INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2B LIFE INSURANCE OCTOBER 2011 EXAMINATIONS

Marking Guide

Level of Difficulty

Question	Syllabus Performance Outcome	Units	Knowledge & Understanding	Straight-forward judgement	Complex Judgement	Total Marks
1 a)	12	6	1			1
1 b)	12	6	4			4
1 c)	2,9,12	1,5,6			7	7
1 d)	4,12	2,6		5		5
1 e)	4,12	2,6		2		2
2 a)	5	3	5	2		7
2 b)	5	3		6		6
2 c)	5	3			6	6
3 a)	7	4		3		3
3 b)	7	4	2	3	1	6
3 c)	7	4	1			1
3 d)	7	4	2	2		4
3 e)	7	4		1	3	4
3 f)	7	4			4	4
4 a)	1	1	2	3		5
4 b)	1,2,3	1,2		8		8
4 c)	1,2,3	1,2			7	7
5 a)	4	2	2			2
5 b)	4	2		1		1
5 c)	4	2	1	1	2	4
5 d)	4	2			6	6
5 e)	4	2		5	2	7
TOTAL			**20**	**42**	**38**	**100**

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Answer all 5 questions

QUESTION 1 (19 Marks)

It is 1 April 2012 and you have just joined a newly formed Australian Life Company, ONLINE life, as Appointed Actuary. You have extensive experience as a Valuation Actuary in other life companies. 1 April 2012 is also the launch date for ONLINE Life.

ONLINE Life sells business exclusively through its website "whyuseanadviser.com".

ONLINE Life's two product lines are:

- **A Funeral Benefit Plan, which pays a benefit of up to $15,000 to cover the cost of the funeral of the life insured.**
- **An Accidental Death product, which pays a maximum sum insured of up to $500,000.**

The financial year ends on 30 September.

You will present the 30 September 2012 Financial Condition Report (FCR) at the November board meeting. The Directors have experience in companies other than a life company, but have no knowledge of life insurance business.

You have a small valuation team of four people, comprising a recently qualified Actuary with 3 years experience in pricing protection products, two Actuarial Analysts and yourself as Appointed Actuary. You will be heavily involved in completing the policy liability valuation as well as writing the FCR.

a) Describe the difference in the key responsibility between the Appointed Actuary and the Board of Directors. (1 Mark)

b) The FCR is a complex document. You will spend a significant amount of time writing the FCR, so you will want the FCR to effectively communicate your messages to the Directors.

Discuss how you would structure and format the FCR so that your points are effectively communicated to the Directors. (4 Marks)

c) Discuss the issues that you would expect to encounter in preparing the 30 September 2012 FCR, and how you plan to resolve these issues. (7 Marks)

d) In the FCR you recommend that no dividend be paid to shareholders.

i) Provide possible reasons for recommending no dividend be paid.

ii) For each reason you have provided in i) explain whether or not it is absolutely critical that no dividend be paid. (5 Marks)

e) Describe the actions you could take if the Directors ignored your recommendation and decided to pay a dividend to shareholders. (2 Marks)

QUESTION 1: SOLUTIONS

a)
The difference in the key responsibility between an Appointed Actuary and Board of Directors:

- The Appointed Actuary is an adviser to the Board of Directors. (0.5 mark KU)
- The Board of Directors ultimately takes responsibility for decisions concerning the company. (0.5 mark KU)

Marking Guide

Marks as specified above for each point.

To a maximum of 1 mark KU.

b)
To communicate effectively to the Directors:

- The report should be well structured and subdivided into various sections. (0.5 mark KU)
- Include a contents page. (0.5 mark KU)
- At the start of the report, there should be an executive summary focusing on the key issues and recommendations. (0.5 mark KU)
- The report must comply with PS200 by covering all the topics and requirements of the standard. (0.5 mark KU)
- The technical details should be shown in the Appendices. (0.5 mark KU)
- As the directors are from a non actuarial background, one would avoid the use of actuarial jargon. (0.5 mark KU)
- One would need to explain complex actuarial concepts in simple terms. (0.5 mark KU)
- The use of graphs and table to present actuarial results would greatly assist the directors in comprehending the messages that the Appointed Actuary is trying to convey. (0.5 mark KU)
- Should link experience variation and effect of change in assumptions to a concept that the directors would understand such as impact on profit, solvency or capital adequacy. (0.5 mark KU)
- Include a dictionary of technical and insurance terms in one of the appendices. (0.5 mark KU)

- Other valid points with an appropriate explanation. (0.5 mark KU)

Marking Guide

Marks as specified above for each point with an appropriate explanation.

To a maximum of 4 marks KU.

c)
Issues that may arise with actions to resolve them include:

Issue	Actions To Resolve the Issue
Assumption Setting By 30/9/2012, Online life would have only been operating for 6 months. It won't have enough experience to form assumptions for policy liability calculations. (0.5 mark CJ)	It will likely revert to the assumptions used in pricing. Alternatively the solution would be to use industry experience studies, reinsurers' advice or seek advice from actuarial consultants. (0.5 mark CJ)
Data Integrity In the FCR, the Appointed Actuary must comment on data integrity issues. As the company is new, actuarial extracts will be required for the first policy liability valuation and there could be issues with the data integrity of actuarial extracts. (0.5 mark CJ)	Data will need appropriate checks such as reasonableness checks on data fields (age, duration, sum assured, annual premium etc). (0.5 mark CJ)
Expense Apportionment As a new company, there would not be enough data (including historical data) to determine appropriate drivers to split unallocated expenses between the two products appropriately. (0.5 mark CJ)	Seek advice from actuarial consultants who may have experience with similar online insurance products. (0.5 mark CJ)
Lack of knowledge The actuarial team except for the Appointed Actuary lacks the knowledge, experience and skill in performing the policy liability valuation and other actuarial tasks required for the FCR. (0.5 mark CJ)	Use training/education sessions and use experienced outside consultants. (0.5 mark CJ)

Risk Framework As part of the FCR, the Appointed Actuary must comment on the business risks and the risk framework. As the company is new, a risk framework probably has not been set up yet. (0.5 mark CJ)	Assist management in setting up a risk framework by identifying risks and actions to take if risks occur. (0.5 mark CJ)
Amount of Work Required As there is only six months to go before the 30 September 2012 policy liability valuation is due, there is a substantial amount of work required and limited actuarial resources. (0.5 mark CJ)	Develop an action plan. Recruit outside consultants. (0.5 mark CJ)
Company Administration Systems are Working as Intended As we have a new company, with new products with a new distribution channel and with possibly inexperienced staff, there is great possibility for the products to be administered incorrectly (not according to policy documentation). (0.5 mark CJ)	Audit of administration systems by independent people. (0.5 mark CJ)
Conflict of Interest This concerns the Appointed Actuary's role and his/her position as an employee of company. The Appointed Actuary is responsible for the protection of the policyholders, where the company is acting for the interest of the shareholders. Thus when the Appointed Actuary is an employee of the company, he may come under pressure from senior management to change his recommendations. (0.5 mark CJ)	When conflicts arise discuss with peers or have a mentor inside or outside the company. (0.5 mark CJ)
Other Issues (0.5 mark CJ)	Appropriate explanation of other issues. (0.5 mark CJ)
To a maximum of 3.5 marks CJ	To a maximum of 3.5 marks CJ

Marking Guide

Marks as specified above for each point with an appropriate explanation.

To a maximum of 7 marks CJ.

d)

i) Reason	**ii) Explain if it is absolutely critical that no dividend be paid**
In the first year the company may be making a loss because of the set up costs. Hence no dividend can be paid. (0.5 mark SJ)	If there is a loss, there is no profit and hence it is impossible to pay a dividend. (0.5 mark SJ)
Paying a dividend could breach the Solvency Requirement. (0.5 mark SJ)	It is critical that no dividend be paid in this situation as it brings on all the consequences of a run off situation. (0.5 mark SJ)
Paying a dividend could breach the Capital Adequacy Requirement. (0.5 mark SJ)	It is critical that no dividend be paid in this situation as it brings on all the consequences of a full review by APRA and restrictions in running the business. (0.5 mark SJ)
Paying a dividend could breach the Target Surplus policy. (0.5 mark SJ)	It is not critical that no dividend be paid. A dividend can be paid but it means it is more likely that the Capital Adequacy Requirement will be breached in the future. (0.5 mark SJ)
Rather than paying a dividend from the next three years' profits, the company will have sufficient retained profits to fund the capital requirements of new business over the next three years. (0.5 mark SJ)	It is not critical that no dividend be paid A dividend can be paid, but it means a reduction in future dividends or an injection of capital may be required to fund new business. (0.5 mark SJ)
Any other valid reasons with an appropriate explanation. (0.5 mark SJ)	With an appropriate explanation. (0.5 mark SJ)
To a maximum of 2.5 marks SJ.	To a maximum of 2.5 marks SJ.

Marking Guide

Marks as specified above for each point with an appropriate explanation.

To a maximum of 5 marks SJ.

e)

Actions you could take if the Directors ignore your recommendation and decide to pay a dividend to shareholders are:

Compulsory Point:

- As a last resort, if the dividend paid meant the company breached the Solvency Requirement or the Capital Adequacy Requirement, use the whistle blowing powers of the Appointed Actuary under the Life Act and inform APRA immediately. (1 mark SJ)

Non-Compulsory Point:

- Before it gets to this drastic stage, arrange a meeting as soon as possible with the Directors to discuss the issue and the consequences if a dividend is paid. (1 mark SJ)

- Other valid points with an appropriate explanation. (1 mark SJ)

Marking Guide

Marks as specified above for each point with an appropriate explanation with:

- **1 mark SJ for compulsory point on whistle blowing**
- **1 mark SJ for non-compulsory point**

To a maximum of 2 marks SJ.

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QUESTION 2 (19 Marks)

PCL is an Australian Life Insurer which has a large open book of Yearly Renewable Term (YRT) business, providing lump sum death benefits only. PCL also has other lines of business including a large block of closed participating business. PCL uses Surplus Reinsurance. Advisors receive initial commission of 100% of the first year premium.

All assets are invested in cash.

You are the Valuation Actuary for PCL Life and have received the following YRT profit results for the year ending 30/6/2012:

	Actual	Expected	Actual – Expected with interest on cashflows
	$000s	$000s	$000s
Gross Premiums	214,000	214,000	0
Reinsurance Premiums	-10,800	-10,700	-103
Gross Claims	-111,000	-106,800	-4,314
Reinsurance Claims	4,300	7,500	-3,287
Acquisition Expenses	-19,800	-17,400	-2,465
Renewal Expenses	-46,700	-42,600	-4,211
Net Cashflow	30,000	44,000	-14,380
Investment Income	3,400	3,800	-400
Increase in Policy Liability	-9,700	-2,200	-7,500
Profit	43,100	50,000	-6,900

Policy Liability Information	Actual	Expected
	$'000s	$'000s
For all policies inforce at 30/6/2011:		
IBNR	16,300	16,300
Projection Policy Liability	-254,800	-254,800
Total Policy Liability	-238,500	-238,500
IBNR all policies inforce @ 30/6/2012	16,900	17,200
Projection Policy Liability for inforce at 30/6/2012 that was inforce at 30/6/2011:		
using 30/6/2011 assumptions (with 5.5% rdr)	-237,800	-240,400
using 30/6/2012 assumptions (with 5.0% rdr)	-245,200	n/a
Projection Policy Liability for new business written that is inforce at 30/6/2012 (30/6/2012 assumptions)	-19,900	-17,500
Total Policy Liability @ 30/6/2012	-248,200	-240,700

Notes:

- **Renewal and Acquisition expense items include commission.**
- **All cashflows are assumed to occur half way through the year.**
- **Tax can be ignored.**
- **No reinsurance policy liability is calculated as it is immaterial.**
- **30/6/2012 assumptions are the same as the 30/6/2011 assumptions, except for a change in the risk discount rate (rdr) assumption.**
- **The 30/6/2011 rdr assumption was 5.5% p.a. and the 30/6/2012 rdr assumption is 5.0% p.a.**
- **The expected lapse rate is 10% p.a. with a standard deviation of 1% p.a. (from the recent lapse experience analysis).**
- **Actual lapse rate is 11% for business that was inforce at 30/6/2011. Actual lapse rate is as expected for new business.**
- **The actual investment earning rate of 5.5% p.a. is equal to the expected investment earning rate of 5.5% p.a.**

a) The following items from the analysis of profit have already been calculated:

	$000s
IORE	**15,700**
Expected Profit Margins	**34,300**
Total Experience Profit	**-6,900**
Total Actual Profit	**43,100**
Investment Experience Profit	**0**
Renewal Expenses Experience Profit	**-4,211**

Given this information and the cashflow experience profits with interest above, complete the analysis of profit for the Experience Profit for the year (showing all workings).

In your analysis of profit, where you consider it is appropriate, allocate each component of the change in policy liability to a cashflow item.

In your answer, include a table summarising the analysis of profit, including all components of the actual profit. (7 Marks)

b) Comment on each experience item in the analysis of profit, explaining with reasons whether or not there is a potential issue that needs further investigation. (6 Marks)

c) Describe the investigations you would undertake in regard to the issues identified in b). (6 Marks)

QUESTION 2: SOLUTIONS

a)

Note: In the analysis of profit below, the following signing convention is used (this is particularly important for getting the right sign (+/–) for claims experience (profit/loss)):

Revenue Account Item	**Sign**
Income: Premiums and Investment Income	+
Outgo: Expenses and Claim payments	–
Release of Policy Liabilities	–

Components of the Change in Policy Liabilities

The cashflow experience items (with interest) have been provided in the question.

I have completed the following table for convenience as it gives a breakdown of the change in policy liabilities into components:

	Actual	**Expected**	**A - E**	**Marks KU**
Policy Liability @ 30/6/2011	-238,500	-238,500		
Change in Policy Liability from:				
Change in IBNR:	**600** *=16,900 – 16,300*	**900** *=17,200 –16,300*	**-300**	**1**
Lapses of policies inforce at 30/6/2011:	**17,000** *= -237,800 – -254,800*	**14,400** *= -240,400 – -254,800*	**2,600**	**1**
New Business inforce at 30/6/2012:	**-19,900**	**-17,500**	**-2,400**	**0.5**
Change in rdr assumption from 5.5% to 5%:	**-7,400** *= -245,200 – -237,800*			**0.5**
Total change in Policy Liability	-9,700	-2,200		
Policy Liability @ 30/6/2012	-248,200	-240,700		

[Note to Markers. Candidates may not prepare a table as above but may calculate the components as they work through the analysis of profit. If this is the case, marks should be awarded as specified above in the table.]

Marks as specified above for components of change in policy liabilities to a maximum of 3 marks KU.

Each component of the change in policy liability needs to be allocated to the appropriate cashflow item as follows:

Gross Claims Experience Profit

= Gross Claims Payments Experience Profit with interest
+ IBNR Experience Profit

IBNR Experience Profit = 300 from above.

(1 mark KU only if IBNR has not been already identified as a component of the change in policy liabilities above**).**

= -4,314 + 300
= -4,014

(0.5 mark SJ for including IBNR experience profit with gross claims payment experience. No marks if gross claims payments experience only).

Reinsurance can be handled a number of ways.

The preferred method (which gets the most marks) is to calculate Cost of Reinsurance Experience Profit and show this separately to the Gross Claims Experience Profit.

Candidates may include reinsurance claims with gross claims to derive a net claims experience profit. However, this receives fewer marks.

Both methods are shown below.

Cost of Reinsurance Experience Profit

Actual Cost of Reinsurance = Actual Reinsurance Premiums - Actual Reinsurance Claims

Expected Cost of Reinsurance = Expected Reinsurance Premiums - Expected Reinsurance Claims

Cost of Reinsurance Experience Profit = Actual Cost of Reinsurance – Expected Cost of Reinsurance

From the information given in the question, this can be expressed as:

Reinsurance Premiums Experience Profit - Reinsurance Claims Experience Profit
(0.5 mark SJ)

= - 103 – 3,287
= - 3,390
(0.5 mark KU)

Marks as specified for cost of reinsurance experience profit to a maximum of 1 mark (0.5 mark KU, 0.5 mark SJ).

Net Claims Experience Profit (Gross Claims Profit plus Reinsurance Claims Profit)

Add Reinsurance Claims Payment Experience Profit with interest (-3,287) to Gross Claims Experience Profit as follows to give:

Net Claims Experience Profit:

= -4,014 – 3,287
= -7,301

(0.5 marks KU for including reinsurance claims with gross claims).

If Net Claims Experience Profit is determined, then Reinsurance Premiums Experience Profit of -103 is required as well in the Analysis of Profit. No marks are given for this.

Lapse Experience Profit

There are no surrender payments on lapses.

= – (Policy Liability released on actual lapses
– Policy Liability released on expected lapses)

= -2,600 (from above)

(1 mark KU only if it has not been already identified as a component of the change in policy liabilities above).

New Business Experience Profit

= Acquisition expenses experience profit with interest
– New Business Policy Liability Experience Profit

New Business Policy liability should be included in sales experience profit as it offsets the acquisition expenses.

New Business Policy Liability Experience Profit = 2,400 from above.

(0.5 mark KU only if the new business policy liability has not already been identified as a component of the change in policy liabilities).

= -2,465 + 2,400
= -65

(0.5 mark SJ for including New Business Policy Liability experience profit with Acquisition experience).

Change in rdr assumption

= – Change in Policy Liability from change in rdr assumption
= +7,400 (from above)

(0.5 mark KU only if the change in policy liability from change in rdr assumption has not already been identified as a component of the change in policy liabilities).

Calculate Total Explained Experience Profit

Investment Experience Profit	0
Gross Claims Experience Profit	-4,014
Cost of Reinsurance Experience Profit	-3,390
Renewal Expenses Experience Profit	-4,211
Lapse Experience Profit	-2,600
New Business Experience Profit	-65
Change in rdr assumption	+7,400
Total Explained Experience Profit	-6,880

(0.5 mark KU)

Unexplained Experience Profit

= Total Experience Profit – Total Explained Experience Profit
= -6,900 – (-6,880)
= -20 (0.5 mark KU)

A comment is required on the size of the unexplained amount as follows:

Either:

If the unexplained is small:

As the unexplained is a small -20, we have covered all the experience items. (0.5 mark SJ)

Or:

If the unexplained is large due to say a calculation error:

The unexplained is relatively large. This could imply there is a calculation error in my analysis of profit for which I will need to check or there are other items causing experience profits/losses which I need to include in the AOP. (0.5 mark SJ)

Summary of Analysis of Profit

	$000s
IORE	15,700
Expected Profit Margins	34,300
Experience Items:	
Investment Income	0
Gross Claims	-4,014
Cost of Reinsurance	-3,390
Renewal Expenses	-4,211
Lapses	-2,600
New Business	-65
Change in rdr assumption	+7,400
Unexplained	-20
Total Experience Profit	-6,900
Total Profit	43,100

(0.5 mark KU)

Marking Guide

Summary of marks specified above:

	KU	SJ	Total
Change in policy liability (actual and expected)	3.0		3.0
Gross Claims Experience Profit		0.5	0.5
Cost of Reinsurance Experience Profit	0.5*	0.5*	1.0*
Lapse Experience Profit			
New Business Experience Profit		0.5	0.5
Change in rdr assumption			
Total Explained Experience Profit	0.5		0.5
Unexplained Experience Profit with comment	0.5	0.5	1.0
Summary of Analysis of Profit	0.5		0.5
Total Marks	5.0	2.0	7.0

If Reinsurance Premiums Experience Profit is included with Gross Claims Experience Profit, then only 0.5 mark KU is given in total.

To a maximum 7 marks (5 marks KU, 2 marks SJ).

b)

Experience Item	Profit Impact $m	Comments
Investment Income	0	No issue as actual equals the expected investment earning rate. (0.5 marks SJ)
Gross Claims	-4.0	An issue that needs to be investigated as there is a significant impact on profit with claim payments contributing -$4.3m. (0.5 mark SJ) No issue with Change in IBNR as has a small +$0.3m positive impact. (0.5 mark SJ) **Maximum of 1 mark SJ.**
Cost of Reinsurance	-3.4	An issue that needs to be investigated as there is a significant impact on profit. Normally there is a small loss on reinsurance, reflecting the reinsurer's profit margins. (0.5 mark SJ) No issue with reinsurance premium as experience profit is a small -$0.1m. (0.5 mark SJ) The issue is with the reinsurance claims where there is a $3.3m loss, with actual reinsurance recoveries 57% of expected reinsurance recoveries. (0.5 mark SJ) You might expect that there would be an increase in reinsurance claims to offset the adverse gross claims experience. (1 mark SJ) **Maximum of 2 marks SJ.**
Renewal Expenses	-4.2	An issue that needs to be investigated as it is a very large item in terms of impact on profit. (0.5 mark SJ)
Lapses	-2.6	Not an issue as an 11% actual lapse rate is within 2 standard deviations (2 x 1%) of a 10% expected lapse rate. This is within the range for statistical fluctuations. (1 mark SJ)
New Business	-0.1	No issue as a small negative impact. Higher sales have meant acquisition expenses have increased, but this has been offset by the increase in new business policy liability. (0.5 mark SJ)
Change in rdr assumption	+7.4	An issue that needs to be investigated as this is the most significant item in absolute terms. Although a positive impact, it needs to be confirmed. (0.5 mark SJ)

Marking Guide

Marks as specified above with an appropriate explanation with:

- **0.5 mark SJ for discussion on Investment Income.**
- **1 mark SJ for discussion on Gross Claims.**
- **2 marks SJ for discussion on Cost of Reinsurance.**
- **0.5 mark SJ for discussion on Renewal Expenses.**
- **1 mark SJ for discussion on Lapses.**
- **0.5 mark SJ for discussion on New Business.**
- **0.5 mark SJ for discussion on Change in rdr assumption.**

To a maximum of 6 marks SJ.

c)
Investigations to be conducted cover:

Gross claims experience:

- First question is whether the actual claims figure is correct. One would check the actual claims paid against another source, possibly the experience study, although this may not be up to date. (0.5 mark CJ)

- Investigate the actual claims to see if there are any large claims which may have caused the claims experience loss. (0.5 mark CJ)

- Further investigation is required to understand the nature of the claims, whether the experience is a statistical deviation or the result of a rise in claim rates.(0.5 mark CJ)

- Analysis of claims experience by number of claims and sum assured would provide a credible indication of the level of claims incidence experience versus expected. (0.5 mark CJ)

- The large loss in YRT could be caused by poor underwriting. In this case, your investigation would show that extra deaths had occurred at the early duration. In this case, this is a risk management issue, so need to review the underwriting process. (0.5 mark CJ)

- Compare against industry experience such as recent IAA mortality experience. (0.5 mark CJ)

- Compare against experience studies that the reinsurer has conducted. (0.5 mark CJ)

- Other valid points about claims experience with a reasonable explanation. (0.5 mark CJ)

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Marks as specified above on claims experience with an appropriate explanation.

To a maximum of 2 marks CJ.

Cost of Reinsurance:

- If there are a few large claims causing the adverse gross claims experience, investigate whether the low reinsurance recoveries are a timing issue. The reinsurer may have yet to pay the reinsurance claim because there is usually a delay between the company paying the gross claim and the reinsurer paying the company in respect of this claim. (0.5 mark CJ)

- Review the accounts to check if the provision for accrual of reinsurance recoveries is working correctly. A provision for a reinsurance recovery should be raised in the accounts whenever a large claim (which is covered by reinsurance) has already been paid out. (0.5 mark CJ)

- Other valid points about reinsurance loss experience with a reasonable explanation. (0.5 mark CJ)

Marking Guide

Marks as specified above for reinsurance loss with an appropriate explanation.

To a maximum of 1 mark CJ.

Loss on Renewal Expenses:

- Check whether this relates to a direct expense (such as renewal commission) or to indirect expenses, where expenses need to be apportioned. (0.5 mark CJ)

- Review expense allocation by product. Check to see if there is an offsetting expense experience profit on other products, which might indicate an error in the expense allocation process. (0.5 mark CJ)

- Check expense allocation between acquisition and maintenance expenses. Perhaps there is an error (or change of allocation methodology) with too many expenses allocated to maintenance rather than acquisition expenses. (0.5 mark CJ)

- Check actual expenses against budgeted expenses, by product and type of expense. (0.5 mark CJ)

- Gain information on any special one off costs that may have occurred. (0.5 mark CJ)

- Check the expense apportionment from the current year and compare to previous years. This will identify if any business areas have changed their split up of expenses and this has resulted in more being attributed to this product than there should be. (0.5 mark CJ)

- Check modelled expenses in the valuation system, used to derive projected expected expenses for the year ending 30/6/2012. It is a requirement under LPS1.04 that the best estimate expense assumption set at 30/6/2011 must reflect the expected level in the year following the valuation date. (0.5 mark CJ)

- Other valid points about renewal expense experience with a reasonable explanation. (0.5 mark CJ)

Marking Guide

Marks as specified above for renewal expenses with an appropriate explanation.

To a maximum of 2 marks CJ.

Large profit impact from change in rdr assumption:

- Confirm this by:
  - Checking the change in rdr assumption is consistent with the change in a benchmark yield over the year, such as the 10 year CGB yield. (0.5 mark CJ)
  - Check size of impact by looking at the amount policy liabilities change by for a 1% change in rdr assumption (Source: 30/6/2011 financial statements).(0.5 mark CJ)
- Other valid points regarding the impact of the change in the rdr assumption. (0.5 mark CJ)

Marking Guide

Marks as specified above for change in rdr assumption with an appropriate explanation to a maximum of 1 mark CJ.

Overall Marking Guide for part c):

- **2 marks CJ for discussion on gross claims experience.**
- **1 mark CJ for discussion on reinsurance loss.**
- **2 marks CJ for discussion on renewal expense experience.**
- **1 mark CJ for discussion on impact of change in rdr assumption.**
- **No marks to be given for discussion on lapses as we have shown that lapse experience doesn't warrant further investigation as the variation is only 1 standard deviation.**

To a maximum of 6 marks CJ.

QUESTION 3 (22 Marks)

You are the Appointed Actuary of LONGLIFE, an Australian life insurer. LONGLIFE has a large existing portfolio of group life business. Strong sales growth is expected to continue into the future.

MU Life is an overseas life insurer. AUSMU Life, its Australian subsidiary, has a medium sized portfolio of individual yearly renewable risk business (YRT), providing lump sum death, total permanent disability and trauma benefits.

AUSMU Life has been struggling in the Australian market in terms of shrinking market share of YRT new business. MU Life has approached LONGLIFE to seek LONGLIFE's interest in buying AUSMU Life, including its tied agency force.

The CEO of LONGLIFE has asked you to support the bidding process.

You have been provided with the following information from AUSMU LIFE (as at 31 December 2011). All numbers are in $m.

Total Assets	**200**
Best Estimate Liability	**-1,800**
PV future MOS profit margins @ 5% rdr	**1,600**
Policy Liabilities	**-200**
Other Liabilities	**20**
Capital Adequacy Requirement (excluding Other Liabilities)	**100**
PV future MOS profit margins @ 8% rdr	**1,200**
Value of each $100 face value of capital required for inforce business @ 8% rdr	**70**
Actual Sales for 2011	**50**
<u>In respect of 2012 forecast sales:</u>	
Forecast Sales	**50**
Value of future MOS profit margins @ 5% rdr	**180**
Policy Liability (just after first premium is paid)	**-40**
Capital Adequacy Requirement (just after first premium is paid)	**10**
Value of future MOS profit margins @ 8% rdr	**130**
Value of each $100 face value of capital required for new business @ 8% rdr	**60**

Note: The value of face value of capital required is the sum of the present value @ 8% rdr of the following amounts determined for each year of the projection:

- **release of the capital in the year; and**
- **the interest earned (using the investment earning rate) on the capital at the start of the year.**

Assumptions	
Risk discount rate	**8%**
Sales growth rate for 2013 +	**9%**
Margin squeeze rate for 2013 +	**4%**
Investment earning rate	**5%**

The sales growth rate and margin squeeze rate reflect the situation after LONGLIFE has purchased the YRT business from AUSMU, with sales through AUSMU's tied agency force starting from 1 January 2012.

a) For the Value of Inforce Business:

i) Set out the formula for calculating the Value of Inforce Business (ignore tax). In your answer, explicitly state all cashflow items.

ii) Derive an alternative formula that will use the information above by re-expressing the formula in i). Show all steps in your derivation.

iii) Use your formula in ii) to calculate the Value of Inforce Business.

(3 Marks)

b) For the Value of New Business:

i) Specify a formula for calculating the value of 2012 forecast sales that uses the information above (ignore tax). (1 Mark)

ii) Explain the reasons for the differences between this formula and the formula you have used for the Value of Inforce Business. (2 Marks)

iii) Use your formula in i), to calculate the Value of New Business. Assume sales are written for ever and on average sales occur half way through the year.

(3 Marks)

c) Complete your calculation of the estimate of the Appraisal Value by calculating:

i) the Adjusted Net Worth
ii) the Appraisal Value

(1 Mark)

You now wish to review the assumptions supplied by AUSMU Life.

d) In respect of the discount rate:

i) Set out the formula for calculating the risk discount rate using the CAPM Method, explaining all terms in the formula. (2 Marks)

ii) Ignoring the factors associated with the CAPM Method, describe the other factors you may need to consider in setting a risk discount rate. (2 Marks)

e) In respect of the risk discount rate assumption provided by AUSMU Life:

i) Discuss the appropriateness of the risk discount rate. (2 Marks)

ii) Recommend any changes you would make to the risk discount rate assumption with reasons. In your answer, also describe the impact of the change in the risk discount rate assumption on the various components of the Appraisal Value. (2 Marks)

f) In respect of the sales growth rate and margin squeeze rate assumptions provided by AUSMU Life:

i) Discuss the appropriateness of the sales growth rate assumption. (No discussion is required on the margin squeeze rate assumption). (2 Marks)

ii) Recommend any changes you would make to the sales growth rate and margin squeeze assumptions with reasons. In your answer, also describe the impact of the changes to these assumptions on the Value of New Business. (2 Marks)

INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2B LIFE INSURANCE OCTOBER 2011 EXAMINATIONS

QUESTION 3: SOLUTIONS

a)

i) Value of Inforce:

= Present value of future distributable profits

$$= \sum_{t=1} (\text{Premiums}(t) + \text{Investment Income}(t) - \text{Expenses}(t) - \text{Commission}(t) - \text{Claims}(t) - [\text{CAR end of year}(t) - \text{CAR start of year}(t)]) \times v^t \quad @\ 8\%$$

(0.5 mark SJ)

Step 1: The formula in i) can be re-expressed as:

$$= \sum_{t=1} (\text{Premiums}(t) + \text{Investment Income on Policy Liabilities start of year and Net Cashflow}(t) - \text{Expenses}(t) - \text{Commission}(t) - \text{Claims}(t) - [\text{Policy Liability end of year}(t) - \text{Policy Liability start of year}(t)] - [(\text{CAR end of year}(t) - \text{Policy Liability end of year}(t)) - (\text{CAR start of year}(t) - \text{Policy Liability start of year}(t))] + \text{Investment income on } \{\text{CAR start of year}(t) - \text{Policy Liability start of year}(t)\}) \times v^t \ @\ 8\%$$

(0.5 mark SJ)

Step 2:

which can be expressed as:

$$\sum_{t=1} (\text{Premiums}(t) + \text{Investment Income on Policy Liabilities start of year and Net Cashflow}(t) - \text{Expenses}(t) - \text{Commission}(t) - \text{Claims}(t) - [\text{Policy Liability end of year}(t) - \text{Policy Liability start of year}(t)] \times v^t \quad @\ 8\%$$

plus

$$\sum_{t=1} \text{Investment income on } \{\text{CAR start of year}(t) - \text{Policy Liability start of year}(t)\} + [\{\text{CAR start of year}(t) - \text{Policy Liability start of year}(t)\} - \{\text{CAR end of year}(t) - \text{Policy Liability end of year}(t)\}] \times v^t \ @\ 8\%$$

(0.5 mark SJ)

[Note to Markers: Candidates may not set out their derivation as in Step 1 and 2 above. Marks should be awarded to any other valid derivation to a maximum of 1 mark SJ.]

Step 3:

which is:

Present Value of future MOS Profits for all Inforce Business
+ Value of Capital (where Capital equals CAR(0) less Policy Liabilities(0)) @8%

(0.5 mark SJ)

Step 4:

= Present Value of future MOS Profits for all Inforce Business
+ (CAR(0) less Policy Liabilities(0) / 100) x Value of $100 of Capital @8%

(0.5 mark SJ)

iii) Valuation of Inforce is:

= 1,200 + (100 – - 200)/ 100) x 70
= 1,200 + 210
= 1,410

(0.5 mark SJ)

Marking Guide

Marks as specified above for each point.

To a maximum of 3 marks SJ.

b)

i) Formula for value of next years' new business is:

Present Value of future MOS Profits from next year's New Business
+ (CAR (after first premium paid) less Policy Liabilities (after first premium paid) / 100) x Value of $100 of Capital
– (CAR (after first premium paid) less Policy Liabilities (after first premium paid))

using 8% risk discount rate.

(1 mark SJ)

Marking Guide

1 Mark SJ as specified above for correct formula.

ii) Reasons for the key differences between this formula and the formula used for the Value of Inforce business are:

- In the formula for the value of next year's new business, at inception (i.e. at the start of the projection), the capital adequacy requirement and policy liability are zero. (0.5 mark SJ)

- However, if you add the capital adequacy requirement less the policy liabilities (just after the first premium), then the formula for the value of next year's value of new business is same as that used for the value of inforce but instead using the capital adequacy requirement less the policy liabilities (just after the first premium) (1 mark CJ)

- As you have added the capital adequacy requirement less the policy liabilities (just after the first premium), then you will need to deduct this item in the formula. (0.5 mark SJ)

- Any other valid points raised with an appropriate explanation. (0.5 mark SJ)

Marking Guide

Marks as specified above for each point with an appropriate explanation

To a maximum of 2 marks (1 mark SJ, 1 mark CJ).

iii) Value of New Business = Value of next years' new business
x New Business Multiplier (0.5 mark KU)

Capital Adequacy Requirement less Policy Liability (after first premium is paid)

= 10 – -40 = 50 (0.5 mark KU)

Value of next year's New Business is (using formula from e) i))

= 130 + (50/100 x 60) – 50
= 130 + 30 – 50
= 110 (0.5 mark KU)

Assuming a perpetuity, New Business Multiplier equals:

$$1/(1+rdr)^{0.5} \{ 1 + \sum_{t=1} [((1+g)/(1+m))/(1+rdr)]^{t} \}$$

where g is the growth rate and m is the margin squeeze rate

$= 1/(1+rdr)^{0.5} (1 + 1/i)$

where $v = 1/(1+ i) = ((1+g)/(1+m)(1+rdr))$
$i = (1+rdr)(1+m)/(1+g) – 1$
$= (1+8\%)(1+4\%)/(1+9\%) – 1$
$= 3.05\%$
$= 1/(1+8\%)^{0.5} \{1 + 1/3.05\%)$
$= 32.55$ (1 mark SJ)

Alternatively, the New Business Multiplier is:

$$1/(1+rdr)^{0.5} \{ 1 + \sum_{t=1} [(1+g-m)/(1+rdr)]^{t} \}$$

$$= 1/(1+rdr)^{0.5} \{ 1 + 1/i$$

where $v = 1/(1+ i) = (1+g-m)/(1+rdr)$

$i = (1+rdr)/(1+ g-m) - 1$

$= (1+8\%)/(1+9\%-4\%) - 1$

$= 2.86\%$

$= 1/(1+8\%)^{0.5} \{1 +1/ 2.86\%)$

$= 34.64$ (1 mark SJ)

Hence Value of New Business is either:

110 x 32.55 = 3,581 (0.5 mark KU)

or:

110 x 34.64 =3,811 (0.5 mark KU)

Marking Guide

Marks as specified above for each point above.

To a maximum of 3 marks (2 marks KU, 1 mark SJ).

c)

i) Adjusted Net Worth

Note. Capital Adequacy Requirement needs to include Other Liabilities in this calculation.

= Total Assets – Capital Adequacy Requirement
= 200 – (100+20)
= 80

(0.5 mark KU)

ii) Appraisal Value

= Adjusted Net Worth + Value Inforce + Value New Business
= 80 + 1,410 + 3,581
= 5,071 (0.5 mark KU)

or:

= 80 + 1,410 + 3,811
= 5,301

(0.5 mark KU)

Marking Guide

Marks as specified above for each point above.

To a maximum of 1 mark KU.

d)

i) CAPM method formula for calculating risk discount rate (RDR) is:

$RDR = R_f + \beta (R_m - R_f)$ (0.5 mark KU)

Description of terms:

- R_f : The current risk free rate (10 yr CGB yield) in the market. (0.5 mark KU)

- $R_m - R_f$: The equity risk premium of the market as a whole, the level of return required by the market (R_m) in excess of the risk free rate, to allow for the risk of the market as a whole. (0.5 mark KU)

- β: The beta is the relative riskiness of the life company compared with the market as a whole. (0.5 mark KU)

Marking Guide

Marks as specified above for each point above with.

- **0.5 mark KU for specifying formula correctly.**
- **1.5 marks KU for describing the terms.**

To a maximum of 2 mark KU.

ii) Factors to be considered in setting the risk discount rate for an Appraisal Value (other than those factors relating to the CAPM method) include:

- The part of the Appraisal Value that is being calculated, VIF or VNB. VNB may have a higher risk discount rate than the VIF, as there is greater risk and uncertainty associated with new business. (0.5 mark SJ)

- The greater the uncertainty and riskiness of the YRT cashflows, the higher the risk discount rate. (0.5 mark SJ)

- The assumed investment earning rate in the AV calculation, as the risk discount rate should be consistent with this. (0.5 mark SJ)

- Tax rate and imputation credits. (0.5 mark SJ)

- The published risk discount rates of the other life companies in the market. (0.5 mark SJ)

- The situation of MU Life, the seller of the YRT business. If the seller is a stressed seller, one can use a higher risk discount rate to reduce the AV (or price). (0.5 mark SJ)

- Other valid points raised with an appropriate explanation. (0.5 mark SJ)

Marking Guide

Marks as specified above for each point with an appropriate explanation

To a maximum of 2 marks SJ.

e)
Review risk discount rate.

i) The appropriateness of the risk discount rate:

- The current 10 year CGB rate (the risk free rate) is around 5 to 5.5%. (0.5 mark CJ).

- Assuming a beta of 1, an 8% rdr implies a shareholder risk premium of 2.5%-3%. (0.5 mark CJ)

- Other companies have been publishing their AV risk discount rate at around the risk free rate + 5-6%. (0.5 mark CJ

- Thus a 2.5% - 3% margin certainly looks out of line with the market, which makes a 8% risk discount rate too low. (0.5 mark CJ)

- Any other valid points with a reasonable explanation. (0.5 mark CJ)

Marking Guide

Marks as specified above for each point above with an appropriate explanation.

To a maximum of 2 marks CJ.

ii) Recommended change to the risk discount rate assumption:

- The risk discount rate should be around 10 to 11.5%, equal to the risk free rate of 5 to 5.5% plus the current risk premium of 5 to 6%. I would recommend an 11% risk discount rate based on current risk premiums. (1 mark CJ)

[Note to Markers. Candidates may recommend a higher risk discount rate for new business, say 12%.This is acceptable.]

Impact on components of Appraisal Value:

- Using a risk discount rate of 11% (rather than 8%) would significantly:
    - Decrease the present value future distributable profits on the inforce (VIF). (0.5 mark SJ)
    - Decrease the present value of future distributable profits from new business (VNB). (0.5 mark SJ)

Thus overall, there would be a significant decrease in the AV.

Marking Guide

Marks as specified above with:

- **Maximum of 1 mark CJ for recommended risk discount rate with reasons.**
- **Maximum of 1 mark SJ for AV impact.**

To a maximum of 2 marks (1 mark SJ, 1 mark CJ).

f) Growth Rate and Margin Squeeze Rate

i) Appropriateness of Growth Rate:

- Growth rate is a function of the growth in the market and the change, if any, in the company's market share. (0.5 mark CJ)
- The long term growth rate of the market per year should be at least around CPI or GDP of 3%. (0.5 mark CJ)
- The growth rate could be say 1% higher than CPI or GDP, perhaps due to initiatives to address the underinsurance problem. (0.5 mark CJ)
- With a 9% growth rate per annum, this implies the company is obtaining an additional 5% each year from an increasing market share. (0.5 mark CJ)
- There would even be doubts about achieving a 9% growth rate in the short term given poor recent sales. (0.5 mark CJ)
- The growth rate will also be impacted if AUSMU advisors leave as a result of the change in ownership. (0.5 mark CJ)
- Hence a 5% increase per annum from an increase in market share is unrealistic, which makes the 9% growth rate long term unachievable and thus too high. (0.5 mark CJ)

[Note to Markers: Candidates should be awarded marks if they quote a reasonable figure of say 5% or 6% (based on GDP or CPI only) as being an unrealistic increase in market share.]

- Any other valid points with a reasonable explanation. (0.5 mark CJ)

Marking Guide

Marks as specified above for each point above with an appropriate explanation.

To a maximum of 2 marks CJ.

ii) Recommended Growth Rate and Margin Squeeze Rate Assumption:

- With forecast 2012 sales conservatively set equal to the actual 2011 sales, I would recommend the growth rate be set to 4% p.a. starting from 2013, equal to the CPI rate (or GDP) of 3% plus a margin of 1% for to allow for growth due to under insurance and productivity gains. (1 mark CJ)

- The margin squeeze rate needs to be also revised as a 4% rate was set in regards to the 9% growth rate. A more appropriate margin squeeze is say 3% which is in line with the 4% growth rate. (0.5 mark CJ)

- Any other valid points with a reasonable explanation. (0.5 mark CJ)

(Maximum of 1.5 marks CJ).

[Note to Markers: Any other valid suggestion with appropriate reasons should be awarded marks accordingly to a maximum of 1.5 marks. For example: Provided there is a strategy to make the YRT product more attractive to the market with new and innovative features, then a higher growth rate than CPI in the short term, and then reverting to CPI of 3% + 1% is acceptable.]

Impact on Value of New Business:

- This is a significant reduction in the net growth rate (growth rate less margin squeeze rate) from 5% (=9%-4%) to 1% (=4%-3%) which will significantly decrease the present value of future distributable profits for new business (VNB). (0.5 mark CJ)

Marking Guide

Marks as specified above for each point above with an appropriate explanation with:

- **Maximum of 1.5 marks CJ for suggested assumptions.**
- **Maximum of 0.5 mark CJ for impact on value of new business.**

To a maximum of 2 marks CJ overall.

QUESTION 4 (20 Marks)

You are the Valuation Actuary for AUSLIFE, an Australian Life Company which has a large block of individual disability income policies, comprising 1 year, 2 year, 5 year and to age 65 benefit terms. AUSLIFE distributes its products through a dedicated advisor network to which it pays commissions of 100% of the first year's premium and 10% of subsequent years' premiums.

Features of the MOS method of calculating policy liability by AUSLIFE for the disability income product are:

- **A projection method is used to calculate the policy liabilities, except for the IBNR and RBNA where an accumulation method is used.**
- **IBNR is calculated as Annual Premium Inforce x risk claims ratio x average delay period (between incurred and reported dates) in months/12, where the risk claims ratio and average delay period are assumptions.**
- **RBNA is calculated as Annual Premium Inforce x risk claims ratio x average delay period (between reported and admitted dates) in months/12, where the risk claims ratio and average delay period are assumptions.**
- **There is one related product group covering both Actives lives (for policies which currently do not have disability claims in payment) and Disabled Lives Reserve ("DLR", for disability claims in payment).**
- **Expected claim payments (adjusted for actual premium volumes) is the profit carrier.**
- **A 1% increase in the risk discount rate (rdr) assumption increases the active lives policy liability (makes the policy liability less negative) by 10%.**

AUSLIFE has the following investment strategy:

- **Indexed bonds back the DLR with the matching of claim payments in terms of timing and amount.**
- **All other assets are invested in cash and short-term fixed interest.**

From the latest valuation we have the following information (all figures are in $m):

Policy Liabilities:	
IBNR and RBNA	**50**
Active lives policy liability	**-600**
DLR	**300**
	-250
Other Liabilities	**50**
Retained Profits	**900**
Total Assets	**700**

a) The CEO would like to understand the reasoning behind using expected claim payments (adjusted for actual premium volumes) as the appropriate profit carrier rather than actual claims or actual premiums.

Provide a response to the CEO. In your answer:

i) Set out the principle from LPS1.04 that outlines the appropriate profit carrier to use. (1 Mark)

ii) Describe the service provided by the insurer to the policyholder. (1 Mark)

iii) Describe why actual claims would be more appropriate as a profit carrier than actual premiums. (1 Mark)

iv) Describe why expected claim payments (adjusted for actual premium volumes) is more appropriate as a profit carrier than actual claims. (2 Marks)

b) The CEO has noted that the MOS profit for the disability income product has been volatile over the past few years. This is despite the strong management control of expenses, where actual expenses have matched budgeted expenses.

You explain to the CEO that the volatility in profit can arise from assumption changes (economic and non-economic) and experience effects.

i) Describe the economic assumption changes that may have contributed to the profit volatility, explaining how this assumption change may have made the profit volatile. (3 Marks)

ii) Describe the non-economic assumption changes that may have contributed to the profit volatility, explaining how these assumption changes may have made the profit volatile. (2 Marks)

iii) Describe the experience items that may have contributed to the profit volatility, explaining how these experience items may have made the profit volatile. (3 Marks)

c) A key strategy of AUSLIFE is to continue to sell the disability income product in the market, despite the profit volatility. However, the CEO would like to stabilise the profit for the disability income product.

Describe the actions that can be taken to reduce the profit volatility, explaining how these actions will achieve a reduction in profit volatility. (7 Marks)

QUESTION 4: SOLUTIONS

a)

i) Principle:

In accordance with LPS1.04, there is a gradual release of profit margins in line with the later of:

- the service being provided to the policyholder under the insurance contract and
- the receipt of income relating to this service.

(1 mark KU)

ii) Service provided:

For a disability income product, the service provided is income protection insurance where for premiums paid the insurer will pay the policyholder a regular income through claim payments whilst the policyholder is temporarily disabled and cannot earn his/her normal income. (1 mark KU)

iii) Actual claims are more appropriate than actual premiums as a profit carrier:

For a disability income product, actual claims occur later than premiums. Hence actual claims are more appropriate as a profit carrier than actual premiums, as it is more in line with the principle of LPS1.04 above. (1 mark SJ)

iv) Expected claims (adjusted for premium volumes) are more appropriate than actual claims as a profit carrier:

If actual claims are used as a profit carrier, the wrong message is being sent regarding profits. If actual claims are high, then this makes planned profits higher, but this is counter intuitive. If claims are low, then this makes profit lower which is also counter intuitive.
(1 mark SJ)

Expected claims (adjusted for actual premium volumes) makes more sense as a profit carrier as it relates to the service being provided and gives the correct message about profit. If actual premiums are higher, then expected claims (adjusted for premium volumes) are higher, leading to higher profits, which is more sensible. (1 mark SJ)

Marking Guide

Marks as specified above for each point with an appropriate explanation.

To a maximum of 5 marks (2 marks KU, 3 marks SJ).

b)

i) Economic assumption changes that may have contributed to profit volatility are:

Change in the risk discount rate assumption for active lives:

- Under the accounting standards, the risk discount rate for the active lives policy liability must be calculated as the risk free rate of a matching replicating portfolio (typically 10 year commonwealth bonds or 10 year inter-bank swap rates). (0.5 mark SJ)

- The impact of the change in the risk discount rate must be capitalised as it cannot be spread through profit margins. (0.5 mark SJ)

- As the active lives policy liability is a large negative policy liability (i.e. an asset), there is no matching asset to offset the change in policy liability. Hence a change in the risk discount rate can cause a large change in the policy liability with a significant impact on profit. (0.5 mark SJ)

- For example, a modest 0.5% increase in the risk discount rate increases the active lives policy liability by $30m (=$600m x 0.5% x 10) and thus generates a $30m loss (0.5 mark SJ)

(Maximum of 1.5 marks SJ).

Change in the risk discount rate assumption for DLR:

- Under the accounting standards, the risk discount rate for the DLR must be calculated as the risk free rate of a matching replicating portfolio (such as commonwealth government bonds or inter-bank swap rates) (0.5 mark SJ)

  Even though the DLR is matched by suitable assets, profit volatility can arise as the change in the risk discount rate for the DLR may not be the same as the change in the market yield of the assets. Hence, the change in DLR does not match the change in the market value of the assets. (1 mark SJ)

(Maximum of 1.5 marks SJ).

[Note to markers: Students may have included the comments on the volatility associated with the change in the rdr assumption for the DLR under investment experience profits as part of their answer to ii) below. If this is the case, marks should be allocated to <u>this</u> part of the question.]

Marking Guide

Marks as specified above for each point with an appropriate explanation with:

- **Maximum of 1.5 marks SJ for discussion on active lives risk discount rate**
- **Maximum of 1.5 marks SJ for discussion on DLR risk discount rate.**

To a maximum of 3 marks SJ.

ii) Non-economic assumption changes that may have contributed to profit volatility include:

Change in assumptions causing loss recognition:

- If loss recognition occurs, profit volatility can arise from the capitalisation of changes in key assumptions (lapses, maintenance expenses, incidence rates and termination rates) that impact the active lives policy liability. (1 mark SJ)

Changes in IBNR assumptions:

- Profit volatility can arise from changes to the IBNR assumptions (risk claims ratio and average delay period), as the impacts are immediately capitalised and flows directly into profit. (0.5 mark SJ)

Changes in RBNA assumptions:

- Profit volatility can arise from changes to the RBNA assumptions (risk claims ratio and average delay period), as the impacts are immediately capitalised and flows directly into profit. (0.5 mark SJ)

Marking Guide

Marks as specified above for each point with an appropriate explanation.

To a maximum of 2 marks SJ.

iii) Experience items that may have contributed to profit volatility include:

Retained Earnings:

- Of the $900m Retained Earnings, $600m relates to the negative policy liability which will unwind at the risk discount rate. This leaves a large $300m in physical assets, which will earn a significant amount of interest (as part of the IORE) and hence will be a large component of the profit. Hence any variation in actual investment earning rates will have a volatile impact on profit. (1 mark SJ)

Lapse Experience:

- Although no surrender value is paid when a policy lapses, there is a loss as the negative policy liability is released with loss of future premiums to recover the acquisition costs. (0.5 mark SJ)

  As the active lives policy liability is a large negative policy liability (i.e. an asset), a small variation in the actual lapse rate from the expected lapse rate can cause a large change in the policy liability with a significant impact on profit. (0.5 mark SJ)

  For example a 10% variation from the expected lapse assumption could result in a profit variation of 1% of the active lives policy liability (i.e. $6m before tax profit/loss = 1% of $600m). (0.5 mark SJ)

Incidence Experience:

- The incidence rate experience impacts on the number of new claims and the size of the DLR for these new claims and thus can have a significant impact on profit. (0.5 mark SJ)

Termination Experience:

- Given the size of the DLR, the variation in the termination experience rate from the expected termination rate can significantly change the DLR, either increasing or decreasing the DLR. Thus it can have a significant impact on profit. (0.5 mark SJ)

- Even if the overall termination experience matches the assumption, the termination experience in the shorter durations can be different to the experience for the longer durations. If the shorter duration claims are recovering more than expected, but the longer duration claims are not recovering as expected, the DLR will increase from the longer duration claims and will reduce profit. Whereas if the reverse happens, the DLR will decrease and profit will increase. (1 mark SJ)

Other Points:

- Any other valid points raised with an appropriate explanation. (0.5 mark SJ)

Marking Guide

Marks as specified above for each point with an appropriate explanation.

To a maximum of 3 marks SJ.

c)
Actions that can be taken to overcome profit volatility include:

Change Commission Structure:

- For future new business, change the commission structure of the product from high upfront commission to lower upfront commission and higher renewal commission. The negative policy liability for new business will decrease as upfront commission, the major contribution to the high acquisition costs, is reduced. (1 mark CJ)

- This results in a decrease in the size of the negative policy liability, as the run off of old business with higher negative policy liability is replaced by a smaller negative policy liability from new business. (0.5 mark CJ)

- A smaller overall negative positive policy liability means the impact of changes in economic assumptions and lapse experience will have less of a volatile impact on profit. (0.5 mark CJ)

- Even better would be to pay advisers level commission in respect of new business, with positive rather than negative policy liabilities for new business. This may be hard to achieve as advisers must be persuaded to receive level commission each year rather than high initial commission and lower renewal commission. (0.5 mark CJ)

- Other valid points on change in commission structure with a reasonable explanation. (0.5 mark CJ)

(Maximum of 2 marks CJ).

Reinsurance:

- Use quota share reinsurance (where the reinsurer pays a fixed proportion of each disability claim) or surplus reinsurance (where the retention limit is set on a policy basis, but is set at a fixed $ amount). This reduces the DLR reserve the company needs to hold, and makes the profit less sensitive to changes in termination rate assumptions, incidence and termination experience. The greater the proportion the reinsurer pays, the greater the reduction in profit volatility. However, reinsurance costs will reduce profits. (1 mark CJ)

- Use excess of loss reinsurance whereby the reinsurer pays say 90% of claims, once the cumulative claim payments reach a specified level for each policy. This reduces the DLR the company has to hold at the longer duration claims. As these are the larger DLRs and the most sensitive to termination experience, profit volatility is dampened. (1 mark CJ)

- Other valid points for reinsurance with a reasonable explanation. (0.5 mark CJ)

(Maximum of 2 marks CJ).

Diversification:

- Having a wider product range which diversifies the type of risks the company is exposed to and which profit is sensitive to. (0.5 mark CJ)

  The risks associated with the other products need to be different to the risks with the disability income product. Examples of different type of risk include lump sum term products (mortality, TPD and trauma risks), annuities (longevity risk) and investment linked products (no protection risk). (0.5 mark CJ)

- Diversify target market, by selling new business across various geographic regions. This reduces the risks associated with local fluctuations. (0.5 mark CJ)

- Diversify distribution methods by using different distribution channels. This reduces the risk with fluctuations associated with particular distribution channels. (0.5 mark CJ)

- Other valid points for diversification with a reasonable explanation. (0.5 mark CJ)

(Maximum of 2 marks CJ).

Other:

- Change the product features for new business by restricting the benefit period to 1 and 2 years. This reduces the number of longer duration claims and hence reduces the size of the DLR, where the DLR is most impacted by termination rate assumption changes and termination rate experience. (1 mark CJ)

- If necessary, employ more experienced claim managers who can focus on the shorter duration in payment policies. By adopting strategies that encourage recovery at the shorter durations, you prevent these claims becoming longer duration claims with subsequently larger DLRs. (1 mark CJ)

- Commute future claims payments to a lump sum, for the longer duration claims in payment. This also reduces the number of longer duration claims and hence reduces the size of the DLR. (1 mark CJ)

- Other valid actions with an appropriate explanation. (1 mark CJ)

Marking Guide

Marks as specified above for each point with an appropriate explanation with:

- **Maximum of 2 marks CJ for discussion on points about changing the commission structure.**
- **Maximum of 5 marks CJ for discussion on the other points with:**
  - **Maximum of 2 marks CJ for discussion on reinsurance.**
  - **Maximum of 2 marks CJ for discussion on diversification.**

To a maximum of 7 marks CJ.

QUESTION 5 (20 Marks)

You are the Appointed Actuary for a medium size Australian life insurer named ABC life that has an open portfolio dominated by yearly renewable term business (YRT) and single premium term business (SPT). Both products provide lump sum death benefits only. The company has been successful in writing considerable amounts of profitable new business in recent years.

ABC life has a reinsurance arrangement with a reinsurer to reinsure the YRT and SPT business.

Assets are invested in cash.

The new CFO, who comes from a banking background, is convinced that the company is sitting on large amounts of capital that could otherwise be released to shareholders. He has approached you to better understand the capital requirements with a view to reducing them.

a) Explain what is meant by the Capital Adequacy Liability and describe how it is calculated. (2 Marks)

b) Explain why the New Business Reserve may be zero under the Capital Adequacy Standard. (1 Mark)

c) In respect of a Future Income Tax Benefit (FITB):

i) Explain how a FITB arises. (1 Mark)

ii) Explain why a FITB may be an inadmissible asset under the Solvency Standard but an admissible asset under the Capital Adequacy Standard. (3 Marks)

d) The CFO has noticed in the FCR that there is a mortality margin of 40% being applied to the best estimate mortality assumptions for all business. This is at the high end of the 10% - 40% range specified by the Capital Adequacy Standard.

The CFO tells you he finds the existing figure of 40% hard to believe as he saw mortality experience profits in the analysis of profit for the past year and only ever hears about mortality improvements in the press. The CFO is interested in hearing your views on the potential to reduce the margin below 40%.

Discuss the points you would include in your response to the CFO. Include in your answer, reasons why a 40% margin may have been chosen. (6 Marks)

e) You produce the following preliminary results:

	$m
Total Assets	**580**
Policy Liabilities:	
- YRT	**-100**
- Single Premium Term	**370**
	270
Other Liabilities	**50**
Capital Adequacy Requirement	**600**
Excess Assets over Capital Adequacy Requirement	**-20**

The CFO is in the process of writing a recommendation to the Board to ask for a shareholder injection of $20m to bridge the gap between assets and the Capital Adequacy Requirement.

Draft a memo to the CFO explaining the reasons why he may wish to ask for a capital injection in excess of the $20m amount, including the specific risks the company faces. (7 Marks)

QUESTION 5: SOLUTIONS

a) The following explains what is meant by the Capital Adequacy Liability and describes how it is calculated:

- The Capital Adequacy Liability is the present value of future outgo less present value of future inflows using conservative assumptions. (0.5 mark KU)
- The starting point for the calculation should be the best estimate liability, with margins for prudency added to the best estimate assumptions. (0.5 mark KU)
- Appropriate ranges for margins to assumptions are prescribed in LPS3.04, and the Appointed Actuary has scope to choose a point estimate within these ranges. (0.5 mark KU)
- Assumptions cover servicing expenses, mortality and lapses. (0.5 mark KU)
- The calculation needs to be done at the RPG level of granularity. (0.5 mark KU)
- Any other valid points with a reasonable explanation. (0.5 mark KU)

Marking Guide

Marks as specified above for each point above with an appropriate explanation.

To a maximum of 2 marks KU.

b)

The New Business Reserve may be zero because by paying no dividends over the next three years, the profits generated when added to existing retained profits and capital are sufficient to fund the capital requirements of new business over the next three years. (1 mark SJ)

c)
i)

A FITB arises when the market value of an asset falls below its purchase price, thus generating an unrealised loss. (0.5 mark SJ)

A FITB can only be used to the extent that there are unrealised capital gains on other assets, generating a deferred tax expense. (0.5 mark SJ)

Marking Guide

Marks as specified above with an appropriate explanation

To a maximum of 1 mark SJ.

ii)

The Solvency Standard considers the capital position of a company in a run off situation. (0.5 mark KU)

Assets (including those with unrealised capital gains) may need to be sold quickly and at a value much less than their purchase price. (0.5 mark CJ)

This means there are no unrealised gains generating a deferred tax expense that the FITB can be offset against. Hence the reason why a FITB is an inadmissible asset. (0.5 mark CJ)

The Capital Adequacy Standard considers the context of an active and viable ongoing concern. (0.5 mark KU)

This means there will be a range of assets which may either have unrealised gains or unrealised losses from the change in market value over the normal course of business over time. (0.5 mark CJ)

Under this scenario, it is more likely that FITB generated from unrealised losses will be able to offset deferred tax expense from unrealised gains. This is why a FITB can be an admissible asset. (0.5 mark CJ)

Marking Guide

Marks as specified above with an appropriate explanation

To a maximum of 3 marks (1 mark KU, 2 marks CJ).

d)
Points to raise in response to the CFO:

- The capital adequacy margin is broadly intended to represent a 1 in 400 year event. Even if best estimate mortality is improving, this does not say anything about the variability of mortality. i.e. the points in the tail of the distribution of future mortality outcomes. (1 mark CJ)

- To change an existing margin one would generally need some form of new analysis that suggests the existing mortality assumption margin is no longer appropriate. (1 mark CJ)

- It would be useful to understand how the 40% was derived, before assessing whether there is justification for a lower margin. (1 mark CJ)

- It may be worthwhile looking at company's mortality experience over all available years to assess the variability of mortality for the company. However, if there are only a few years of credible mortality experience this may not provide appropriate justification for changing the margin. (1 mark CJ)

- It may be worthwhile examining the company's underwriting approach and whether there have been any changes to this approach in recent years. Generally speaking, a more stringent underwriting approach would give the Appointed Actuary more confidence to apply a lower prudency margin. (1 mark CJ)

- Given the company is not large, it is possible that it is not well diversified with respect to mortality risks in terms of target market, distribution channel and geographic regions, which may warrant a higher estimate. (1 mark CJ)

- I must comply with the Capital Adequacy Standard LPS3.04, which requires me to set the capital adequacy mortality margin reflecting the company's current risk factors relating to mortality. If the company is still exposed to these risk factors, I cannot reduce the capital adequacy margin as this would lead to non compliance with the standard which would put me at risk of professional negligence. (1 mark CJ)

- Any other valid points with a reasonable explanation. (1 mark CJ)

Marking Guide

Marks as specified above for each point above with an appropriate explanation.

To a maximum of 6 marks CJ.

e)

Memo to CFO

To: CFO
From: Appointed Actuary
Subject: Capital Injection in Excess of $20m is Required

Introduction

The purpose of memo is to explain the reasons why a capital injection in excess of the $20m amount is required, including the specific risks the company faces.

Target Surplus Requirement

- Company may wish to hold an amount of target surplus above the Capital Adequacy requirement. (1 mark SJ)

- General reasons for doing so include:
    - So as to have a buffer above any regulatory capital breach as opposed to being right on the limit. (0.5 mark SJ)

    - It is strongly recommended by APRA. (0.5 mark SJ)

- So as to understand threats to the capital adequacy position before they materialise. (0.5 mark SJ)

- To satisfy a credit rating. (0.5 mark SJ)

- Any other valid general reasons with an appropriate explanation. (0.5 mark SJ)

Specific Company Risks

Reasons specific to the company include:

- The company continues to grow quickly. To the extent that YRT new business exceeds SPT new business, this will imply a capital strain which means that a New Business Reserve will be required to be established. This will increase the capital adequacy requirement. (1 mark CJ)

- For the single premium term business there is a mismatch between the cash assets and the capital adequacy liability (present value of future death claims). The company may be exposed adversely to a greater change in yields than allowed for under the Capital Adequacy Requirement. (1 mark CJ)

- The company may potentially incur an operational risk style event which is not allowed for under LPS3.04. (0.5 mark SJ)

- A very adverse year of claims (or a pandemic type event) will also mean the company will have a shortfall in meeting its capital adequacy requirement. (0.5 mark SJ)

- A very adverse year of additional expenses incurred will also mean the company will have a shortfall in meeting its capital adequacy requirement. (0.5 mark SJ)

- A possible reinsurer default could mean the capital adequacy requirement may be breached. (0.5 mark SJ)

- Any other valid reasons specific to the company with an appropriate explanation. (0.5 mark SJ)

Yours Sincerely,

Appointed Actuary

Marking Guide

Marks as specified above for each point above with an appropriate explanation with:

- **Maximum of 1 mark SJ for appropriate memo format, introduction and wording (plain English with no jargon).**
- **1 mark SJ for recognising that the concept of target surplus was relevant here.**
- **Maximum of 1 mark SJ for general reasons for holding target surplus.**
- **Maximum of 4 marks (2 marks SJ, 2 marks CJ) for company specific reasons for holding target surplus.**

To a maximum of 7 marks (5 marks SJ, 2 marks CJ).

END OF PAPER