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)**

QUESTION 1: SOLUTIONS

a) Course Reference: Unit 1 Reading – KPMG – An introduction to unitised funds and unit pricing p47; Textbook p59

Answer

The following issues need to be considered:

- Prices have been too high. This means that withdrawals have been overpaid. However this cannot be recovered.
- The purchases of new units in the superannuation funds have paid too much for their units and need to receive compensation, probably extra units. The company should consider waiving exit fees for new unitholders who decide to redeem their units and state that their reason for purchasing units in the last 6 months was due to strong performance of the fund.
- The individual unit holders need to be compensated if they have a material error (IFSA/FSC standard is 0.3% is a material error and that compensation paid where the loss is $20 or more)
- The life insurance company and the wholesale property unit trust manager should not gain from the compensation arrangement. This often means that an amount equal to the total gain from individual immaterial amounts is paid into the fund
- Unit prices need to be recalculated as if the error had not occurred and then transactions recalculated. (p51 of the KPMG paper gives a detailed description of how this is done but the detail is not required here)
- Switches would need to be treated the same as purchases and withdrawals under the equity principles
- Asset commission paid to distributors has probably been overpaid but it would not be practical to reclaim this

(3 Marks)

Marking Guide

- **1/2 mark each point**
- **To a maximum of 3 marks (KU)**

b) Course Reference: Page 48 of textbook;

Answer

The following checks and controls should be used:

- Comparison of unit prices with a benchmark to ensure reasonableness.
- Unit price movements outside a tolerance range should be checked.
- Regular reconciliation of units in the registry which includes applications, redemptions and units on issue and units in the unit pricing system.
- All procedures to be fully documented and relevant staff to be trained.
- All changes to systems to be fully tested and then documented and signed off.
- Access to relevant systems to be limited to appropriately authorised staff.
- Sign off process should include some independent review from someone not involved in the day to day process
- There should be an escalation process
- Regular (internal or external) review e.g. on a quarterly basis

Plus a valid comment about the effectiveness of each check.

(8 Marks)

Marking Guide
- **1 mark each point with a valid comment regarding the effectiveness of the check/control. ½ mark if no valid comment**
- **To a maximum of 8 marks (4 KU and 4 SJ)**

c) Course Reference: As above

Answer

It is recommended that:

- Staff should be retrained on the checking process
- Training procedures should be reviewed, including staff sign off that they have been trained and some testing of the staff to ensure that they have the competencies for their roles
- Recent system changes should be retested
- An audit of the systems used should be undertaken
- Some incorrect data should be tested in the system to see if the controls are effective

(3 Marks)

Marking Guide
- **1 mark for each point**
- **To a maximum of 3 marks CJ**

d) Course Reference: Unit 1 Reading – KPMG – An introduction to unitised funds and unit pricing; Unit 2 Reading – AIC and APRA Consult the Funds Management Industry on Good Practice in Unit Pricing

Answer

Note this question says discuss

Recommendation

- The market trend is for explicit buying and selling costs in unit prices, especially where buying and selling costs are material as is the case for property. This is also most equitable. Recommend separate buy and sell prices with the profit from matching buying and selling going to fund

Discussion

- Practically, the use or non use of a single unit price is constrained with what was disclosed to unit holders
- The issue is the most important for property funds as the buying and selling costs can be significant for property
- Single unit price is simpler for administration and use in a series of unit prices, so having a buy sell charge is more complicated. E.g. Costs on which spreads are based need to be reviewed regularly to ensure the appropriateness of the spread margins. However this has not proved difficult for most of the industry. With a single price, the Fund manager does not make money from matching buyers and sellers
- With a single unit price, Unit holders receive the benefit of matching buyers and sellers in the form of better performance.
- A single unit price is not fair on the buyer and the seller at a point in time as transaction costs are not reflected

(4 Marks)

Marking Guide

- **1 mark for recommendation**
- **1 mark for giving a reason for recommendation**
- **½ mark for each discussion point**
- **To a maximum of 4 marks (KU)**

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)

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 2: SOLUTIONS

a) Course References: Textbook chapter 18, particularly p348

Answer

- This is a single premium product with no refund when the mortgage is terminated so lapse experience significantly affects profitability. Not modelling lapses in the first year is a conservative assumption.
- Expenses are modelled as only occurring in year 1. In actual fact, there will be some renewal expenses and there needs to be an allowance for these.
- There are no claims modelled in the first two years, but it is reasonable to expect some claims in the first two years, especially as “60% of IA64/70 ultimate” is given as the mortality table.
- Investment income should be checked to see if it is based on the new money rate or portfolio rate.
- Statutory Reserves are just a straight line run off and are too weak as shown by negative earnings in later years.
- Statutory Reserves equal assets so there is no allowance for solvency margins or target surplus.
- The PV of the increase in reserves (at 5%) is not equal to the PV of interest on reserves. This is because the profit tests sets up reserves at the end of the year while investment income assumes assets backing reserves are set up at the start of the year.
- NPV at 5% is higher than NPV at 15%. Because of negative cash flows IRR calculation is unreliable.
- It is not appropriate to discount negative cash flows at a risk adjusted rate
- There is no explicit allowance for tax which may be because tax is on profits, but this should be checked

(7 Marks)

Marking Guide
- **1 mark for each point**
- **To a maximum of 7 marks (SJ)**

b) Course References: Chapter 18, particularly pp338-342

Answer

The sensitivity tests required should include:

- Sensitivities should be chosen for their impact on PV and the level of risk associated with the assumption
- Mortality, both correcting the error and also increased mortality as this has the highest PV hence is an important sensitivity
- Lapse is a relatively important sensitivity as this is a lapse funded product and there is a risk that lapses may vary significantly from expected.
- Test a zero lapse scenario as that is the worst case scenario and will provide a test of reserve suitability as well.

- Expenses in renewal years (although this might not be that important)
- Initial expenses
- New reserve basis to eliminate negative earnings after year 1
- Interest
- Risk Neutral basis, especially interest rates as a single premium 10 year product can be matched and has guaranteed premium rates

(5 Marks)

Marking Guide

- **½ mark for each sensitivity (maximum of 3)**
- **1 mark (total) for justification of order in relation to absolute value of the components of the premium and the level of risk associated with the assumption**
- **1 mark for the relative importance of the sensitivities**
- **To a maximum of 5 marks (SJ)**

c) Course Reference

Answers

The following issues arise:

- Moving from a single premium product to a regular premium product changes the commission flow for the mortgage provider. Even if there is more commission in total there will be an initial drop in income.
- For the insurance provider there will be a drop in revenue initially but profit per sale may be similar. Expense loadings may be less in year one offset by greater loadings in later years.
- It may be necessary for the mortgage provider to calculate the premiums or provide the outstanding balance as the administration may on the mortgage provider's systems and/or administered on the life insurance company's system on a bulk basis.
- Importantly, the guarantees implicit in the product change when the product changes from single premium to annual premium. For an annual premium product the company has an extra investment risk for each premium, but investment risk will be small
- A single premium product guarantees the mortality risk but an annual premium product only does this if the rates are guaranteed
- The policy will not be lapse funded so the company is relieved from that risk but is now exposed to losses on early termination from unrecovered initial expenses

(5 Marks)

Marking Guide

- **1 Mark each point**
- **To a maximum of 5 marks (SJ)**

d) Course Reference

Answers

The following design considerations need to be assessed:

- Benefit Design: The amount of cover needs to be established first. Cover would be the payments due, perhaps with a 6 month waiting period and a maximum of one year's payment. The design should cover what happens to the death cover during unemployment and if multiple claims can be made for unemployment during the life of the policy.
- To be insurable, events need to be unpredictable. Unemployment is a cyclical event but does have likely maximum and minima. Anti-selection will be an issue but less so if coverage is still compulsory and also less if there is a waiting period. Suggest excluding family businesses and self-employed as the event of unemployment would be under the control of the insured, or alternatively make it a requirement for the family business to be placed into insolvency administration or the self employed person to be declared bankrupt
- The event of unemployment needs to be clearly defined. Should be involuntary and require evidence from the insured and the employer. Evidence from the employer can be difficult for two reasons – the employer may be the insured, or the employer may be reluctant to open themselves to some litigation.
- The premium needs to be clearly defined. Is the rate guaranteed and is the benefit cancellable or guaranteed renewable?
- There is a positive selection effect in mortgage insurance as to be eligible for a mortgage and have saved a deposit you would normally need to be steadily employed (although this was not the case in the US before the GFC). This is a risk reduction factor.
- Need to allow for joint mortgages as repayments covered by two incomes which may result in a high replacement ratio if one is made unemployed. The higher the replacement ratio the higher the level of claims similar to disability income.
- Additional underwriting questions may be needed.
- Need to consider whether unemployment insurance can be offered by life companies in the relevant jurisdiction. For example in Australia a declaration under s12A of the Life Act would be required.

(5 Marks)

Marking Guide
- **1 mark for benefit design**
- **1 mark for insurability**
- **1 mark for issues on definition**
- **1 mark for premium guarantees**
- **1 mark for underwriting**
- **1 mark for additional underwriting questions**
- **1 mark for regulatory considerations**
- **Up to 1 mark for any other valid points**
- **To a maximum of 5 marks (CJ)**

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 3: SOLUTIONS

a) Course Reference: Textbook Chapter 14

Commission – Initial / Renewal
Incidence rates - by occupation, age, gender, smoking status, contract type (agreed value or indemnity)
Claim Termination Rates - by duration, waiting period, gender
Ancillary benefit costs
Expenses – Initial (including underwriting)/ Renewal
Interest
Claim inflation rate
Benefit indexation rates
Indexation acceptance
Lapse rates
Claim investigation expenses + ongoing expenses
Stamp duty
Tax
Level of capital above solvency to cover target surplus and capital adequacy

(3 Marks)

Marking Guide
- **1/4 mark for each assumption**
- **Maximum of 3 marks (KU)**

b) Course Reference: Textbook p 37-48 on company structure; Textbook Chapter 8 on disability underwriting; Unit 2 Reading "The Management of Disability Claims" by John De Ravin. Internal discussions should be held with members of the Claims Committee (membership is mentioned on p41 of John De Ravin's).

Answer

The most important internal sources would be

- Claims Manager who will be able to identify common causes **of claims incidence** and **claim duration** and provide details of **where claims are a problem** e.g. obtaining evidence, policy wording etc. Would also identify **why claims are declined**. This analysis would be more anecdotal than statistical
- Underwriting manager who will understand **risk selection process and occupation classification**. The underwriting manager should also **examine early claims** to see if something is wrong in the underwriting process
- Chief actuary or actuaries responsible for experience investigations which should provide a guide for **actual vs. expected** as well as **occupation ratings**

The most important external sources would be

- Reinsurers who would be able to provide guidance on current market experience and **claims trends** and **occupation trends**
- **Professional studies** from the IAA. These are often out of date but would give an indication of trends
- **Other actuaries** in the profession but being careful to avoid trade practices issues **Other relevant studies** from either Australia or applicable overseas markets; these may give other insights into experience

Other internal and external sources

- Legal who can indicate policy wording problems
- Claims investigators who can indicate problems with claims definitions
- Operations manager who can identify and extract available data
- Chief Medical Officer (CMO) who has experience with the causes of claims and knowledge of new developments in medicine. This is a medium sized company so probably will share a CMO with other companies so the CMO will also have a feel for other companies
- Consultants, although this level of detail is often not their strength

(6 Marks)

Marking Guide

- **1 mark each for the most important, ½ mark for who and ½ mark for why**
- **½ mark each for the other sources ¼ mark for who and ¼ mark for why**
- **Maximum of 6 marks (SJ)**

c) Course Reference: Textbook chapters 12, 14, 15, 16; Unit 3 reading, "Interim Report of the Disability Committee

Answer

The primary assumption has been derived from overall experience so a change in the assumed smoker percentage or smoker ratio will change the non-smoker and smoker incidence rates but it will not alter the overall company experience. However the experience of the two groups should be examined to see if there is any subsidy between non-smokers and smokers. Experience should be considered before and after reinsurance.

If the suggestion is adopted for new business a better non-smoker rate may be achieved but it will cause the smoker rates to increase. The revised assumption should be retested against the company's own experience for the two groups. If the increased smoker percentage and smoker ratio is out of line with the market this may skew the distribution of new business towards non-smokers and away from smokers.

If the suggestion is adopted for the existing portfolio a better non-smoker rate may be achieved and may lead to premium rate decreases and possibly a decrease in the in-force premium income from non-smokers but it will cause the smoker premium rates to increase and an increase in the in-force premium income from smokers. The change is likely to have an impact on lapse rates with possibly lighter lapse rates from non-smokers and higher lapse rates from smokers if premium rates can be altered for the in-force. If premium rates cannot be altered then non-smokers are likely to lapse and re-enter. On the other hand if smoker premiums cannot be increased then the company will continue to have lower profitability on the smoker business.

Finally reinsurance needs to be considered. If the company changes the premium rate then the reinsurance rate may change. The reinsurer may also be able to change premiums independently of the company.

(5 Marks)

Marking Guide

- **Implications on incidence rates non-smokers and smokers 1 mark**
- **Comment that overall experience will not change 1 mark**
- **Comment that experience of two groups should be separately examined. 1 mark**
- **Implication for new business rates 1 mark**
- **Implication for in-force rates 1 mark**
- **Comment regarding lapse rates 1 mark**
- **Comment regarding reinsurance ½ mark**
- **Comment regarding premium rate guarantees ½ mark**
- **Any other valid point 1 mark**
- **To a maximum of 5 marks (CJ)**

d) Course Reference: Unit 2 Reading "The Management of Disability Claims" by John De Ravin" p9 discusses the problems with claim experience

Answer

It is most likely that the company's own distributors receive the best occupation category as a subsidy rather than in recognition of good claims experience. Salesmen have particular problems which stem from variable income which can impact claim rates.

- Because income can be variable the replacement ratio can be high. When the replacement ratio is high, claims are usually high
- It is difficult to define work activities that are the key to determining disability
- Insurance salesmen in particular have detailed knowledge of how to make a claim and this can lead to higher claim rates

This problem could be analysed by
- Talking to the claims manager to see if the above factors apply. Looking at some actual cases would also be a good idea
- Looking at the experience of actual/expected for salesmen as a group. There should be enough experience to look at the overall ratio for total claims or at least % of claims vs. per cent of premiums.
- Talk to reinsurers about market trends

The experience should be reanalysed by removing the company's own distributors from the exposure and claims and examining the impact on the overall experience.

For new business the change will result on more competitive rates but may cause resentment from the tied agent who may not recommend the product. If the adviser can say "this is the product I own" then it is a strong recommendation.

For in-force business the change has a different impact for guaranteed and non-guaranteed rates:
- If rates are guaranteed then they cannot be changed. However the existing policies may have lower lapses if the reclassification is part of a general industry trend and the guaranteed rates are low relative to alternative new policies.
- If rates are not guaranteed and rates are increased then there will be strong resentment from the agents and the cost of this may offset the benefits gained. The company could consider treating the occupation category for tied agents as part of the cost of the agency force and exclude the experience from the pricing of the disability product.

(5 Marks)

Marking Guide
- **1 mark for identifying agents are probably subsidised**
- **1 mark each for variable income points to a maximum of 2 marks**
- **1 mark each for analysis to a maximum of 2 marks**
- **1 mark for each comment regarding implementation of a possible solution and**

implications

- **1 mark for any other valid point**
- **To a maximum of 5 marks (SJ).**

e) Course Reference: Textbook Reinsurance Shopping p201, 206

Answer

Whilst the offer of reinsurance does result in the company achieving its aims it is first necessary to examine why the reinsurer can offer such good terms, as the reinsurer will expect to make a profit. Items to consider are:

- The reinsurance commission might be high enough to significantly reduce year 1 investment and improve the overall IRR. This would imply that the reinsurer has a lower IRR than the company. This could be one of the issues with pricing – the company has an IRR requirement that is too high. However reinsurers tend to have a lower distribution risk so a lower IRR might be justified. In addition their source of capital often requires a lower rate of return than a retail life insurance company in Australia, due to regulatory issues in their home markets
- The reinsurer may also be expecting a much better claim rate as they have offered to accept 85% of the risk, which is high. It would be advisable to estimate the reinsurer's claim assumptions assuming they make a 10% loading for profit and expenses.
- It will also be necessary to understand the reinsurer's premium guarantee. When can rates be increased and can they be increased without the company increasing rates?
- Reinsurer's approach to the management of claims and if they also pay claims expenses
- Reinsurer's financial soundness as the ultimate liability remains with the company if the reinsurer fails.
- Implication of writing business with a 30 day waiting period, but reinsuring the risk with a 90 day waiting period. Assess sensitivity of an increase in shorter duration claims (between 30 to 90 days) which will increase net claims costs.

If after all of this the company does not wish to change any assumptions then the reinsurance offer should be considered and the board advised of the IRR both with and without reinsurance.

(6 Marks)

Marking Guide

- **1 mark for each point**
- **To a maximum of 6 marks (CJ).**

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 4: SOLUTIONS

a) Course Reference: Textbook p285 and 286

Answer

Under the existing basis the higher volume of business in the independent financial adviser channel would mean more expense allowances are received from the independent financial adviser channel with the assumption that more overhead support is required. The same logic applies to IT expense allowances.

Under the CEO's proposal there should be different allowances for different channels, reflecting the relative costs of each channel. Some expenses e.g. policy processing will be related to the function and the same regardless of channel.

However overhead and IT costs are fixed or semi fixed and cannot be directly allocated. These costs need to be allocated to the channel first, then to the unit expense allowance using an expense driver. The allocation to channel will require some consideration of how the business is organised. The business has most likely been organised around the historic market shares and the allocation of overhead costs should reflect this.

Discussions with overhead departments would give some indication of time spent with each channel. Allocate overhead expenses first to the channel and then to channel expense loadings.

Some IT costs can be allocated directly. These costs would include hardware and software costs for PCs. These costs would go direct to the channel. There may also be separate systems for different channels and these costs could also be allocated directly. This could be due to legacy products or the different information or interface requirements of each channel.

There are some costs in IT which are generic and apply regardless of channel. These costs can be allocated to function. The expense allowance cost per unit of driver would be the same for each channel.

Other IT costs, particularly mainframe costs are large and semi fixed. As volumes increase beyond a certain point, expensive mainframe upgrades are required. These costs are probably best allocated on a per unit basis, reflecting usage.

System development costs tend to be "lumpy", with resources being project based. Whilst these costs may be allocated by channel, a large cost over the last 3 years whilst a system is finished may not mean large costs over the next three years. System development costs should be amortised for expense analysis purposes and this should give a better spread between channels. However the importance of the bank channel probably means that there will be continued requests for IT development and dedicated resources.

(5 Marks)

Marking Guide

- **1 mark for current basis would lead to more expense allowances being allocated to the independent financial adviser channel, and therefore more expenses spent**
- **1 mark for allocate to channel then to expense allowance using expense driver**
- **1 mark for overhead time analysis**
- **1 mark for using historic organisational split to channel**
- **1 mark for general discussion on the nature of IT costs**
- **1 mark "lumpy" costs to be analysed**
- **1 mark for any other valid point**
- **To a maximum of 5 marks CJ**

b) Course Reference: Textbook Distribution structures P59, Marginal expenses p291, p288 embedded values

Answer

CFO

- The impact of using different allowances can be measured by the impact on the embedded value which will basically be:

  (value per unit before expense) x (volume less marginal expenses)

- Expenses will need to be properly allocated to each channel
- Comparing expenses in each channel with pricing allowances should assist in the better management of the company
- The IFA channel head will need to reduce expenses as the channel has a higher expense allocation. The alternatives are to increase sales volumes (difficult), increase product prices (difficult as prices are set by the market) or reduce compensation (difficult as the advisers are not tied)
- Impact: Challenge for the CFO is to maximise the revenue for the organisation whilst trying to ensure that channel conflict is minimised by ensuring that the profitability of each channel reflects the true profitability of that channel.
- There is a chance that the bank business will be lost, therefore a contingency plan to reduce expenses should be investigated
- Costings of additional strategies in each channel would need to be examined

Head of Products

- Will need to manage the repricing of products both in the short term and the long term.
- The cross subsidy between channels should be clearly understood and considered when evaluating requests from each of the channels.
- There is a real prospect of channel conflict which means that it is advisable to sell different products in different channels rather than the same product across more than one channel. This could reflect the nature of advice given in each channel.

Channel Sales Heads

- Both the direct channel and the IFA channel should be looking at strategies to increase sales, although these might require investment
- IFA head should look for expense savings from the current structure as well as the ability to use existing staff on new sales generating projects. Concentrate on items without a direct link to sales
- Bank channel head can seek to lock in volumes from bank and also expand product line with bank
- The Bank channel head should have had a wider source of business and even if successful with the tender should still look for other bank partners
- Head of bank channel should look at expense savings (or at the very least controlling the increase in expenses) to improve the value of the bank channel

(8 Marks)

Marking Guide

- **1 mark for stating that the impact on embedded value is the focus**
- **1 mark for each point other point to a maximum of 3 marks per perspective**
- **To a maximum of 8 marks (CJ)**

c) Course Reference: Chapter 18

Answer

An effective bonus system needs to reward results that lead to an increase in the value of the company above a threshold from results that are controllable by the channel heads adjusted for risk. The main drivers of value for the channel heads are sales, persistency and expenses.

Sales can be rewarded on sales volume but given the importance of embedded value and the competitive nature of the market (particularly for the bank channel) the increase in embedded value would be a better measure. This would also make allowance for the profitability of business. Note that the embedded value would be the value of in force plus the net worth as new business has a strain. An alternative is just to look at the value of new business but this does not give any weight to policy retention as new business persistency can only be measured over several years, and any lapses in the current year would have a small impact.

The annual sales bonus would be a percentage of target bonus in dollars, with the percentage determined from a scale related to the percentage increase in embedded value compared with budget, with bonus not commencing until 90% of budget is achieved. For example achievement of 90% of budget might result in 50% of target bonus, 100% of budget might result in 100% of target whilst 125% would result in 150% of target bonus.

Whist the Channel Heads may argue that persistency is not within their control it is a key component of the embedded value and can be related to the quality of advice given through our channels and the target markets for our direct channel. The problem however is that persistency from this year's business will not be known for several years. It is therefore suggested that part of the bonus should be deferred and released in the future as persistency targets are achieved although this may not be practical to administer. Also by including the value of in force business, any business lost would lower the embedded value. However, changes to persistency assumptions should probably be excluded from the calculation as this can create large and late variances in value and can also create a lot of pressure for the actuary making the assumption. Another alternative is to have persistency or lapse rate targets as a separate KPI for determining bonuses.

Finally part of the bonus should reflect the expense savings or overrun for the channels direct expenses (not including allocated expenses such as overheads, IT development etc). Again this could be a percentage of target bonus based on achievement of savings relative to budget. For example, meeting budget would receive 100% of target, a 5% expense saving say 125% of target and a 5% overrun 50% of target and no bonus above a 5% overrun.

Please note that the percentages given above are to illustrate how the concept works and further work is needed to decide the appropriate target and percentages.

(4 Marks)

Marking Guide
- **1 mark for relating sales to value**
- **1 mark for a persistency component**
- **1 mark for expense component**
- **1 mark for minimum threshold**
- **1 mark for percentage of target bonus but zero marks if percentage of increase in embedded value**
- **1 mark for any other valid point**
- **To a maximum of 4 marks (CJ)**

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 Commis sion	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)

QUESTION 5: SOLUTIONS

a) Course Reference: Textbook Chapter 10 on Investing Assets

Answer

- The investment return needs to be consistent with the investment policy.
- The pricing can be based on a new money matched rate or a portfolio rate. The candidate should state which they assumed it to be.
- The pricing should allow for operational cash needs which prohibits a full investment policy.
- The investment return should allow for the cost of investment expenses

(3 Marks)

Marking Guide
- **1 mark for investment return being consistent with investment policy**
- **1 mark for matched cash flows in Australian government bonds or portfolio return**
- **1 mark for knowing that cashflows cannot be fully invested as some operational cash is required**
- **1 mark for investment expenses**
- **1 mark for any other valid point**
- **To a maximum of 3 marks KU**

b) Course Reference: Textbook Chapter 20 on Surrender Values (Candidates are not expected to know current investment rates – see *Learning Objective 11.3: Design and describe a coherent set of investment assumptions* students do not need to know a basis. In this question we have given a range of calculations and told the student to use these as an initial estimate of the surrender value. We have told them the interest basis and the mortality basis as well as the fact that in the bank a simple basis is needed. Also the mortality risk is not high in a product paid by four annual premiums and which has a sum insured of 104% of premiums paid or payable, so I think judgment would suggest use an interest margin to allow for mortality).

Answer

- The surrender value should be less than the asset share but equal the maturity value on the maturity date. 4*1000*1.04 = 4160 and in table 1 3% gives 4085 and 3.25% gives is 4172. Hence surrender values should not be more than the asset share at 3.25% or the implied yield to surrender will be more than the yield to maturity
  - The interest rate assumption for the asset share should be something like 5.5% (current bond is 5.7% for 10 year, 5.6% 9 year, 5.5% 8 year and 5.4% 7 year). Investment expenses should be 0.1% to 0.2%.
  - Surrender values should not vary by age as a simple basis is needed (this is stated in the question)
  - Mortality exposure is slight as the maximum payable on death is 4,160, the maximum issue age is 55 and reserves released on death are quite high meaning the net amount at risk would be low. An interest margin of 0.25% (i.e. 2.50 per thousand) should be more than sufficient to allow for mortality risk.
  - 5.5%-0.2%-0.25% Hence use 5% as the asset share assumption, but this makes no allowance for reinvestment risk as most of the investment for these policies takes place in the future 3 years. The asset share is before shareholder profits
  - Surrender values are guaranteed so some conservatism is justified. Using Asset share rate of 5% and an accumulation of cash flows at 3.75% gives the maturity value and provides 1.25% profit for risk and shareholder return as well as a 1% return on premiums for the policyholder
  - However the values at early durations do not provide much profit on surrender. Hence they should be multiplied by a percentage to give a reasonable profit. The total accumulated profit over 10 years is around $50 per year.
  - There is also the risk that as interest rates rise policyholders surrender and assets are sold at market value. Hence a margin is required for this optionality risk although this risk is largest in the middle of the contract.
  - The recommended values are (candidate only needs give end of years 1,3, 5 and 8)

End of Year	Asset Share at 5%	Asset Share at 3.75%	Ratio	SV	Profit on SV	SI	Asset Share at 3.25%
1	630	623	90%	560	70	4,320	620
2	1,659	1,631	94%	1,534	125	4,320	1,621
3	2,739	2,678	96%	2,571	168	4,320	2,654
4	3,874	3,764	98%	3,689	185	4,320	3,721
5	4,015	3,854	100%	3,854	161	4,320	3,790
6	4,163	3,946	100%	3,946	217	4,320	3,862
7	4,319	4,042	100%	4,042	277	4,320	3,936
8	4,482	4,142	100%	4,142	340	4,320	4,012
9	4,654	4,246	100%	4,246	409	4,320	4,091
10	4,834	4,353	100%	4,353	481	4,320	4,172

- On this basis the surrender value does not exceed premium paid until the beginning of year 10.

(7 Marks)

Marking Guide

- **1 mark for mentioning investment expenses**
- **1 mark for mentioning mortality cost**
- **1 mark for 4.5 to 5% as asset share assumption**
- **1 mark for mentioning optionality in contract**
- **1 mark for mentioning policyholder return**
- **1 mark for adjustment to early values, but it would be difficult to argue for a surrender penalty after year 4 when premiums are fully paid**
- **½ mark for each value at end of policy year if value is less than asset share and adjustment factor is 100% no later than duration 6. Value not to be lower than 500 at end of policy year 1, 2,400 at end of policy year 3 and 3,700 at end of policy year 5**
- **1 mark for any other valid point**
- **To a maximum of 7 marks SJ**

c) Course Reference: Textbook Chapter 20, p384 and 385

Answer

- Introducing a terminal bonus credited on a discretionary basis changes the policy to participating which means that profit could not be distributed until it is distributed to policyholders in year 10
- Even introducing a terminal bonus on surrender would only add small distributions to policyholders
- The quantum of profit going to shareholders is also reduced. Because of this we may want to limit the guarantees but even if the sum insured is reduced to 4000 the accumulated shareholder profit will be 20% of 834 (4834 less 4000) = 166.80 rather than 100% of 674 (4834 less 4160). Credit to be given if different but consistent numbers are used
- Not a good candidate for participation as the cash flows can be matched and there are no equity/property components in the investment policy currently.

(4 Marks)

Marking Guide
- **1 mark for each point**
- **To a maximum of 4 marks CJ**

d) Course Reference:

Answer

Dear Director,

Thank you for your suggestion about examining the possibility of selling the Pacifica product in Australia. There are a number of issues which impact on the feasibility of the product

- Whilst Pacifica has no income tax, there is income tax in Australia both for life insurance companies (30%) and individuals. This adds an additional expense for the company. The additional tax may further reduce policyholder returns so that it becomes unattractive. The policyholder return could be improved by cutting commission and allowances.
- The bank would need to give the customer appropriate advice on the product, and given the current return from competing products I doubt that the bank could recommend sale of the Pacifica product.

Please let me know if you wish to discuss this, or any other sales proposal, in more detail. I would be happy to discuss this further.

(4 Marks)

Marking Guide

- **1 mark for each point, income tax, commission and advice**
- **1 mark for style but only ½ mark if only "Dear Director" and very little else**
- **To a maximum of 4 marks KU**

END OF PAPER

Question	Syllabus Performance Outcome	Units	Knowledge & Understanding	Straight-forward Judgement	Complex Judgement	Total Marks
1 (a)	7.5	2	3			18
1 (b)	3.2, 7.6	1,2	4	4		
1 (c)	7.6	2			3	
1 (d)	7.5	2	4			
2 (a)	14.2	4		7		22
2 (b)	14.1	4		5		
2 (c)	5.2, 5.3	2		5		
2 (d)	5.1, 7.1	2			5	
3 (a)	14.1	4	3			25
3 (b)	8.1,8.3	3		6		
3 (c)	2.4, 8.3	1,3			5	
3 (d)	5.3	2		5		
3 (e)	5.4	2			6	
4 (a)	2.2, 8.3,10.1	1,3			5	17
4 (b)	2,3, 9.1, 10.2	1,3			8	
4 (c)	2.4	1			4	
5 (a)	11.1	3	3			18
5 (b)	15.1,15.2	5		7		
5 (c)	16.1	5			4	
5 (d)	1.1,1.2	1	4			
TOTAL			**21**	**39**	**40**	**100**
BENCHMARK			20	40	40	
TARGET			15-30	35-45	30-45	100

