Institute of Actuaries of Australia

2011 PART III EXAMINATIONS

Subject Title: **C2A**
Life Insurance

Date: **Thursday 28th April 2011**

Time: **9:15 pm – 12:30 pm**

Time allowed: Three (3) hours plus fifteen (15) minutes of reading time

Instructions: Each new question (but not each section of a question) must be commenced in a new answer book.

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

Question	**Marks**
1	18
2	22
3	25
4	17
5	18
Total	**100**

Candidates are required to answer ALL questions.

This paper has eight (8) pages (excluding this page).

INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2A LIFE INSURANCE **APRIL 2011 EXAMINATIONS**

Answer all 5 questions

QUESTION 1 (18 Marks)

An Australian financial services group offers single premium superannuation products through both a wholly owned life insurance company and a unit trust company. A range of different investment options is offered within the various products. Many of these options have a property component but, because of the varying size of the funds, it is not practical for them to hold their own property investments. Consequently, the funds invest in a wholesale property trust run by the group. The wholesale property trust operates using a single unit price.

A unit pricing error has recently been discovered. Due to a linkage problem with the spreadsheets used in calculating the unit price for the superannuation products, the unit price for the wholesale property fund has not been updated for the last 6 months. Over the last 6 months the wholesale property unit trust price has declined by 10%, reflecting the impact of recent revaluations. However, the strong performance of the retail funds over this period (in part because of this error) has resulted in a large inflow of funds with the result that the wholesale fund now has a significant volume of funds available for direct investment.

As a consulting actuary, you have been asked for your recommendations on the error correction process.

a) Outline the issues you would consider in determining your recommended compensation for unit holders in both the life insurance company and the unit trust company. **(3 Marks)**

b) Describe the checks and controls that you would recommend when calculating unit prices and comment on their effectiveness in detecting the error. **(8 Marks)**

c) What extra steps would you undertake to minimise the risk of errors occurring in addition to the checks and controls recommended in b)? **(3 Marks)**

d) Discuss the advantages and disadvantages of using a single unit price for the wholesale fund rather than separate prices for buying and selling units. Give your recommendation. **(4 Marks)**

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QUESTION 2 (22 Marks)

As the pricing actuary for an overseas life company, you have been provided with the following profit test and pricing results (see next page) for a single premium insurance contract covering an interest only mortgage sold through mortgage providers. This insurance is compulsory for mortgages in this market and the insurance will cover the amount of the mortgage outstanding on the date of death. Policies are issued on the basis of simplified underwriting assessed on 4 health questions. The life insured in this profit test is a male aged 55.

a) Comment on the results including the following:
- factors affecting profitability
- sufficiency for future expenses
- pattern of claims
- earnings pattern
- use of an internal rate of return profitability measure for this product
- other relevant factors you would have investigated

(7 Marks)

b) What sensitivity tests would you ask for and why? Indicate the most important sensitivities and why you consider these to be important. **(5 Marks)**

c) Following consumer pressure, banks have launched mortgages that can be transferred from one property to another, and to change insurance from being payable by a single premium, to monthly premiums. What issues arise for the mortgage provider and your company? **(5 Marks)**

d) It has been suggested that the new monthly premium product should include unemployment insurance. What are the policy design considerations you need to assess before determining a price? **(5 Marks)**

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COURSE 2A LIFE INSURANCE **APRIL 2011 EXAMINATIONS**

PROFIT TESTING AND PRICING RESULTS

Profit Test Assumptions

	60% of IA64/70 ultimate							
Year	**Age**	qx	lx	dx	wx	lx+1	**Reserve at Start**	**Reserve at End**
1	55	0.00000	1.00000	0.00000	0.00000	1.00000	7,200.00	6,480.00
2	56	0.00000	1.00000	0.00000	0.10000	0.90000	6,480.00	5,760.00
3	57	0.00640	0.90000	0.00576	0.08942	0.80481	5,760.00	5,040.00
4	58	0.00714	0.80481	0.00575	0.07991	0.71916	5,040.00	4,320.00
5	59	0.00796	0.71916	0.00573	0.07134	0.64209	4,320.00	3,600.00
6	60	0.00886	0.64209	0.00569	0.06364	0.57276	3,600.00	2,880.00
7	61	0.00986	0.57276	0.00565	0.05671	0.51040	2,880.00	2,160.00
8	62	0.01096	0.51040	0.00559	0.05048	0.45433	2,160.00	1,440.00
9	63	0.01216	0.45433	0.00553	0.04488	0.40392	1,440.00	720.00
10	64	0.01349	0.40392	0.00545	0.03985	0.35863	720.00	0.00

Best Estimate Cash flow model using Statutory Reserves

Year	**Premium**	**Expenses and Commission**	**Claims**	**Increase in Reserves**	**Investment Income**	**Earnings**	**Statutory Reserve at Start**	**Invested Assets at Start**	**Interest on Assets at Start**	**Interest on Cash Flows**
1	7,200.00	-2,304.00	0.00	-6,480.00	604.80	-979.20	7,200.00	7,200.00	360.00	244.80
2	0.00	0.00	0.00	1,296.00	324.00	1,620.00	6,480.00	6,480.00	324.00	0.00
3	0.00	0.00	-576.18	1,127.74	259.20	810.76	5,184.00	5,184.00	259.20	0.00
4	0.00	0.00	-574.64	949.49	202.81	577.66	4,056.26	4,056.26	202.81	0.00
5	0.00	0.00	-572.60	795.25	155.34	377.99	3,106.78	3,106.78	155.34	0.00
6	0.00	0.00	-569.02	661.98	115.58	208.53	2,311.53	2,311.53	115.58	0.00
7	0.00	0.00	-564.63	547.08	82.48	64.93	1,649.55	1,649.55	82.48	0.00
8	0.00	0.00	-559.20	448.24	55.12	-55.84	1,102.47	1,102.47	55.12	0.00
9	0.00	0.00	-552.56	363.41	32.71	-156.43	654.24	654.24	32.71	0.00
10	0.00	0.00	-545.06	290.83	14.54	-239.69	290.83	290.83	14.54	0.00
Total				0.00		2,228.71	0.00	0.00		
NPV										
5.0%	7,200.00	-2,304.00	3,314.30	-1,018.53	1,594.53	2,157.70			1,361.39	233.14
15%	7,200.00	-2,304.00	1,924.95	-2,161.49	1,246.41	2,055.97				
Profit Margin as % of premium @ 5%						30.0%				

QUESTION 3 (25 Marks)

You are the Pricing Actuary for a medium sized Australian Life Office distributing through independent financial advisers. The Life Office has a market share of 5% of the total life insurance market. Your guaranteed renewable disability income product has had low sales (less than 1% market share) and you have recently completed a pricing review for the product. However the new pricing, which is based on the most recent overall company experience and target yield on transfers, is still not competitive. An actuarial student in the marketing department has suggested that you split the aggregate morbidity assumption using a higher percentage of smokers and a higher smoker claim ratio in order to achieve a more competitive non-smoker rate. The Head of Marketing has suggested that you review all assumptions in order to get a more competitive product.

a) List the assumptions needed to price a typical disability income product.

(3 marks)

b) Identify the sources of information you would consult before reviewing your incidence and termination rate assumptions and relate why each is important to your review. You should note that sources should include internal departments and external parties.

(6 Marks)

c) Discuss the issues you would consider in responding to the actuarial student in the Marketing Department, and outline the implications for the company if the suggestion is implemented. Consider the impact on new business and on repricing the in-force block.

(5 Marks)

d) The same actuarial student has pointed out that "our top occupational category experience has been impacted by the inclusion in that category of the bad claims experience from policies covering disability for the company's tied agency force. We could get a more competitive premium rate in the top occupation category by giving a lower occupation rating to policies covering the company's tied agents." Discuss the issues you consider in your reply, including the impact on new business and on repricing the in-force block.

(5 Marks)

e) A reinsurer has offered to take 85% of the risk for the contract using a standard 90 day waiting period for all contracts. Most of your business is for a 30 day waiting period. Your initial calculations show that this will make your premium rates competitive and meet your profitability criteria. Discuss the items you would consider in assessing this offer for this product, mentioning any further analysis you would require. **(6 Marks)**

QUESTION 4 (17 Marks)

You are the Appointed Actuary for a listed Australian life insurance company which distributes business through three different channels – independent financial advisers, banks and direct marketing. The Channel sales mix has been stable for a number of years. Actual sales last year were 40m/30m/30m for independent financial advisers, banks and direct marketing respectively. The bank channel operates in an arrangement with a single bank.

The distribution agreement with the bank is now due for renewal. The initial tender has indicated that your company is likely to lose this business unless commission rates can be increased.

Until now pricing has been done on an average basis with the same unit expense allowances used for each channel. Some products are sold in more than one channel but when this happens, the same premiums and charges apply in each channel.

The CEO has said that it would be disastrous for the company to lose its long established relationship with the bank and this would need to be disclosed in the soon to be released annual results which include the embedded value, sales results and sales forecast. The CEO has therefore asked you to use lower expense allowances for the bank channel when determining the maximum commission payable to the bank. Premiums and charges for products offered in the bank channel will remain unchanged.

a) Discuss the issues you would consider for using different expense allowances for each distribution channel when determining the expense allowances for overhead costs and IT costs. **(5 Marks)**

b) Evaluate the impact of using different expense allowances for each distribution channel from the perspectives of <u>each</u> of the following direct reports to the CEO

- CFO (Chief Financial Officer)
- Head of Products
- Channel Sales Heads (Head of Agency Sales, Head of Bank Sales, Head of Direct Sales)

Assume that your investigations have shown that the acquisition expense assumptions should be calculated in the ratio of 120/80/100 for independent financial advisers, bancassurance and direct marketing respectively. No change is required for maintenance expense assumptions. **(8 Marks)**

c) The bank business has been retained by increasing commissions in the bank channel whilst leaving prices unchanged. Your CEO has asked for your initial thoughts on how to determine the annual bonus for the channel heads now that different expense allowances have been introduced. Outline your reply. **(4 Marks)**

QUESTION 5 **(18 Marks)**

You are the Appointed Actuary of an Australian Life Insurance company which has recently acquired Pacifica Life, a life insurance company in Pacifica, a developing Pacific island nation. The Pacifican government is financially sound due to the strong demand for its natural mineral resources and manages the Pacifican dollar so it is linked to the Australian dollar (P$2 = A$1), and financial contracts may be written in either A$ or P$.

Investments in P$ are limited to Pacifican bank deposits, 5 year government bonds (current yield 2%) and 2 year corporate bonds (current yield 3%) so most insurance contracts are written in A$ and invested in A$. Where Pacifican life companies invest in A$ investments they are only permitted to invest in securities issued by Australian banks and Australian government bonds. There is no corporate or income tax in Pacifica as the government earns sufficient income from resource royalties.

Individuals can only invest in insurance contracts or bank deposits and cannot invest overseas. Bank deposits are currently paying 0.1%.

The only insurance contract available in Pacifica is 10 year non-participating endowment insurance with premiums of $1,000 pa payable annually in advance for 4 years. The Sum Insured for the policy is equal to 104% of total premiums due under the policy and is payable on death or maturity.

All insurance is sold through banks. The banks receive a total commission payment of 20% of the first year's premium. Although Pacifica Life has only been established for five years, it has a stable expense structure and expenses approximately equal to 20% of the first premium and $50 p.a. in the second and subsequent years. The mortality of insured lives is equal to 70% of IA90/92 ultimate. The maximum issue age is 55.

You can assume that:

- the current A$ bond yield is 5.7% for 10 year, 5.6% for 9 year, 5.5% for 8 year and 5.4% for 7 year
- the average duration of net cash flows is 8 years
- the sum of net cash flows is $3,150 without interest or discounting.

a) Describe the issues you would consider in determining the investment return assumption used in pricing this contract. Do not calculate any returns.

(3 Marks)

b) A student has provided the following tables. Use these numbers to derive an appropriate surrender value basis for this product and provide an initial estimate of the surrender value to be published in the policy document for the end of policy year 1, 3, 5 and 8. As the policies are sold through the bank the basis needs to be as simple as possible.

Policy Year	Premium	Expense and Commission	Net Cash Flow	Accumulation of Net Cash Flow at end of Policy Year using							
				5.00 %	4.50 %	4.00 %	3.75 %	3.50 %	3.25 %	3.00 %	2.75 %
1	1000	-400	600	630	627	624	623	621	620	618	617
2	1000	-50	950	1,659	1,648	1,637	1,631	1,626	1,621	1,615	1,610
3	1000	-50	950	2,739	2,715	2,690	2,678	2,666	2,654	2,642	2,630
4	1000	-50	950	3,874	3,830	3,786	3,764	3,743	3,721	3,700	3,678
5		-50	-50	4,015	3,950	3,885	3,854	3,822	3,790	3,759	3,728
6		-50	-50	4,163	4,075	3,989	3,946	3,904	3,862	3,821	3,779
7		-50	-50	4,319	4,207	4,096	4,042	3,989	3,936	3,884	3,832
8		-50	-50	4,482	4,344	4,208	4,142	4,077	4,012	3,949	3,886
9		-50	-50	4,654	4,487	4,325	4,246	4,168	4,091	4,016	3,941
10		-50	-50	4,834	4,636	4,446	4,353	4,262	4,172	4,085	3,998

Policy Year	Premium	Accumulation of Premiums paid at the end of the Policy Year using							
		2.00 %	1.50 %	1.00 %	0.75 %	0.50 %	0.40 %	0.25 %	0.10 %
1	1000	1,020	1,015	1,010	1,008	1,005	1,004	1,003	1,001
2	1000	2,060	2,045	2,030	2,023	2,015	2,012	2,008	2,003
3	1000	3,122	3,091	3,060	3,045	3,030	3,024	3,015	3,006
4	1000	4,204	4,152	4,101	4,076	4,050	4,040	4,025	4,010
5		4,288	4,215	4,142	4,106	4,071	4,056	4,035	4,014
6		4,374	4,278	4,183	4,137	4,091	4,073	4,045	4,018
7		4,461	4,342	4,225	4,168	4,111	4,089	4,055	4,022
8		4,551	4,407	4,268	4,199	4,132	4,105	4,065	4,026
9		4,642	4,473	4,310	4,231	4,153	4,122	4,076	4,030
10		4,734	4,540	4,353	4,262	4,173	4,138	4,086	4,034

(7 Marks)

c) It has been suggested that a terminal bonus, paid as a percentage of the maturity value, should be added to improve the marketability of the policy. Participating products, profits are distributed 80% to policyowners and 20% to shareholders respectively. Evaluate this suggestion.

(4 Marks)

d) A board member of your company has asked whether or not the Pacifican product has potential as a non superannuation life product in the Australian market as your company is looking to drive revenue growth next year. Draft your reply to the director covering the issue of the attractiveness of the Pacifican product for the customer in the current Australian market (consider tax and distribution costs).

(4 Marks)

END OF PAPER

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