

INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2B LIFE INSURANCE

APRIL 2010 EXAMINATIONS

Marking Guide

Level of difficulty

Question	Syllabus Performance Outcome	Units	Knowledge & Understanding	Straight- forward Judgement	Complex Judgement	Total Marks
1 (a)	1, 2	1	2			2
1 (b)	1, 2	1	2	4		6
1 (c)	1,2,3,10,12	1,3,5,6		5	5	10
1 (d)	3	3			3	3
2 (a)	1,2,3,9	3		4	7	11
2 (b)	1,2,9	1,5	1			1
2 (c)	1,2,9	1,5	1			1
2 (d)	1,2,9	1,5	0.5	1.5		2
2 (e)	1,2,9	1,5		1		1
2 (f)	1,2,9	1,5	0.5	1	1.5	3
3 (a)	4	2,4	3.5	6.5		10
3 (b)	4,9	2,4		3	8	11
4 (a)	6,9	5,6	3		3	6
4 (b)	7,9	4,5	4	1	1	6
4 (c)	7	4		4	3	7
5 (a)	12	6	3			3
5 (b)	12	3,6		5		5
5 (c)	5, 12	6		4	8	12
TOTAL			20.5	40	39.5	100

Answer all 5 questions

QUESTION 1

(21 Marks)

You are the valuation actuary for a medium sized Australian life insurer. The insurer's flagship individual lump sum and disability risk products have been very successful in recent years, as have its group lump sum and group salary continuance business. The insurer's only other in force business is a significant book of CPI linked term certain annuities that have been in runoff for a number of years.

- a) Describe the key principles behind LPS1.04 Valuation of Policy Liabilities, including the methods for handling changes of assumptions for the projection method. (2 marks)
- b) For each of the following two products:
 - Group salary continuance
 - Term certain annuities
 - i) State whether the product should be classified as an Insurance Contract or an Investment Contract and explain why. (2 marks)
 - ii) State whether you would use the accumulation or projection method and explain why. (2 marks)
 - iii) List and briefly explain the components of the policy liability in light of your answer to part ii). (2 marks)
- c) The recently appointed Chief Risk Officer (CRO) has been browsing through the draft accounts and has noticed that the policy liabilities represent large figures on the balance sheet, and feels she is unfamiliar with precisely where the figures come from. The CRO is interested in understanding the various risks associated with the policy liability valuation process, which ends with the actuarial notes in the financial statements.
 - i) List the various risks associated with the policy liability valuation process. (5 marks)
 - ii) Discuss the mitigation strategies that you would put in place for each risk in part i). (5 marks)
- d) You are looking at an analysis of profit performed by one of your analysts on the term certain annuity portfolio and you notice that there is no experience item for inflation indexation. You check the RBA website and CPI inflation has been tracking at around 5% for the previous 12 months and you know that the previous year's assumption was 3%. The unexplained amount in the analysis of profit is immaterial.

Suggest some possible reasons why the unexplained amount appearing in the analyst's work is immaterial. (3 marks)

Solutions

a)

The key principles behind LPS1.04 Valuation of Policy Liabilities are as follows:

- Gradual release of profit margins in line with the services being provided under the insurance contract.
- Policy liability to consist of a best estimate liability (on best estimate assumptions) and a present value of future profit margins component.
- Immediate capitalisation of losses if the expected future margins become negative.
- Unless a related product group is in loss recognition, changes in best estimate assumptions do not have an impact on current year profit as the release of such profit is respread over the remaining life of the policy.
- An exception for the previous point is for products where benefits do not depend on the investment performance of the underlying assets. A change in the best estimate risk discount rate, investment earning rate and inflation rate arising from changes in market conditions, requires the change in the present value of future profits (which are generated by the change) to be released into profit.

Marking Guide:

0.5 mark KU for each point with a reasonable explanation, to a maximum of 2 marks KU.

b)

i)

Group salary continuance policies are insurance contracts as the insurer has agreed to compensate a policyholder in the event of a future adverse event occurring to that policyholder (in this case that they become disabled and are unable to work). That is, the insurer bears insurance risk.

Term certain annuities are investment contracts as they do not fit the definition of an insurance contract under AASB 4. That is, there are only investment related risks borne by the insurer.

Marking Guide:

For each product 1 mark SJ for the correct classification with a reasonable explanation, to a maximum of 2 marks SJ.

ii)

Group salary continuance would use the accumulation method as:

- Detailed information on each underlying individual within each scheme may not be available as underwriting is minimal in group schemes.
- Group business is often very short term (before re-tender) and it may be impractical to build detailed projection models for each new scheme
- The terms of the possible future renewals are unknown.

Term certain annuities would use the projection approach as this is the best method available to ensure that the principles of LPS1.04 are met, in particular that the profit will emerge smoothly in line with the profit carrier, possibly annuity payments made.

Marking Guide:

For each product, 1 mark SJ for the correct method identified with a reasonable explanation, (0.25 marks if correct method given with no explanation) to a maximum of 2 marks SJ.

iii)

Group salary continuance policy liability:

- = Unearned Premium Reserve
- Deferred Acquisition Costs (if acquisition costs are material)
- + IBNR/RBNA (Incurred But Not Reported Claims Reserve and
Reported But Not Admitted Claims Reserve)
- + DLR (Disabled Lives Reserve [Claims in Course of Payment], including claim expenses)
- + Loss Reserve (required if losses are expected on best estimate assumptions)

[Note for Markers: Candidates may include a Reserve for Accrued Profit share]

Term certain annuity policy liability:

- = PV of future annuity payments
- + PV of future expenses
- + PV of future profit margins

Marking Guide:

0.5 marks KU for all components of GSC excluding Loss Reserve.

0.5 marks KU for GSC Loss Reserve.

0.5 marks KU for PV annuity payments and expenses.

0.5 marks KU for PV profit margins.

To a maximum of 1 mark KU for GSC and 1 mark KU for Term Certain Annuities.

Overall marks for part b:

6 marks (2 marks KU, 4 marks SJ).

c)

The various risks associated with the policy liability valuation process along with mitigation strategies to put in place for each of these risks are set out below:

i) Risks by Category	ii) Mitigation Strategies
1. Data Risks:	
Data on the administration system may be incorrect. [0.5 mark SJ]	Check sample policy documents and claims forms (e.g: for disability claims in payment) to details on the administration system. [0.5 mark CJ]
Data extract from administration systems may be incomplete or inaccurate. [0.5 mark SJ]	Compare valuation data extract to an independent extract from the administration systems. [0.5 mark CJ] Reconciliation of Starting and Ending statistics, that is for example: Inforce at start of period + New Business – Exits = Inforce at end of period. [0.5 mark CJ]
Data may be lost or incorrectly manipulated during the model point file creation process or the projection model calculation. [0.5 mark SJ]	Key policy statistics (number of policies, sum insured, in force premium) should be confirmed to be consistent between the admin system, model point files and final output from the projection system. [0.5 mark CJ]
Grouping of data for model point files, if used, may not be appropriate. [0.5 mark SJ]	On a regular basis (say every 2 years) the projection model should be used to calculate the policy liability using a) grouped model points b) and individual model points. The policy liability for grouped data should be compared to the policy liability for individual data and check that the difference is immaterial. [0.5 mark CJ]
Maximum of 2 marks SJ.	Maximum of 2 marks CJ.
2. Methodology Risks:	
Classification of contracts into insurance and investment contracts may not be correct. [0.5 mark SJ]	A document (signed off by the Appointed Actuary or suitably qualified Actuary and peer reviewed) that sets out for each product: <ul style="list-style-type: none"> The classification (either Insurance or Investment Contract) and reasons that justify the choice. [0.5 mark CJ] Methods and principles used in calculating the policy liability and demonstrating how they comply with AASB1038 and LPS1.04. [0.5 mark CJ]
Methodology and principles applied may not be consistent with AASB1038 and LPS1.04. [0.5 mark SJ]	
Maximum of 1 mark SJ.	Maximum of 1 mark CJ.

3. Assumption Risks:	
<p>Assumptions may not be representative of best estimate assumptions given current available information.</p> <p align="right">[0.5 mark SJ]</p> <p>This is particularly a risk to current period policy liability calculation for related product groups in loss recognition or with potential to enter loss recognition if a more appropriate best estimate assumption was used.</p> <p align="right">[0.5 mark SJ]</p>	<ul style="list-style-type: none"> • A written report is required for each assumption, setting out the analysis of experience with justification for the recommended best estimate assumptions. Such a process should be technically reviewed including all calculations. In addition, a suitably qualified and experienced actuary should review the assumption report. • Assumptions should be regularly reviewed and there should be a document which sets out the frequency in which experience analysis and a review of assumptions are undertaken. <p align="right">[0.5 mark CJ]</p>
Maximum of 1 mark SJ.	Maximum of 1 mark CJ.
4. Projection Model Risks:	
<p>Potential errors in projection model. Possible examples may include referencing incorrect assumptions for one or more products, adding instead of subtracting items, forgetting to convert a yearly item to a monthly item etc;</p> <p align="right">[0.5 mark SJ]</p>	<ul style="list-style-type: none"> • When a projection model is initially built it should be tested by performing the calculations for a sample of model points, which is representative of the mix of business. Ideally a report should be written by the model creator that sets out the model version number, name of model creator, date model was created, product features modelled and not
<p>Over simplification of projection model.</p> <p align="right">[0.5 mark SJ]</p>	

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	<p>modelled and tests performed. There should be a written validation report by a suitably qualified person who has not been involved in creating the model. The validation report should validate that the changes made to the model are correct and suggest any model improvements. <i>[Note to Markers: To get full marks candidates need to mention a review of the model needs to be undertaken].</i> [0.5 mark CJ]</p> <ul style="list-style-type: none"> • A similar process should be adopted when a model is changed, with checks performed to indicate that the quantum of any changes in policy liability is reasonable. [0.5 mark CJ] • Model Security: Only staff required to use projection models should be able to do so, so as to avoid unwanted changes to projection models. [0.5 mark CJ]
Maximum of 1 mark SJ.	Maximum of 1 mark CJ.

<p>5. Calculation Risks:</p> <p>There could be errors in the calculation of policy liabilities. [0.5 mark SJ] Examples are:</p> <ul style="list-style-type: none"> • Manual / spreadsheet numbers regarding group insurance policy liabilities may be calculated incorrectly. • Acquisition expenses may be incorrectly determined for the calculation of the new business policy liability. • Reinsurance %s are incorrect in the calculation of group insurance policy liabilities. [0.5 mark SJ] 	<ul style="list-style-type: none"> • Analysis of Profit: This check is to confirm that the profit for the year can be attributed to all known sources (being planned profits and experience items). Where the unexplained amount is small this gives comfort over the value of the policy liabilities. [0.5 mark CJ] • Results Checks: Comparison to prior period can be performed to ensure high level reasonableness of policy liability movements and components. Also, where applicable, ratios such as policy liabilities over premium, policy liabilities over number of policies etc can be confirmed for general reasonableness. [0.5 mark CJ] • Peer Review: An independent review of results [from external audit or otherwise) is important such that questions are asked from someone who is not as close to the valuation. [0.5 mark CJ]
<p>Maximum of 1 mark SJ.</p>	<p>Maximum of 1 mark CJ.</p>
<p>6. Compilation Risks:</p> <p>Errors may occur when compiling the results at various stages in the valuation process. [0.5 marks SJ] Examples could include:</p> <ul style="list-style-type: none"> • Results from projection model download to spreadsheets used to aggregate and summarise results may not be compiled correctly. • Results not be correctly aggregated and summarised into general ledger and financial statements. [0.5 mark SJ] 	<ul style="list-style-type: none"> • Control Checks at various stages in the valuation process. Policy Liabilities in financial statements are consistent with spreadsheets used to download and summarise results and these are consistent with figures from the projection model. [0.5 mark CJ] • Manual Check-Off of Results: A manual check of policy liabilities in the financial statements to projection model to confirm figures have been summarised correctly. [0.5 mark CJ]
<p>Maximum of 1 mark SJ.</p>	<p>Maximum of 1 mark CJ.</p>

7. Operational Risks:	
<p>Timetable for policy liability valuation is not met which then impacts ability to meet financial statement timeframes for reporting to shareholders.</p> <p style="text-align: right;">[0.5 mark SJ]</p>	<ul style="list-style-type: none"> • Ensure a timetable is prepared in enough detail that sets out all the valuation tasks. Each task should identify who is responsible for performing and reviewing it and the due date for completion. [0.5 mark CJ] • There should be regular team meetings of actuarial personnel (ideally daily if required), to track the progress with the completion of the tasks on the timetable and identify any issues arising. [0.5 mark CJ]
<p>Insufficient knowledge and understanding of relevant actuarial personnel, which could lead to calculation errors.</p> <p style="text-align: right;">[0.5 mark SJ]</p>	<ul style="list-style-type: none"> • Training sessions educating actuarial personnel on the valuation process, including the coverage of key principles. [0.5 mark CJ] • Procedures document setting out the method for calculating policy liabilities. [0.5 mark CJ]
Maximum of 1 mark SJ.	Maximum of 1 mark CJ.
0.5 mark SJ for any other reasonable point	0.5 mark CJ for any other reasonable point

Marking Guide:

For part i):

- For each risk category, 0.5 mark SJ for each valid point with a reasonable explanation, up to a maximum of 1 mark SJ.

To a maximum of 5 marks SJ for part i).

For part ii):

- For each risk category, 0.5 mark CJ for each valid mitigation strategy with a reasonable explanation, up to a maximum of 1 mark CJ.

To a maximum of 5 marks CJ for part ii).

d)

The situation could be explained by:

- If the assets backing the term certain annuities provided a perfect inflation hedge then the additional amounts paid out in annuity benefits would be offset by additional investment returns on the assets. It may be that the net impact of inflation is presented in the analysis of profit and this may be close to zero.
- It is possible there is another legitimate item missing from the analysis of profit, which is of similar magnitude to the inflation item but of the opposite sign. Or one of the existing items is out by an equal and opposite amount. In this case the analysis of profit could be improved but there may not be an issue with the policy liability calculation.
- It is possible that there should be an item for inflation and this creates an unexplained amount. In this case it is more likely that there is an error in the calculation of the policy liabilities and this error has occurred during the most recent year and needs to be investigated. A starting point for the quantum of the error would be the value of the unexplained.

Marking Guide for Part d):

1 mark CJ for each valid point discussed up to a maximum of 3 marks CJ.

Overall Marking Guide for Q1:

Part a) 2 marks (2 marks KU)

Part b) i) 2 marks (2 marks SJ)

Part b) ii) 2 marks (2 marks SJ)

Part b) iii) 2 marks (2 marks KU)

Part c) i) 5 marks (5 marks SJ)

Part c) ii) 5 marks (5 marks CJ)

Part d) 3 marks (3 marks CJ)

Overall: 21 marks (4 marks KU, 9 marks SJ, 8 marks CJ).

QUESTION 2

(19 Marks)

You are the Appointed Actuary for Long Life Ltd (LLL), an Australian Life Insurance Company. LLL sells a wide range of products including individual lump sum protection, group lump sum protection, group disability and individual investment linked business. LLL also has a block of traditional and investment account business, which are closed to new business.

Financial statements have just been completed for the 30/9/09 year end. LLL discloses profits to the market for the 31/3 and 30/9 half years.

The new CEO has only recently been appointed and is new to the Life Insurance Industry. The CEO has some basic knowledge of life insurance products, but little understanding of policy liabilities.

The CEO has asked you why changes in economic conditions have caused such volatile profits for the individual protection business. The CEO is also interested in your views on how management profits should be presented to address the volatility in protection profits.

To help you answer the question, you have extracted the following information:

- Budgeted profit for the total protection business for the year ending 30/9/09 is \$50m after tax.
- The individual lump protection business is valued using the projection method.
- Total individual protection lump sum policy liabilities at 30/9/09 = -\$800m.
- For a 1% change in the discount rate, policy liabilities change by 8%.
- For a 1% change in the inflation rate, policy liabilities change by 2%.
- There was strong growth in the value of equities in the year 30/9/08 to 30/9/09.
- History of economic conditions over the last 3 years:

Date	Discount Rate	Inflation rate
	%	%
30/9/09	6.33%	2.54%
31/3/09	5.20%	2.25%
30/9/08	6.19%	3.42%
31/3/08	6.83%	3.76%
30/9/07	6.95%	3.61%
31/3/07	6.67%	3.36%

a) Draft a memo to the CEO discussing:

- i) For the individual lump sum protection business, the nature of the policy liabilities (including how they are determined, the intended effect on profit, expected value over time) and why the changes in the discount rate and inflation rate would have had a volatile impact on the profit from this business. (6 marks)

- ii) A suggested alternative presentation of profits for management purposes, which allows for this volatility in individual lump sum protection profits. (5 marks)

The CEO has been reviewing the 30/9/09 financial statements and has a number of questions.

Discuss the points you would raise in answering the following questions from the CEO:

- b) Provide reasons why the Present value of profit margins for individual protection business might have decreased from 30/9/08 to 30/9/09 when the business has grown. (1 mark)
- c) Why would an increase in the lapse rate assumption for individual protection business not change the current year's profits and equity? (1 mark)
- d) Why might the total Policy Liability have decreased from 30/9/08 to 30/9/09 when the business has grown? Your answer should include a discussion on each product line and on the total policy liability. (2 marks)
- e) What are the typical guarantees for Traditional Business and Investment Account Business? (1 mark)
- f) For traditional business:
- i) Provide a definition of the best estimate bonus rate.
- ii) How does the best estimate bonus rate differ from the declared bonus?
- iii) Why may the best estimate bonus rate have increased from 30/9/08 to 30/9/09? (3 marks)

Solution

(a)

To: CEO

From: Appointed Actuary

Subject: Protection Profit Volatility Resulting from Changes in Economic Conditions

Dear CEO,

As requested this note sets out:

- (i) Reasons for the volatile impact on profit resulting from changes in economic conditions, and
- (ii) A suggested management view of profit to reflect this volatility.

i) Volatile Impact on Profit resulting from Changes in Economic Conditions

Nature of Policy Liability

The policy liability along with future premiums and investment income is expected to be able to fund claims, expenses and profits as they fall due. [0.5 mark SJ]

The Policy Liability is then expressed mathematically as:

$$\text{PV Claims} + \text{PV Expenses} + \text{PV Profits} - \text{PV Premiums}$$

discounted using an appropriate discount rate. [0.5 mark SJ]

A protection policy liability is negative, to offset the high acquisition expenses in the first year. This defers the acquisition costs into the future, with the effect that profits are smoothed over time. [0.5 mark SJ]

For most products a liability is usually positive with an offsetting asset. Market movements in interest rates are capitalized by the liability valuation process and also reflected in the asset valuations. The change in liability is almost matched by the change in asset value from change in interest rates, and so there is no impact on profit. [0.5 mark SJ]

As the protection policy liability is negative, there is no offsetting asset and the capitalized movement in the liability impacts directly on profits. [1 mark CJ]

Accounting Requirements

The Accounting Standard AASB1038 requires that the discount rate used for policy liabilities reflect the timing and length of the policy liability cash flows. [0.5 mark SJ]

This means that the discount rate is akin to the 10 year commonwealth government bond for long term products. For a 1% change in the risk discount rate, the policy liability will change by 8%. With a -\$800m policy liability at 30/9/09, an increase of 1% in the risk discount rate, would increase the policy liability by \$64m which would reduce profit by \$64m before tax (\$45m after tax). [1 mark SJ]

This would wipe out most of the \$50m budgeted profit after tax for 09/10.

[0.5 mark SJ]

The change in discount rates is the main driver of the volatility in economic conditions.

[0.5 mark CJ]

There have been changes in the inflation rate, which to some extent have offset the impact of the change in risk discount rate, however these impacts are smaller. [0.5 mark CJ]

Marking Guide for part a) i):

0.5 mark SJ for format of answer and appropriate wording.

To a maximum of 6 marks (4 marks SJ, 2 marks CJ).

ii) Presentation of Profits for Management

Management should not be measured by the impact of changes in economic conditions on protection profits, as it does not have any control of the investment markets. Instead it should only be measured in terms of what they can influence ideas such as sales, claims, expenses and retention of business. [1 mark CJ]

Profits in the financial statements are expressed as:

Planned Profits

$$\begin{aligned} &+ \text{Experience Profits (including impact of changes in the discount rate)} \\ &+ \text{Interest on Retained Profits (IORP)} \\ &= \text{Total Operating Profit} \end{aligned}$$

The impact of changes in economic conditions is reflected by:

- Impact of discount rate changes, included in experience profits, and
- IORP

[1 mark CJ]

An adjusted view of profits is shown below, which separately identifies the impact of changes in economic conditions.

Planned Profits

$$\begin{aligned} &+ \text{Experience Profits (excluding impact of changes in the discount rate)} \\ &= \text{Operating Profit after tax (before IORP and impact of changes in rdr)} \\ &+ \text{Impact of discount rate changes} \\ &+ \text{IORP} \\ &= \text{Operating Profit} \end{aligned}$$

[Credit can be given for similar presentations that separately identify the impact of changes in economic conditions]

[1 mark CJ]

Alternatively it should be noted that movements in the liabilities for this business represent the borrowing and repaying of capital to enable the smooth emergence of profit (when conditions are as expected a cohort of business will effectively borrow capital to set up the negative reserve at the end of the first year and repay this with interest over the life of the business). [1 mark CJ]

Therefore, in general, these amounts should not be excluded from the profit calculation. However for management purposes it would be reasonable to smooth the effect of the movements in the risk discount rate and inflation rate on profit over the expected life of each cohort of business. For example an increase in the liability wholly due to the risk discount rate would effectively be an accelerated repayment of capital and therefore any amount over the expected repayment of capital for that year could be deferred, in the management reporting, to subsequent years. [1 mark CJ]

Yours sincerely

Appointed Actuary

Marking Guide for part a) ii):

Marks as specified overall to a maximum of 5 marks CJ.

Answers to CEO questions on financial statements are set out below:

b) Why has the Present value of profit margins decreased when the business has grown?

- Increases in the mortality, expense and lapse assumptions are possible reasons for the reduction in future profit margins. [0.5 mark KU]
- The small increase in the discount rate from 6.2% (30/9/08) to 6.3% (30/9/09) will not change the profit margin but the PV of profit margins will slightly decrease as this impact is capitalised in the policy liability calculation. [0.5 mark KU]
- The new business that is being written may be unprofitable. [0.5 mark KU]

Marking Guide for Part b)

Marks are specified to a maximum of 1 mark KU

c) Why does an increase in the lapse rate assumption not change current year profits and equity?

- Under LPS 1.04 using a projection method, changes in assumptions such as lapses, are not allowed to be capitalised with an immediate impact on profit. The only exception is a change in assumption that leads to loss recognition, but given the significant budgeted profit this is unlikely. [0.5 mark KU]
- This is achieved by keeping the policy liability unchanged at 30/9/08, but spreading the impact of changes in profit margins over the future life of the policies. [0.5 mark KU]

Marking Guide for Part c)

Marks are specified to a maximum of 1 mark KU

d) Why has the Policy Liability decreased when the business has grown?

- Investment Account and Traditional Business are no longer open to new business. Thus this business is running off, which means policy liabilities continue to fall. [0.25 mark KU]
- Investment Linked Business is open to new business. Assuming sufficient sales one would expect policy liabilities to increase, as new business will offset the lapse of existing business. [0.25 mark KU]
- Similarly, Protection Business is open to new business. As the policy liability is negative, you would expect the policy liability to become a bigger negative

(i.e. to decrease), as the new business will offset the lapse of existing business.

[0.5 mark SJ]

- The growth rate of protection business has probably exceeded the growth of investment linked business, through higher sales or lower lapses.
- The resulting effect is that the bigger negative protection policy liability along with the decrease in the traditional and investment account policy liability, has more than offset the increase in the investment linked policy liability.

[0.5 mark SJ]

[0.5 mark SJ]

Marking Guide for Part d)

Marks are specified to a maximum of 2 marks [0.5 marks KU, 1.5 marks SJ]

e) What are the guarantees for Traditional Business and Investment Account Business?

- Traditional policyholder contracts stipulate minimum benefits will be paid out on surrender of a policy; also on the happening of an insured event the sum insured and declared bonuses (if any) will be paid. [0.5 mark SJ]
- Investment Account policyholder contracts stipulate the minimum crediting rate that can be declared is 0%. This effectively guarantees the Current Account Balances, so the Minimum Termination Value equals the Current Termination Value. [0.5 mark SJ]

Marking Guide for Part e)

Marks are specified to a maximum of 1 mark SJ

f) Answers to questions on traditional business:

- The best estimate bonus rate is the future declared bonus rate calculated so that the present value of future benefits (less premiums), expenses, policyholder's bonuses and shareholder share of bonuses is equal to the relevant value of the supporting assets (VSA). [0.5 mark KU]
- The best estimate bonus rate is not the same as the declared bonus rate. The best estimate bonus rate is determined as part of the calculation of policy liability process, and ensures a smooth progression of profits over time. The declared bonus rate will lead to a bonus distribution out current year and prior retained profits in respect of participating business. However, when the Appointed Actuary recommends a declared bonus rate, the best estimate bonus rate will be taken into account. [1 mark SJ]
- Possible reasons for the increase in the best estimate bonus rate are:
 - Strong investment returns on equities over the 08/09 year, is the most likely reason as this would lead to a significant increase in the value of assets supporting traditional business. This would lead to an increase in PV of profit margins, which gives a higher best estimate bonus rate. [0.5 mark CJ]
 - Increase in lapse assumption from 30/9/08 to 30/9/09. The policy liability would remain the same, but the best estimate liability

would fall resulting in an increase in the PV of profit margins. This in turn would lead to an increase in the best estimate bonus rate.

[0.5 mark CJ]

- Increase in equity proportion of assets should lead to an increase in the investment earning assumption. The policy liability would remain the same, but the best estimate liability would fall and as a result there would be an increase in the PV of profit margins leading to an increase in the best estimate bonus rate. [0.5 mark CJ]
- If the fall in the inflation rate over the period was associated with a decrease in long term expense inflation assumptions this this would tend to increase the best estimate bonus rate. [0.5 Mark CJ]

Marking Guide for Part f)

Marks are specified to a maximum of 3 marks [0.5 marks KU, 1 mark SJ, 1.5 marks CJ]

Overall Marks for Q2:

Part a) i) 6 marks [4 marks SJ, 2 marks CJ]

Part a) ii) 5 marks [5 marks CJ]

Part b) 1 mark [1 mark KU]

Part c) 1 mark [1 mark KU]

Part d) 2 marks (0.5 marks KU, 1.5 marks SJ).

Part e) 1 mark SJ.

Part f) i) 0.5 marks [0.5 marks KU]

Part f) ii) 1 mark [1 mark SJ]

Part f) iii) 1.5 marks [1.5 marks CJ]

Overall: 19 marks [3 marks KU, 7.5 marks SJ, 8.5 marks CJ]

QUESTION 3

(21 Marks)

You are the valuation actuary for Company “XYZ”, an Australian Life Insurance Company. There are two statutory Funds. Statutory Fund No.1 (SF 1) has two related product groups, Disability income (claims not in payment) and Disabled Lives Reserve (DLR) for disability claims in payment. Statutory Fund No.2 (SF 2) has single premium investment linked business (SP). The end of year valuation has been performed and it has been proposed that the following dividends are to be paid, \$50m (SF1) and \$100m (SF2).

You have been provided with the following information as at the end of year. All numbers are in \$m.

	SF 1			SF2
	Active Lives	DLR	Total	SP
<u>Policy Liabilities</u>				
Best Estimate Liability	-2,300	100	-2,200	
PV profit Margins	2,000	0	2,000	
Policy Liability	-300	100	-200	1,800
<u>Assets</u>				
Cash			204	229
Fixed Interest			34	687
Indexed Bonds			84	0
Australian Equity			93	573
International Equity			65	458
Property			0	344
			480	2,290
Future Income Tax Benefit			70	0
Debtors			50	100
Total Assets			600	2,390
<u>Liabilities</u>				
Policy Liabilities			-200	1,800
Other Liabilities			150	100
			-50	1,900
Equity				
Share Capital			500	50
Shareholder Retained Profits			150	440
			650	490
Total Liabilities			600	2,390

	SF 1			SF2
	Active Lives	DLR	Total	SP
<u>Expenses</u>				
Acquisition Non-Fixed			100	50
Acquisition Fixed			130	100
Maintenance Non-Fixed			200	100
Maintenance Fixed			250	1,000
			680	1,250
Solvency Liability for DLR		120	120	
Capital Adequacy Liability for DLR		120	120	
Minimum Termination Value	100	100	200	2,000
Current Termination Value	100	100	200	2,000
Target Surplus (as a % of Capital Adequacy Requirement)			110%	105%

Notes:

1. Investment linked solvency margin = 0.25 %.
2. Investment linked capital adequacy margin = 1.5%.
3. International equities for SF1 include a \$48m holding in Sparks Ltd.
4. Indexed bonds for SF1 include a holding of Mooney bonds with a \$27m market value.
5. The Future Income Tax Benefit (FITB) is admissible for the Solvency Requirement and Capital Adequacy Requirement.
6. The \$5m Expense Reserve Offset is available for SF1 only.
7. SF1 has a \$100m New Business Reserves, whereas SF2 has no New Business Reserve as it can fund future new business from retained profits and capital.
8. For SF1 and SF2, Cash, Fixed Interest and Indexed Bonds are invested in the following proportions of credit rated securities: 20% AAA Govt, 20% AA Corporate, 30% AA- Corporate and 30% BB Corporate.
9. For calculating the Resilience Reserve for the Solvency Requirement, A''/A is 0.92 (SF1) and 0.88 (SF2). In addition, $L'/L = 0.95$ (SF1) and 1 (SF2).
10. For calculating the Resilience Reserve for the Capital Adequacy Requirement, A''/A is 0.84 (SF1) and 0.81 (SF2). In addition, $L'/L = 0.9$ (SF1) and 1 (SF2).

a) Calculate the following for SF1 and SF2:

i) Solvency Requirement (5 Marks)

ii) Capital Adequacy Requirement and Target Surplus (5 Marks)

Show all the calculation steps.

b) Based on your calculations from part a):

i) Comment on the financial position of SF1 and SF2. (3 Marks)

ii) Describe any actions that could be taken as a result for SF1 and SF2. (8 Marks)

Solution

a)

i) Solvency Requirement

Item	SF1	SF2
(a) Solvency Liability	For active lives RPG: This calculation does not need to be performed if it can be demonstrated that the Solvency Liability \leq MTV. This is the case for the active lives RPG. However, this needs to be demonstrated from a past calculation (which should be performed say every 3 or 5 years). For DLR, solvency liability = 120. [0.5 Mark SJ]	
(b) Calculate Minimum Termination Value	By RPG: Active Lives MTV = 100 DLR MTV = 100 Total MTV = 200 [0.5 Mark SJ]	Includes the 0.25% investment linked margin $= 2,000 \times 1.0025 = 2,005$ [0.25 Mark KU]
(c) Greater of MTV from (b) and Solvency Liability from (a) by RPG	For active lives = 100 For DLR = $\text{Max}(100, 120) = 120$ Total = 220 [0.5 Mark SJ]	= 2,005
(d) Add Expense Reserve	Expense Reserve = Fixed Acquisition Expenses $\times 0.7$ – Expense Reserve Offset $= 130 \times 0.7 - 5 = 86$ Running Total = $220 + 86 = 306$ [0.5 Mark SJ]	As for SF1 $= 100 \times 0.7 = 70$ Running Total = $2,005 + 70 = 2,075$ [0.25 Mark KU]
(e) Minimum of Current Termination Value and (d)	= $\text{Max}(200, 306) = 306$ [0.25 Mark KU]	= $\text{Max}(2,000, 2,075) = 2,075$ [0.25 Mark KU]
(f) Add Other Liabilities to (e)	Other Liabilities = 150 Running Total = $306 + 150 = 456$ [0.25 Mark KU]	Other Liabilities = 100 Running Total = $2,075 + 100 = 2,175$ [0.25 Mark KU]

(g) Add Inadmissible Asset to (f)	<p>Possible Inadmissible Assets: Sparks Ltd: $= 48/600 = 8.0\%$ Inadmissible Asset $= (8\% - 5\%) \times 600 = 18$ Mooney Indexed Bonds: $= 27/600 = 4.5\% < 5\%$. Running Total = $456 + 18 = 474$ [0.5 Mark SJ]</p>	No Inadmissible Asset
(h) Add Resilience Reserve (RR) $RR = L' \times A / A'' - L$	<p>$A''/A = 0.92$ $A/A'' = 1.087$ L (from (f)) = 456 (Note: inadmissible Asset is not included) $L' = 0.95 \times L = 433$ $RR = 433 \times 1.087 - 456 = 15$ Solvency Requirement $= 474 + 15 = 489$ [0.5 Mark SJ]</p>	<p>$A''/A = 0.88$ $A/A'' = 1.1364$ $L =$ from (f) – Account Balance, as Assets are matched to Liabilities $= 2,175 - 2,000 = 175$ $L' = L = 175$ $RR = 175 \times 1.1364 - 175 = 24$ Solvency Requirement $= 2,175 + 24 = 2,199$ [0.5 Mark SJ]</p>
Total Maximum Marks	3.5 Marks [0.5 Marks KU, 3 Marks SJ]	1.5 Marks [1 Mark KU, 0.5 Marks SJ]

Marking Guide for a) i)

Marks are specified to a maximum 5 Marks [1.5 Marks KU, 3.5 Marks SJ]

ii) Capital Adequacy Requirement

Item	SF1	SF2
(a) Capital Adequacy Liability	<p>For active lives RPG: This calculation does not need to be performed if it can be demonstrated that the Capital Adequacy Liability \leq CTV. This is the case for the active lives RPG. However, this needs to be demonstrated from a past calculation (which should be performed say every 3 or 5 years). For DLR, capital adequacy liability = 120 [0.5 Mark SJ]</p>	

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(b) Calculate Current Termination Value	By RPG: Active Lives CTV = 100 DLR CTV = 100 Total CTV = 200 [0.5 Mark SJ]	= 2,000 [0.25 Mark KU]
(c) Greater of CTV from (b) and Capital Adequacy Liability from (a) by RPG	For active lives = 100 For DLR = Max (100,120) = 120 Total = 220 [0.5 Mark SJ]	= 2,000
(d) Add Other Liabilities to (c)	Other Liabilities = 150 Running Total = 220+150 = 370 [0.25 Mark KU]	Other Liabilities = 100 Running Total = 2,000+100 = 2,100 [0.25 Mark KU]
(e) Inadmissible Asset to (d)	As for Solvency, inadmissible asset = 18 Running Total = 370+18=388 [0.5 Mark SJ]	
(f) Add Resilience Reserve to (e) $RR = L' \times A / A'' - L$	$A''/A = 0.84$ $A/A'' = 1.1905$ L (from (d)) = CTV+OL = 370 $L' = 0.9 \times L = 333$ $RR = 333 \times 1.1905 - 370 = 26$ Running Total = 388+26 = 414 [0.5 Mark SJ]	$A''/A = 0.8100$ $A/A'' = 1.2346$ $L = CTV + OL - \text{Account Balance, as Assets are matched to Liabilities} = 2,100 - 2,000 = 100$ $L' = L = 100$ $RR = 100 \times 1.2346 - 100 = 23$ Running Total = 2100 + 23 = 2,123 [0.5 Mark SJ]
(g) Minimum of Solvency Requirement	= Max(489,414) = 489 [0.25 Mark KU]	= Max(2199,2123)=2199 [0.25 Mark KU]
(h) Add New Business Reserve	New Business Reserve = 100 Capital Adequacy Requirement = 489+100=589 [0.25 Mark KU]	New Business Reserve is 0. Running Total = 2199

[Note for Markers: Candidates could jump to step (g) without performing the previous steps (a) to (f), as the Solvency Requirement dominates. If this happens no marks should be given for steps (a) to (g), as candidates are required to show all calculation steps.]

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Target Surplus

Target Surplus	Capital Adequacy Requirement x 110% = 589 x110% = 648 [0.25 Mark KU]	Capital Adequacy Requirement x 105% =2199 x105% = 2309 [0.25 Mark KU]
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Total Marks for Capital Adequacy Requirement and Target Surplus	Maximum of 3.5 Marks [1 Mark KU, 2.5 Marks SJ]	Maximum of 1.5 Marks [1 Mark KU, 0.5 Marks SJ]
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Marking Guide for a) ii)

Marks are specified to a Maximum of 5 Marks [2 Marks KU, 3 Marks SJ].

b)

i) In order to assess the financial position, you need to first determine the excess assets over the Solvency Requirement, the Capital Adequacy Requirement and Target Surplus with and without the proposed dividend as follows.

	SF1	SF2
Solvency Requirement	489	2,199
Dividend	50	100
Balance of Excess Assets	61	91
Excess Assets over Solvency Requirement	111	191
Total Assets	600	2,390
Capital Adequacy Requirement	589	2,199
Dividend	50	100
Balance of Excess Assets	-39	91
Excess Assets over Capital Adequacy Requirement	11	191
Total Assets	600	2,390
Target Surplus	648	2,309
Dividend	50	100
Balance of Excess Assets	-98	-19
Excess Assets over Target Surplus	-48	81
Total Assets	600	2,390

[1 mark SJ]

In summary the financial position by statutory fund is as follows:

SF 1

- Is solvent as satisfies the Solvency Requirement, even after paying the proposed dividend.
- Meets Capital Adequacy Requirement before paying out the proposed dividend. Cannot pay the proposed dividend as the fund would not then satisfy the Capital Adequacy Requirement.

- Even before paying out the proposed dividend, it does not meet the Target Surplus requirement.

SF2

- Is solvent as satisfies the Solvency Requirement, even after paying the proposed dividend.
- Meets Capital adequacy requirement (same as Solvency Requirement), even after paying out the proposed dividend.
- Meets Target Surplus before paying out proposed dividend. However, will not meet Target Surplus if proposed dividend is paid out.

Marking Guide for part b) i):

0.25 mark SJ for each point discussed to a maximum of 3 marks SJ.

b)

ii)

Actions to be taken for SF1:

- Needs to either inject capital or lower the Capital Adequacy Requirement [0.5 mark CJ]
- Needs to reduce the Solvency Requirement as this mainly drives part of the Capital Adequacy Requirement. [0.5 mark CJ]
- In addition, needs to reduce New Business Reserve in the Capital Adequacy Requirement. [0.5 mark CJ]
- Possible strategies include:
 - Defer the payment of the dividend until next year. Build up excess margins from next year's profit. [0.5 mark CJ]
 - Only pay a dividend if there is sufficient retained profits and capital to finance the business over the next 3 years. This will eliminate the need for a New Business Reserve, which will reduce the capital adequacy requirement and thus improve the financial position. [0.5 mark CJ]
 - Inject capital to strengthen its financial position, although there will be a cost associated with this. [0.5 mark CJ]
 - Transfer capital from SF2 to SF1 [0.5 mark CJ]
 - Raise subordinated debt. This will be less expensive than capital. [0.5 mark CJ]
 - Look at changing its commission structure from high up front commission to more level commission. This will reduce the level of acquisition expenses and the need for such a high New Business Reserve. However this will not happen in the short term. [0.5 mark CJ]
 - Reinsure the disability portfolio under a reinsurance arrangement. As the reinsurer pays for the acquisition costs, the New Business Reserve will decrease for Capital Adequacy and the Expense Reserve will reduce the Solvency Requirement. The Minimum Termination Value and Current Termination Value will also decrease. This will improve the financial position, but there will also be a reinsurance cost, which will reduce profit. [0.5 mark CJ]

- Needs to reduce investments in risky equities, as at 50% this is too high. This causes a mismatch between assets and liabilities (long term and indexed for inflation) for DLR. This will reduce the resilience reserve. [0.5 mark CJ]
- Needs to reduce investments in poorly credit rated investments, as at 50% this is too high. This will reduce the resilience reserve. [0.5 mark CJ]
- Look at ways to reduce fixed acquisition expenses as this contributes to the Expense Reserve. [0.5 mark CJ]

Actions to be taken for SF2:

- There are not really any actions management can take to reduce the Solvency Requirement (which is equal to the Capital Adequacy Requirement) and therefore reduce the Target Surplus. [0.5 mark CJ]
- There are no legal reasons why a dividend cannot be paid as it still satisfies the Capital Adequacy Requirement. [0.5 mark CJ]
- The payment of the dividend will depend on its Target Surplus policy. [0.5 mark CJ]
- Not paying a dividend will mean it has maintained its Target Surplus, and it maintains a buffer against possible future adverse experience fluctuations. [0.5 mark CJ]
- A dividend could be paid, but the risk is that the buffer against future adverse experience is reduced. [0.5 mark CJ]
- If a dividend is paid, then raising shareholder capital and/or subordinated debt would restore its level of Target Surplus. [0.5 mark CJ]
- Could pay a reduced dividend, say \$40m - \$60m, as it will satisfy its Target Surplus policy, whilst maintaining a reasonable amount of excess assets above Target Surplus. [0.5 mark CJ]

Marking Guide for part b) ii):

For SF1, marks as specified above to a maximum of 5 marks CJ.

For SF2, marks as specified above to a maximum of 3 marks CJ.

To a maximum of 8 marks CJ overall.

Overall Marks for Q3:

Part a) i) 5 Marks [1.5 Marks KU, 3.5 Marks SJ].

Part a) ii) 5 Marks [2 Marks KU, 3 Marks SJ].

Part b) i) 3 Marks [3 Marks SJ].

Part b) ii) 8 Marks [8 Marks CJ].

Overall: 21 Marks [3.5 Marks KU, 9.5 Marks SJ, 8 Marks CJ].

QUESTION 4

(19 Marks)

“ABC” is a medium-sized Australian life insurance company that is wholly owned by “Topco”, a large diversified financial services group. ABC has a broad range of products across three statutory funds and reports its profit to Topco every month on a year-to-date basis. ABC uses Margin on Services (MoS) methodology to determine profits, with an approximate calculation of the policy liabilities throughout the year and a full valuation at year-end. ABC also prepares annual Budgets and Business Plans for the year ahead, with expected results for each month through the year. You are the Financial Reporting Actuary for ABC.

The Finance Director has concerns about the apparent disparities between the following:

- the Business Plan comparison of actual to expected profit results
 - the MoS analysis of profits. (6 marks)
- a) Discuss the possible reasons for the difference between these two views of the sources of profit.
- b) The Finance Director has been talking to a CFO of another insurance company, which uses a traditional Appraisal Value to assist management in the reporting of profits. The Finance Director has asked you for more information on the Appraisal Value.
- i) Describe the components of the Appraisal Value. (1 mark)
 - ii) Describe how the profit is calculated using the Appraisal Value approach. (1 mark)
 - iii) Discuss the differences between the Appraisal Value Profit and MOS Profit Reporting. (4 marks)
- c) The Finance Director would like to introduce a separate Appraisal Value process for ABC involving a full accurate calculation twice a year (at the end of months 3 and 9 in the company year). Each of these results will be rolled forward to obtain estimated values at the end of months 6 and 12 respectively, corresponding to the half year and full year periods. Results are required by day 3 following half year end and full year end.
- i) Describe in detail a suitable process for such a “roll-forward”. (4 marks)
 - ii) Discuss any issues that may arise from using a roll-forward process. (3 marks)

Solution

a)

Reasons for differences between Business Plan versus Actual Profits and MOS Analysis of Profit are as follows:

Difference	Business Plan versus Actual Profits	MOS Analysis of Profit
Purpose	Required for management purposes to compare actual versus budgeted items, such as sales, claims and expenses. There may be adjustments to reflect responsibility for different profit components, e.g. normalized investment income. [0.5 Mark CJ]	Required for statutory reporting reasons, as is included as a note in the Financial Statements at the end of the year. [0.5 Mark KU] It also gives comfort over the policy liabilities (if low unexplained) [0.5 Mark KU]
Reporting Level	Focuses on reporting on management divisions or business units and then by product groups. [0.5 Mark CJ]	Operates at the Statutory Fund level or lower by groups of related product groups. [0.5 Mark KU]
Level of Expense Analysis	Could analyse expenses at a very detailed level such as by distribution costs, overheads, claims expenses etc; [0.5 Mark CJ]	Usually only by acquisition/maintenance expenses and non-commission/commission expenses. [0.5 Mark KU]
Assumptions for Business Plan vs MoS planned profit	Referenced to management expectations and related Business Plan purposes. Business Plan typically would include stretch, motivational or aspirational target elements with management performance and reward hurdles. [0.5 Mark CJ]	Set by external or perspective standards (LPS1.04), which must be followed. MOS assumptions are central “best estimate assumptions” of likely experience. [0.5 Mark KU]
Short/term or Long term Focus	Business plan has a short term focus on outcomes, usually over a one year time horizon. [0.5 Mark CJ]	Focuses on long term assumptions that will apply over time. [0.5 Mark KU]

Updates to Assumptions	There is also potential for significant timing differences to impact the BP processes. While it may start (and often needs to complete) well ahead of the starting point for the next year, this introduces the possibility of changes between the budget period and the next year. For example, the assumption may be changed after the budget has been locked in. Sometimes there can be several “iterations” of plans & budgets over the course of management sign-off. [0.5 Mark CJ]	Expected Assumptions are those applying at the end of last year (or whenever they were last changed). These assumptions are locked in. [0.5 Mark KU]
Auditing	No requirement to be audited by external parties. However, its good practice for appropriate internal reviews and checks be performed as this is a key management reporting tool. [0.5 Mark CJ]	As shown in the Financial Statements will need to be reviewed by the actuarial auditors along with the review of actuarial assumptions and Policy Liability calculations. [0.5 Mark KU]
Owners/Personnel	Could be owned by Actuarial area or by a separate Finance area. Requires suitably experienced personnel, not necessarily actuarial. [0.5 Mark CJ]	Owned by Actuarial area. Requires actuarial personnel with training and experience as uses MOS actuarial assumptions. [0.5 Mark KU]
Total Marks	0.5 Mark for each reasonable explanation made to a maximum of 3 Marks CJ.	0.5 Mark for each reasonable explanation made to a maximum of 3 Marks KU.

Marking Guide for part a):

Maximum of 6 marks [3 marks KU, 3 marks CJ]

b)

i)

Appraisal value comprises the following:

- Value of Inforce Business (VIF): Present value for future distributable profits from current in force business (including the release of target surplus backing the inforce business).
- Value of New Business (VNB): Future profits from projected future sales of new business (including the release of target surplus).

- Adjusted Net Worth (ANW): This represents the shareholder net assets equal to the value of the shareholders' fund plus the excess of the statutory fund assets over the target surplus.

Target surplus is the amount of capital the shareholders' choose to hold above the statutory capital adequacy requirement [1 mark KU]

Marking Guide for Part b) i):

Maximum of 1 mark [1 mark KU]

ii)

Profit consists of change in total Appraisal Value over each period (adjusted as required for capital effects), and consists of expected change in value, experience variations within the period, and assumption changes that relate to present values of future profits for both existing and future new business. [1 Mark KU]

Marking Guide for Part b) ii):

Maximum of 1 mark [1 mark KU]

iii)

Differences between Appraisal Value and MOS Reporting are as follows:

Difference	Appraisal Value	MOS
Purpose	Management view of profit, to give management the signals and immediate impact of their decisions. [0.5 Mark SJ]	Statutory view of profit as required for external reporting needs. Signals are given to management but can be different to the Appraisal Value. [0.5 Mark KU]
Best Estimate Expense Assumptions	Best estimate assumptions but with adjustments for expense savings over the long term. [0.5 Mark CJ]	Best estimate assumptions as per LPS1.04, with expenses likely to be incurred during the year following the valuation date. [0.5 Mark KU]
Volatility/Stability of Profits from changes in assumptions	AV Profit is more volatile as it responds to changes by capitalizing future assumption changes. [0.5 Mark SJ]	MoS profits tend to exhibit relative stable profits. The effect of changes in assumptions (apart from investment earnings) is spread over the future life of the policy through the profit margin. [0.5 Mark KU]
New Business	Significant component of the AV as the value of all future distributable profits are capitalized. Hence provides management with the right signals in terms of sales. [0.5 Mark SJ]	Provided the product is not in loss recognition, any profits upfront cannot be recognized immediately. Instead profit is spread over the life of the policy through the profit margin. Contribution to profit from new business is small as equals sales x profit margin/2. Hence does not send the right signal to management. [0.5 Mark KU]

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Reserves	Uses Target Surplus, stronger than Capital Adequacy Requirement, to reflect that the company needs to provide reserves to support the capital needs of the business. [0.5 Mark SJ]	Uses Policy Liabilities (as set out in LPS 1.04). [0.5 Mark KU]
Discount Rate	Reflects risk of the shareholder, usually 10 yr bond yield + Beta x Equity Risk Premium [0.5 Mark SJ]	Either best estimate investment earning rate on assets backing liabilities or a risk free rate reflecting the nature and terms of the cashflows relating to the liability. [0.5 Mark KU]
Cost of Capital	Reflects cost of capital: Discount Rate – Expected Investment Rate on Assets The company incurs a cost in borrowing capital where it earns an interest rate less than the discount rate. [0.5 Mark SJ]	Does not reflect cost of capital as only uses Policy Liability and discount rate does not take of account of shareholder risks. [0.5 Mark KU]
Premium Rate Changes	Can potentially include premium rate changes that will occur in 6 months' time if it already knows these have been approved by the board of directors. [0.5 Mark CJ]	Will only reflect new premium rates when they are reflected in the administration data received in an actuarial extract. [0.5 Mark KU]
Total Marks	0.5 Mark for each reasonable explanation made above to a maximum of 3 Marks [2 marks SJ, 1 mark CJ].	0.5 Mark for each reasonable explanation made above to a maximum of 3 Marks KU.

Marking Guide for part b) iii):

Maximum of 4 marks [2 marks KU, 1 marks SJ, 1 mark CJ].

c)
i)

- Project expected ANW, VIF, and VNB : based on starting positions, allowing for interest, and expected policy related cash flows and target surplus movements for both the in force and expected new business in the period. [1 mark SJ]
- The interest rates for the VIF and VNB will be their separate discount rates. [0.5 mark SJ]
- The interest rate for the ANW will be the assumed fund earning rate. [0.5 mark SJ]

- Care must be taken to allow for changes of capital and/or payment of dividends on a consistent basis. [0.5 Mark SJ]
- Allow for experience variations over the period. Compare actual with expected levels of -
 - New business (sales) for the period;
 - Cash flows (premiums, claims, etc.);
 - Discontinuances (lapses, surrenders);
 - Investment earnings (impact on FUM, future fees), etc.
 - In each case, comparing against what was expected (or implied) in the projections carried out in AV_0 at start of the period. Make allowance for the impacts of these experience variations on
 - Cash flow/value roll-up for the period; and
 - PV of future profits as at end of the period.
 - The latter may be allowed for using “sensitivities” calculated as part of the AV process at the start of the period.

[1 mark SJ]

- Allow for any assumption changes over the period. Apart from specific product changes (e.g. revised premium rates), these changes are most likely to relate to economic assumptions such as –
 - Assumed fund earning rates, if the economy and/or financial markets have changed significantly over the period;
 - Risk Discount Rate – for similar reasons to the above point;
 - Inflation assumptions, etc.
 - The latter may be allowed for using “sensitivities” calculated as part of the AV process at the start of the period.

[1 Mark SJ]

Marking Guide for part c) i).

Marks as specified above to a maximum of 4 marks SJ.

ii)

Issues with the roll-forward process are:

- The roll-forward calculation is approximate, so could be possibly be subject to error. [0.5 Mark CJ].
- As the value needs to be determined by day 3 after the year end, much of the actual revenue information will not be available. Thus, they will need to use actual sales for 2 months and expected sales for the last month. Similarly, they will need to use actual investment earning rate for 2 months and expected interest rate for the last month.

[1 Mark CJ]

- Key experience information may not be available for the 3 month roll-forward period, as there is usually a time delay before lapse and claims experience analysis may be available. [0.5 Mark CJ]
- The roll-forward process would have difficulty in properly allowing for the non-linear effect of the operation of any policy guarantees or options. [0.5 Mark CJ]
- As this is an approximate method, a reconciliation will need to be performed between the roll-forward value and the recalculated value for the AV using actual data and assumptions. Any differences between the components will need to be explained, leading to improvements in the roll-forward process going forward.

[1 Mark CJ]

Marking Guide for part c) ii):

Marks as specified to a maximum of 3 marks CJ.

Overall Marks for Q4:

Part a) 6 marks [3 marks KU, 3 Marks CJ]

Part b) i) 1 mark [1 mark KU]

Part b) ii) 1 mark [1 mark KU]

Part b) iii) 4 marks [2 marks KU, 1 marks SJ, 1 Mark CJ]

Part c) i) 4 marks [4 marks SJ]

Part c) ii) 3 marks [3 Marks CJ]

Overall: 19 marks [7 marks KU, 5 marks SJ, 7 marks CJ]

QUESTION 5

(20 Marks)

MIRO is a listed Australian financial services holding company that has a life insurance subsidiary, MIRO Life. MIRO Life has two statutory funds. Statutory Fund No.1 comprises participating business, which has been closed since 1998. Statutory Fund No.2 comprises investment linked superannuation business, which is growing.

MIRO has recently launched a successful takeover bid for ALEC Life, a previously listed life insurance company. ALEC has three statutory funds. Statutory Fund No.1 comprises traditional participating business, Statutory Fund No.2 comprises non-participating risk business and Statutory Fund No.3 comprises investment linked superannuation business. Statutory Funds No.2 and No.3 are growing with strong new business sales. For the last couple of years there has been very little new business written in the participating fund.

You are the Appointed Actuary of MIRO reporting to the CFO who is new to the Life Insurance industry.

- a) The CFO has asked you to explain the role of the Appointed Actuary. Briefly describe the key responsibilities of the Appointed Actuary in providing advice to a life company. (3 marks)**
- b) The takeover envisages that both participating statutory funds will be merged. Discuss the issues that would need to be considered in an actuarial report on the merger. (5 marks)**

The participating business of MIRO provides both reversionary bonuses and terminal bonus (based on date of entry) to policyholders. The declared reversionary bonus rate has been stable at 5%. As Appointed Actuary you have actively managed the level of terminal bonus over recent years. Based on the recent valuation, there is a reasonable amount of retained profits in Statutory Fund No.1 of MIRO. The long term strategic asset mix is 10% Cash, 30% Fixed Interest, 30% Australian Equities, 20% International Equities and 10% Property.

Upon review of the ALEC participating business, you learn that it provides only reversionary bonus and has built up a significant level of retained profits. The declared reversionary bonus rate has been stable at 4%. The long term strategic asset mix is 10% Cash, 40% Fixed Interest, 20% Australian Equities, 20% International Equities and 10% Property.

- c) The CFO would like to merge the participating business of MIRO and ALEC, with a single bonus policy going forward. You have been asked to propose a bonus policy for the combined fund.
- i) Describe any information you would need and why; (3 marks)
 - ii) Discuss calculations you would perform and why; and (1 mark)
 - iii) Discuss your recommended principles in implementing the single bonus policy and give examples of how each principle might be applied. Give reasons for recommending the single bonus policy and state any qualifications you may need to make. (8 marks)

Solution

a)

An Appointed Actuary has four general areas of responsibility to provide advice to a life company as follows:

- **Product Advice:** to provide the company written advice before the company issues a new product about the proposed terms and conditions, the surrender basis and the unit pricing method. Advice also needs to be provided if there are proposed changes to terms and conditions for existing policyholders. Advice on proposed reinsurance arrangements must also be provided before they are entered into.
- **Apportionments:** to provide the directors written advice regarding the equity and suitability of the proposed basis for the expense apportionment across products within statutory funds. The review should cover non-direct expenses, the product drivers used (no. of policies, new business premiums, funds under management and claim expenses, and the split between acquisition and maintenance expenses.

The Appointed Actuary needs to provide advice on the equity and suitability of a proposed investment income allocation basis. This is required where assets are not directly allocated to specific products in a statutory fund.

- **Financial Condition Investigations:** to prepare a written report to the directors on the investigation into the financial condition of the company at the end of each financial year (or at other times as may be required) which is to include a valuation of the company's life insurance liabilities (policy Liabilities, the solvency requirement and the capital adequacy requirement). Other important items include review of experience, review of information systems, suitability of assets, and appropriateness of the investment policy.
- **Distributions of Profit and Capital:** to provide the directors written advice regarding the target surplus policy and the consequences of a proposed distribution of retained profits or shareholders' capital. Equity between policyholders and shareholders and between policyholder with different discretionary benefits needs to be considered.

Marking Guide for part a):

1 mark KU for each key area of responsibility listed with appropriate explanation of responsibilities to a maximum of 3 marks KU.

b)

Issues to be discussed in a report on the merger of the two participating funds include:

- The impact on the benefit expectations of the policyholders of each life company, detailing any adverse effects. This can be considered in terms of minimum contractual benefits and the reasonable expectation of policyholders including the bonus policy for the combined business
[0.5 mark SJ]
- Steps to be taken as a part of the merger to secure the policyholder reasonable expectations if there are different expectations for different groups or cohorts within the statutory funds.
[0.5 mark SJ]

- Whether the ex-ALEC participating business is to remain open to new business on the current premium scales. [0.5 mark SJ]
- The possibility and likely effects of a substantial increase in lapses for the ex-ALEC business (and possibly the MIRO business) if policyholders are not satisfied with the process of the merger and the communication of this process. [0.5 mark SJ]
- The impact of the merger on the security of the benefits of the policyholders of each life company. This should be assessed in terms of net assets and the capital positions. Assessment of the capital position should be for both regulatory capital (solvency requirement and capital adequacy requirement) and Target Surplus. When determining the capital position, proper allowance should be made for any guarantees and options. [0.5 mark SJ]
- Adjustments to be made to the existing expense allocation process for each company, to accommodate the merged fund and how this will impact benefit expectations. [0.5 mark SJ]
- The treatment of the costs associated with the merger i.e. Are the policyholders being expected to bear any of the costs? [0.5 mark SJ]
- Cost synergies may emerge from the combined company. How are these to be treated and will policyholders receive some benefit? [0.5 mark SJ]
- Adoption of an investment policy for the combined fund needs to be considered with its impact on policyholder benefits and security. [0.5 mark SJ]
- The new life company will include the non-participating statutory funds MIRO and ALEC. Consideration needs to be given to any contagion risks associated with these other statutory funds, which might affect the capital position of the combined participating fund and thus the security of policyholder benefits. Any additional capital required and its possible sources need to be understood. [0.5 mark SJ]
- Any analysis should be considered at the time of the merger and how it is expected to evolve over time. For example, capital strength is a measure of benefit security. At the time of the merger, both blocks of business could have an equivalent strength. However, if one has a shorter duration or relative higher \$ bonuses in the immediate future, over time the capital strength of one block could be supporting the other, which needs to be avoided. [1 mark SJ]
- As there is a significant change to the profile of the business with the inclusion of ALEC participating business, the target surplus policy should be reviewed.
- Administration and system issues [0.5 marks SJ]
- The merging of the Relative Product Groups of the MIRO and ALEC participating business. For example, the impact on profit if one was in loss recognition. [0.5 marks SJ]
- Opportunities for product rationalisation. [0.5 marks SJ]
- Other reasonable points if well explained [0.5 mark SJ]

Marking Guide for part b):

Marks as specified above to a maximum of 5 marks SJ.

c)

i) Information required:

To establish the existing bonus philosophy:

- Any documents sent to policyholders that may set out any reasonable expectations of bonuses to be paid into the future. [0.5 mark SJ]
- Most recent advice, say last three years, on bonus recommendations to the ALEC Life Board by their Appointed Actuary. [0.5 mark SJ]
- Recent FCRs, in particular the section setting out the bonus philosophy. [0.5 mark SJ]
- Face to face meeting with the ALEC Appointed Actuary and Product Actuary, to understand how the bonus philosophy has been applied in practice – both historically and in terms of future expectations for the bonus payments. [0.5 mark SJ]

Other Information:

- Copy of investment policy document, which sets out the long term investment strategy and how it relates to the bonus philosophy. [0.5 mark SJ]
- Details of terms and conditions from policy document, Best Estimate Assumptions and Projection models and data to enable the calculation of best estimate bonus rates. [0.5 mark SJ]

Marking Guide for part c) i):

Marks as above to a maximum of 3 marks SJ.

ii)

Calculation of supportable bonus (allowing separately for a runoff of retained policyholder profits) for the merged participating fund, using MIRO's long term asset mix, under three scenarios:

- For MIRO and ALEC policyholders together
 - For MIRO policyholders only
 - For ALEC policyholders only
- [0.5 mark SJ]

As this helps out in assessing any equity issues in using the one reversionary bonus declared rate. [0.5 mark SJ]

Marking Guide for part c) ii):

Marks as above to a maximum of 1 mark SJ.

iii)

The principles to be adopted in implementing the single bonus policy would be :

- The retained policyholder profits for each fund should be used to benefit the block of policyholders that contributed to them. For example the retained profits in the ALEC fund could be secured for the ALEC policyholders by declaring a special reversionary bonus declaration at date of merger for ALEC policyholders only, which distributes all ALEC's retained profits as at the date of the merger. This is particularly important as there are significant retained profits in the ALEC fund. [1 mark CJ]
- A single reversionary bonus rate scale should be able to be used for both blocks of policies, the MIRO scale. For example future reversionary bonus declarations would use the MIRO bonus policy, with the MIRO investment mix with a long

term asset mix of 10% Cash, 30% Fixed Interest, 30% Australian Equities, 20% International Equities and 10% Property. This would probably lead to a 5% reversionary bonus rate for all policyholders (including ex-ALEC policyholders)
[1 mark CJ]

- A single terminal bonus rate scale should be able to be used for both blocks of policies. In line with the first principle the retained profits in the MIRO fund should not be applied to benefit the ex-ALEC policyholders. For example terminal bonus would use the MIRO policy based on date of entry. For ex-ALEC policyholders, their date of entry is the date of merger for determining the terminal bonus scale.
[1 mark CJ]

[To a maximum of 3 marks CJ. To get full marks the principles and an example of how they could be applied need to be given.]

Reasons for my recommended bonus policy are as follows:

Equity

- Equity needs to be maintained between MIRO and ALEC policyholders in respect of their retained profits built up over time. Otherwise, the retained profits attributable to each could not be separately identified, and this might have led to one group of policyholders subsidising the other. (Assumes terminal bonuses only funded by assets backing retained profits).
[1 mark CJ]
- A single reversionary bonus rate scale would be appropriate if both groups of policyholders have their assets invested in the same way, the same long term investment earning rate should ensure the same long term best estimate bonus rate and stable declared bonus rate. (Assumes profiles and other assumptions are similar).
[0.5 mark CJ]
- A single terminal bonus rate scale would be appropriate if the terminal bonus is based on date of entry (with date of merger used for ALEC policyholders). This ensures equity is maintained in receiving terminal bonuses in respect of market movements over time. Assuming assets shares are used, then the ALEC policyholders terminal bonus is in respect of unrealised capital gains since the date of merger, whereas the MIRO policyholders terminal bonus is in respect of unrealised capital gains since their date of entry, before the merger date.
[1 mark CJ]

To a maximum of 2.5 marks CJ.

Meets Reasonable Expectations

- Meets the reasonable expectations of MIRO policyholders as reversionary bonuses and terminal bonuses are unchanged.
[0.5 mark CJ]
- Exceeds the reasonable expectation of ALEC policyholders in the following ways:
 - Any early distribution of the retained earnings of the ALEC fund to ex-ALEC policyholders to ensure they have the benefit of these funds (eg by the payment of a special one off reversionary bonus distribution) would give them access to profits which they may have only be entitled to years in the future and if they had stayed.
[0.5 mark CJ]
 - Moving to the MIRO reversionary bonus rate scale (eg by the adoption of more aggressive equity mix) ensures a stable reversionary bonus rate of 5% exceeding the previous 4%.
[0.5 mark CJ]
 - Payment of terminal bonuses, which they did not receive previously.

[0.5 mark CJ]

To a maximum of 2 marks CJ.

Simplicity/Stability

- As one reversionary bonus rate is used. [0.5 mark CJ]
- No changes required to systems as method unchanged to calculate bonus rate, except for terminal bonuses. For terminal bonuses the date of merger could be used as date of entry for ex-ALEC policyholders. [0.5 mark CJ]
- As uses the current 5% declared rate for MIRO which is expected to be stable. [0.5 mark CJ]

To a maximum of 1 mark CJ.

Qualifications

- Attention must be paid to any possible changes in capital requirements due to the steps taken to implement the single bonus policy and how these might be funded . For example changing the asset mix for the ex-ALEC block of business to the more aggressive MIRO asset mix would result in the increase in the resilience reserve. [1 mark CJ]
- The policy documents would need to be checked to see if they allow the intended change in investment policy. [0.5 mark CJ]
- Any marketing material/communications to policyholders would need to be checked to see if they allow the intended change in investment policy [0.5 mark CJ]

Marking Guide for part c) iii):

Marks as set out above to a maximum of 8 marks CJ.

Overall Marks for Q5:

Part a) of 3 marks [3 marks KU]
Part b) of 5 marks [5 marks SJ]
Part c) i) of 3 marks [3 marks SJ]
Part c) ii) of 1 mark [1 mark SJ]
Part c) iii) of 8 marks [8 marks CJ]

Overall: 20 marks [3 marks KU, 9 marks SJ, 8 marks CJ]

END OF PAPER