANCING AND INSURANCE

Namua's National Disaster Management Plan cites disaster-related financing as the role of the Ministry of Finance (MoF). Under the Plan, the MoF must coordinate the collection, allocation, and provision of monetary aid to people affected by a disaster.

The World Bank sponsored study comments that:

"Effective post-disaster financial response relies on two fundamental capabilities:

- *The ability to rapidly mobilise funds post-disaster, and*
- *The ability to spend the funds in a timely, transparent and accountable fashion."*

It suggests the following range of ex-post (before the disaster) and ex-ante (after the disaster) financial tools available for mobilising and spending the monetary aid. Those marked "U" have been used (to some extent) by Namua to date. Those marked "N" have not been used by Namua.

Ex-post financing	Short term 1 – 3 months	Medium term 3 – 9 months	Long term over 9 months
Donor assistance (relief grants)	U	U	n/a
Budget reallocation	U	U	n/a
Domestic borrowing	U	U	U
External borrowing	n/a	U	U
Capital budget realignment	N	N	N
Donor assistance (reconstruction)	n/a	U	U
Tax increase	N	N	N
Flash appeal	N	N	N
Ex-ante financing			
Emergency fund	U	n/a	n/a
Contingency budget	U	U	n/a
Contingent borrowing	N	N	N
Government catastrophe risk insurance	U	U	n/a
Traditional disaster insurance	U	U	U

The study emphasises the need for good planning for future disasters so that Namua is able to effectively respond to disasters and recover from them.

It also supports the development of financial risk-sharing mechanisms, particularly insurance, reinsurance and other financial measures against disasters as both a key national and regional (Pacific island) activity. It suggests a three-tiered disaster risk financing strategy:

- Self-retention, such as a contingency budget and national reserves, to finance small but recurrent disasters;
- A contingent credit mechanism for less frequent but more severe events; and
- Disaster risk transfer (such as insurance) to cover major natural disasters.

END OF QUESTION

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GENERAL INSURANCE

QUESTION

It is 9 am on 29th February 2016 and you are Anne Actuary, the Capland Partner of InSult, a multi-national insurance consulting company. You live and work in Capland, but as you are an FIAA, you are bound by the Australian professionalism requirements, including the Code of Professional Conduct.

Capland is a large developed nation with an entrepreneurial culture. Many people run their own small businesses. So insurance of small businesses is big business, and insurers competitively supply property and small business packages. The pool of risks is fairly homogeneous, and competitive forces have effectively removed any possible cross-subsidies between different policies. Most small business insurance is sold via brokers. The insurance industry is heavily regulated. Brokers must:

- Have a panel of insurance suppliers that includes at least 3 unrelated insurers, and demonstrate that they are actively selling policies from each and every one of the insurers on their panel
- Provide recommendations to clients that are free of conflicts of interest
- Justify their recommendation (i.e. which insurer product) whenever their recommendation is priced significantly differently to the cheapest insurer on their panel
- Not charge brokerage fees – all of their income comes from fixed rate commissions paid by insurers
- Disclose commission rates to clients
- Transfer premiums to insurers within one working day of receipt of payment from customers

But the regulations are about to change. Effective from 1st March 2016, insurers may make arrangements with brokers to pay profit commissions as part of their remuneration. Brokers must have documented procedures for how profit commissions affect their recommended insurer. The regulator may audit this document at any time without warning, and audit whether the broker is complying with their documented procedures.

You have just come out of a breakfast meeting with Catherine Everton-Overton, the CEO of Sellerbait, an insurance broker specialising in small business insurance, selling 25,000 policies per annum. Catherine is in a panic because Sellerbait is not ready for the new regulations, and she has to publish their new procedures by 6pm today. She will return to meet with you again at 5pm to see your recommendations, and if acceptable, use your recommended procedures as her published procedures.

Catherine has a limited budget and you have limited time. So you won't use your internal modelling platform (a complex proprietary model that you use for large insurers, and which you price at $500,000 per client). Instead you will use a simpler and quicker Excel-based approximation that you have used in the past with clients who have a limited budget. That approximation is in the attached spreadsheet. You remember from some previous assignments and comparison benchmarking that the approximation model produces similar loss ratio statistics to your full model, but that it lacks an investment model, economic cycles, detailed catastrophe models (instead of modelling individual catastrophe events, your model includes a loss ratio based

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catastrophe model that approximates the statistical distribution implied by the catastrophe models), and the full complexities of interactions via copula models.

Attachment:

Simulation model and Sellerbait accounting details: CAP_GI.xlsx

Appendices

1 File Notes: 8:30am 29-Feb-16 Meeting with Sellerbait
2 File Notes: Excel Approximation Simulation Model

Note to Candidates:

- Do not check the calculations and formulae in the spreadsheet. That level of detail is out of scope for this exam case study. Approach the case study as if that work has already been done and the spreadsheet passed a full audit.
- Do not over-complicate matters by changing calculations or assumptions within the spreadsheet model that are out of scope. Limit yourself to only changing the number of iterations, the average loss ratio assumption, and the proportion of business allocated to each insurer.

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Appendix 1: File Note 8:30am 29-Feb-16 Meeting with Sellerbait

Present:

- Catherine Everton-Overton (CEO of Sellerbait)
- Anne Actuary (Partner, InSult)

Background

- At present
  - all insurers are paying 13.25% fixed commission rates
  - products and pricing are fairly similar, so Sellerbait sells apprixmately even amounts from each of its three insurers: Axion, Besure and Clayme
- New arrangements
  - Axion is offering 10% base commission + sliding profit commission = min(max(0, 0.5 * (55% - loss ratio)), 5%) * premium
  - Besure is staying with a fixed 13.25% commission with no profit commission
  - Clayme is offering 12% base commission + sliding profit commission = min(max(0, 0.15 * (59% - loss ratio)), 4%) * premium
  - Profit commission is paid on 1st April of each year, based upon the calendar year accident year loss ratio. The 3 month delay in payment is to allow for late reported claims and claim development, as this is 99% completed after 3 months (Capland claims are reported and handled very quickly!)
- Concerns expressed by Sellerbait
  - Will Sellerbait be in financial trouble if loss ratios turn out to be really bad?
  - Sellerbait needs to pay dividends each year, but shareholders will (reluctantly) accept a 25% reduction on dividends year-on-year if results are unusually poor
  - What is the best mix of insurers for Sellerbait?
  - Catherine requires that we use an average loss ratio assumption of 59.5% (0.5% lower than the industry average) because that's the loss ratio Sellerbait achieved in 2015, and she is sure that Sellerbait can sustainably outperform the industry
  - Ignore any issues related to the transition period between the old rules and the new rules. Do the calculations on an ongoing basis – as if there is a full year of loss ratio exposure for which the calculations are done.
  - Need a recommended procedures document for Sellerbait to use to meet their compliance requirement – InSult should include this in the appendix to our report. A procedures document should include, but not be limited to:
    - Description of the effect that insurer remuneration has upon the choice of insurer to be recommended
    - Description of the criteria used for selecting which insurer to recommend to each individual client
    - Defining when to recommend an insurer with a higher or lower premium rate
    - Description of what documentation the broker must keep, with regards to each recommendation made to a client, in order to prove the broker's compliance

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Apendix 2: Excel Approximation Simulation Model

- An approximation of our proprietary model
    - Catastrophes are not separately modelled but are included in the systemic risk component of the model – this means that catastrophes are being modelled stochastically as a systemic risk
    - No economic scenarios
    - No investment scenarios
    - No copula – just a combination of systemic and non-systemic risk
    - Have tested the loss ratio distribution and it is a close match to the proprietary model. The interactions in the proprietary model are slightly more complex than the systemic / non-systemic approximation, particularly the relationship between investment returns and loss ratio. But the loss ratio approximation for combinations of insurance portfolios seems to be reliable.
- The model parameters are calibrated for a portfolio of 25,000 policies (called "100% Share" in the spreadsheet).
- Sub-portfolios have higher non-systemic risk, and this is allowed for in the model by using Buhlmann credibility (based upon square-root of policy counts)
- Loss ratios are assumed to be log-normal distributed, and this has tested well against historical industry data. However, this assumption breaks down for insurance portfolios with less than 1,000 policies.
- Homogeneity of risk in the small business sector means that we do not need to model different industry segments separately
- The key assumptions to review for different clients are:
    - Average loss ratio
    - Split of business between different insurance subportfolios

END OF QUESTION

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GLOBAL RETIREMENT INCOME SYSTEMS

QUESTION

Capland's retirement income system comprises a government age pension, mandatory occupational and voluntary personal retirement plans. The retirement plans are regulated by an independent body appointed by Capland's government.

The age pension is paid from general government revenue to all citizens from age 65 at a percentage per annum of average weekly earnings (AWE), 20% for a single person and 30% in total for a couple. The age pension is universal, ie there is no means testing applied. Retirement industry benchmarking indicates that a comfortable retirement income would currently require income of 50% of AWE for a single person and 65% for a couple. Latest Capland mortality rates show life expectancy at age 65 for a male of 20 years, and for a female of 25 years.

Mandatory occupational arrangements are that a minimum of 8% of a worker's income is contributed by his or her employer to a regulated superannuation plan operated in the private sector. Regulated superannuation plans can be sponsored by a single employer or by multiple employers. Employer contributions are allocated to accounts held in individual members' names and invested at the direction of each member (or invested in a default investment option if no choice is made). No insurance premiums are paid from retirement accounts.

Employers and workers can voluntarily contribute towards retirement through either an addition to their occupational account or a personal retirement account. Personal retirement account plans are administered and invested by private sector managers.

Capland's government does not apply tax to contributions, investment earnings or benefit payments in regulated superannuation plans. All income (including age pension and retirement plan benefits) is taxable based on an individual's marginal tax rates.

Building Super Plan (BSP) provides defined contribution superannuation benefits to a large number of employees in Capland's building industry. These employees are also members of the Capland Building Workers Union which represents its members in wage and benefit negotiations with employers. The Plan has a mutual governance structure, managed by a Trustee Board including independent and Union appointed representatives.

Contributions and investment earnings are allocated to individual retirement accounts. After retirement (defined as permanently leaving the workforce at any time after attaining age 55), retirement accounts can be paid as a lump sum, transferred to another plan, or paid as a flexible pension (minimum amount of 5% of the retirement account balance each year) until all assets have been paid.

BSP's Trustee is responsible for the administration and investment of its members' assets with a regulatory requirement to "act in the best interests of members". BSP provides three investment options for members to select, with a default for those who make no choice. The standard administration fee is 0.5% pa of a member's retirement account. The Trustee employs financial advisors who help members to plan for retirement, at an additional cost to the member, charged on a fee for service basis.

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The Trustee's business strategy is to achieve better economies of scale by increasing membership and assets under management. The Union's strategy is to negotiate with employers to provide better benefits for members.

The Trustee has been considering three proposals to improve the services provided to its members.

Retirement income calculator

The Trustee wants to provide a simple projection tool as part of its standard administration service that will help members plan for retirement and maximise their retirement income. It has been suggested that an on-line retirement income calculator could be developed to use a member's current membership data to project retirement income. The calculator could then be used to show the impact on retirement income of changes in the member's behaviour in choices of contribution and investment options.

The Trustee wants your advice on the advantages and disadvantages of a retirement income calculator compared to individual advice currently provided by its financial advisors.

Your advice should include recommendations on the data and assumptions needed for a retirement income calculator and any other issues that the Trustee should consider. Using a simple projection model embedded in your report, illustrate how it would be used by members.

Pension option

The Trustee wants to provide an option for retiring members to transfer their lump sum retirement benefit to a guaranteed pension payable for life.

The Trustee has asked you to outline possible pension option designs and advise on the administration and management of pension liabilities and assets.

Investment strategy

The Trustee wants to introduce a new life-cycle investment option which reduces the exposure to more risky growth asset classes as the member ages. It has been suggested that the new option could be provided within the standard administration fee.

The Trustee has asked you to outline a possible life-cycle investment option, consider the advantages and disadvantages of this option compared to the existing investment options and to illustrate the potential impact on members' retirement income.

Prepare a report to the Trustee advising on these three proposals. Based on your analysis, include your opinion on whether the mandatory occupational contribution of 8% of income is adequate for all BSP members.

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Attachment:

1) Capland data: CAP_GRIS_Data.xlsx

   Contains

   - Mortality rates for males and females – 2015
   - Economic data at 1 January 2016
   - Building Super Fund investment options

END OF QUESTION

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INVESTMENTS

QUESTION

Capland is a developed first world country with a comprehensive financial market.

Big Fund Manager ("BFM") is Capland's largest fund manager. It offers a conventional range of products with pre-mixed options and individual sector funds. It does not offer any guarantees.

BFM has always valued actuarial input into its key business decisions. For many years it has had a Chief Actuary position and the occupant has regularly contributed to business decisions on a range of issues including strategy, product pricing and investment approaches. You were appointed Chief Actuary two years ago after a career in actuarial investment consulting.

While BFM continues to have an enviable track record it has been receiving a growing volume of complaints from customers and financial planners about the significant market volatility, especially in the equities market. There has also been feedback from some of BFM's Directors who have been asking whether BFM could change its investment approach to focus on the issues which really drive future profitability rather than having to accept the, sometimes irrational, behaviour of market participants.

As a result of these discussions the Board Strategy Committee (comprising 3 directors and the CEO) has produced a short brief on the matter. The CEO has provided you a copy of this brief and has asked you to provide a report for the committee in response. He has reminded you of BFM's evidence based approach to decision making and asked that the following questions be comprehensively dealt with:

- Possible product offerings
- The choice of economic indicators. (This is one of the major points to be addressed. Several well justified alternatives should be considered.)
- What would be a sensible target return on capital?
- What impact would such products have on actual investment decision making?
- Your recommendations as to the action to be taken, including
    - What specific product offering should be used
    - What capital would be required for this offering to support any guarantees
    - What return on this capital would be expected

Appendix
Board Strategy Committee Brief

Attachments

1. Investment Data CAP_INV_Capland_Investment_Data_Dec15.xlsx
2. Economic Data CAP_INV_Capland_Economic_Data.xlsx

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Appendix A

Board Strategy Committee Brief

While BFM has had a very successful record and has stayed conventional with its product offerings and investment approach, the time is now right for a review of the possibility of an alternative offering. In particular, the recent growing volume of complaints about the level of volatility in equity markets needs some response from BFM.

While BFM has not offered guarantees in the past it may well be appropriate to consider including a guarantee in any new offering. The committee considers that a substantially equity based product which provides a guarantee of performance, over say 5 years, equal to the performance of one or more economic indicators, would be an interesting idea.

In order that such a venture would be easily identifiable a separate subsidiary company would be the vehicle for this should it prove viable. This would enable relevant branding to be achieved without impacting on BFM's core business.

Clearly the current annual profit target of 0.33% of FuM would need to be changed to a return on capital.

END OF QUESTION

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LIFE INSURANCE

QUESTION

Capland is a developed first world country with a comprehensive financial market.

Government regulations in Capland provide that only Life Insurance companies can offer retirement saving products to customers. On retirement customers can take their benefits as a lump sum with a very low tax rate. The Capland government has now introduced new rules which will require all retirement benefits to be taken as a non-commutable lifetime annuity (unless retirement is caused by disability, in which case the annuity requirement is materially relaxed). In Capland the retirement age for everyone is 65.

Until now there have been almost no annuity sales in Capland. However, Princeland, a neighbour of Capland, has had large volumes of compulsory retirement annuity sales for many years and its recently published annuity mortality investigation is available. Capland's population mortality is known to be around 5% lower than Princeland's.

Old Cap Life ("OCL") was one of the first life insurance companies to be established in Capland many years ago. While it had been a market leader, it has suffered a steady loss of market share in recent years. Outside commentators have attributed this to uncompetitive prices rather than poor investment performance.

Retirement savings products are mostly distributed by independent financial planners. There is no indication that the retirement annuities will not be distributed in the same manner. OCL has always enjoyed good relationships with financial planners and their commission structure has been competitive.

The former Chief Actuary retired six months ago after a long career with OCL. You were appointed as his replacement and started one month ago. Until this move you had been a senior partner with Actuaries for All Business ("AAB") for many years.

The OCL Board has been concerned about the loss of market share and appointed a new CEO three months ago. Sarah Good-Price had been the CEO of a medium sized, and successful, fashion retailer. You had provided her with consulting advice in respect to pricing over a number of years.

In response to the new retirement rules you have had several conversations with Sarah about OCL's response. In these conversations she has repeatedly emphasised that it was absolutely essential for OCL to have competitive pricing to reverse its loss of market share. She also remarked that she always found it odd that life insurers did not use some of the common pricing techniques - like sales and special deals. She added that it was beyond her comprehension that life insurers almost always ignored the fact that expenses, and hence prices, were dependant on likely volumes. She and you had successfully used all of these pricing techniques when she was in fashion retailing.

She has asked you, as the Chief Actuary, to prepare a comprehensive report giving not only indicative pricing for the retirement annuity product OCL will be introducing but also well justified ideas for some other pricing techniques. She has said that you only need to consider a single life annuity for males age 65. She has reminded you that this report will be discussed with the Chairman, who will be paying attention to the likely

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impact on market share and is aggressively pressuring her about the need for competitive pricing.

The day after she gave you this task, OCL's major competitor - Very Profitable Life ("VPL") - introduced its retirement annuity product with a price of $C307,500 for an annuity of $C1,500 per month, indexed at 3% p.a., for a single life annuity for a male aged 65. VPL has long been known for its competitive pricing and consistent good profitability.

Task

Prepare your report

Appendices

1. OCL's financial criteria
2. Capland Regulatory Rules for Retirement Annuities
3. Market Estimates for Retirement Annuity Volumes
4. OCL's recent expense analyses
5. OCL's recent market share and business volumes

Attachments

1. Princeland Annuitant Mortality CAP_LI_Princeland_Annuitant_Mortality.xlsx
2. Capland Investment Data CAP_LI_CapLand_Investment_Data_Dec15.xlsx

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Appendix 1

OCL's Financial Criteria

Prior to your predecessor's retirement the Board determined the rules for return on capital for annuities of at least 15% p.a. (before tax) on the regulatory capital required from time to time.

Appendix 2

Capland Regulatory Rules for Retirement Annuities

The minimum capital is the difference between the annuity liabilities calculated on the company's 'best estimate assumptions' and that calculated using the same 'best estimate assumptions' except that

- The rate of mortality improvement is to be 0.25% p.a. greater than that assumed under the 'best estimate assumptions',
- The rate of future expenses related to the annuities is to be 15% greater than that assumed under the 'best estimate assumptions', and
- The discount rate is to be 2.0% p.a. below the average of the yield on 10 year Capland Government Bonds over the last 10 years.

Investment earnings on retirement annuity liabilities are tax free.

Appendix 3

Market Estimates for Retirement Annuity Volumes

Your previous firm, AAB, has publilshed the following estimates for total market sales of retirement annuities.

Financial Year	$C (million) Sales
2016/17	1,674
2017/18	1,761
2018/19	1,873
2019/20	2,009
2020/21	2,186

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Appendix 4

OCL Recent Expense Analyses

The OCL actuarial department has concluded that these expense assumptions for retirement annuities would be reasonable. They were based on OCL expenses remaining at current levels in respect to retirement savings.

The commission rates were agreed with Sales & Marketing who confirmed that they would be competitive,

Commission:	2.5% of purchase price
Initial Expenses:	$C250 **plus** 1.0% of purchase price
Rewewal Expenses:	$C100 p.a. (increasing with inflation) **plus** 2% of each annuity payment

Investment Expenses:

The current investment expenses are as follows

Domestic Equities:	0.50% of FuM
International Equities:	0.60% of FuM
Government Debt:	0.25% 0f FuM
Other Debt:	0.35% of FuM
Property:	1.00% of FuM

Appendix 5

OCL Recent Market Share and Business Volumes for Retirement Savings

Year	Business Volumes $C million		Market Share %	
	New Deposits	FuM	New Deposits	FuM
2009	295	7,501	10.2	13.6
2010	310	7,740	9.7	11.8
2011	315	7,956	9.4	11.2
2012	321	8,019	8.8	10.8
2013	335	8,556	8.6	10.4
2014	341	9,105	8.1	10.1
2015	349	9,788	7.9	9.7

END OF QUESTION

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