

QUESTION 1

- a) It is first necessary to calculate the BEL at outset.

$$\begin{aligned}
 \text{BEL at outset} &= \text{PV claims} + \text{PV commissions} + \text{PV expenses} - \text{PV premiums} \\
 &= 40 \cdot 40\% \cdot (1 + 0.9 + 0.9^2 + \dots + 0.9^{44}) + 125\% \cdot 40 \\
 &\quad + 40 \cdot 20\% \cdot (0.9 + 0.9^2 + \dots + 0.9^{44}) + 40 \cdot 60\% \\
 &\quad + 40 \cdot 10\% \cdot (0.9 + 0.9^2 + \dots + 0.9^{44}) - 40 \cdot (1 + 0.9 + 0.9^2 + \dots + 0.9^{44}) \\
 &= 50 + 24 + 40 \cdot (40\% + 20\% + 10\% - 100\%) \cdot (1 + 0.9 + 0.9^2 + \dots + 0.9^{44}) \\
 &\quad - 20\% \cdot 40 - 10\% \cdot 40 \\
 &= 62 - 30\% \cdot 40 \cdot ((1 - 0.9^{45}) / (1 - 0.9)) \\
 &= -\$56.95\text{m}
 \end{aligned}$$

This implies that the present value of profit margins at outset is +\$56.95m.

$$\begin{aligned}
 &\text{BEL at end of year 1} \\
 &= \text{BEL at outset} - \text{cash flows in year 1 (given interest rate is zero)} \\
 &= -56.95 - (40\% + 125\% + 60\% - 1) \cdot 40 \\
 &= -\$106.95\text{m} \\
 &= -\$107.0\text{m to the nearest } \$0.1\text{m}
 \end{aligned}$$

Note: The solution is not dependent on the choice of profit carrier. The calculation below uses claim payments as the carrier. Using premiums as the carrier would result in the same answer.

$$\begin{aligned}
 &\text{PVPMs at end of year 1} \\
 &= \text{PVPMs at outset} \cdot \text{PV claims carrier end of year 1} / \text{PV claims carrier at outset} \\
 &= 56.95 \cdot (\text{PV claims at outset} - \text{claims paid in year 1}) / \text{PV claims at outset} \\
 &= 56.95 \cdot (16 \cdot ((1 - 0.9^{45}) / (1 - 0.9)) - 16) / (16 \cdot ((1 - 0.9^{45}) / (1 - 0.9))) \\
 &= 56.95 \cdot 0.8991 \\
 &= \$51.20\text{m}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Therefore the estimated policy liability at the end of year 1 in respect of the lump sum YRT business is BEL + PVPMs} \\
 &= -106.95 + 51.20 \\
 &= -\$55.7\text{m to the nearest } \$0.1\text{m}
 \end{aligned}$$

OR

A spreadsheet could be constructed to determine the figures, per the output below.

All figures in \$m			Profit Margin		35.91% of claims						
PV/Sum:	396.5	121.3	59.7	158.6							
						PV					
Year	Prem	Comm	Expense	Claim	BEL	Claims	PVPM	PL		Cash Flow	Profit
0					-57.0	158.6	57.0	0.0			
1	40.0	50.0	24.0	16.0	-107.0	142.6	51.2	-55.7		-50.0	5.7
2	36.0	7.2	3.6	14.4	-96.2	128.2	46.0	-50.1		10.8	5.2
3	32.4	6.5	3.2	13.0	-86.4	115.2	41.4	-45.1		9.7	4.7
4	29.2	5.8	2.9	11.7	-77.7	103.6	37.2	-40.5		8.7	4.2
5	26.2	5.2	2.6	10.5	-69.8	93.1	33.4	-36.4		7.9	3.8
6	23.6	4.7	2.4	9.4	-62.7	83.6	30.0	-32.7		7.1	3.4
7	21.3	4.3	2.1	8.5	-56.3	75.1	27.0	-29.4		6.4	3.1
8	19.1	3.8	1.9	7.7	-50.6	67.5	24.2	-26.4		5.7	2.7
9	17.2	3.4	1.7	6.9	-45.4	60.6	21.8	-23.7		5.2	2.5
10	15.5	3.1	1.5	6.2	-40.8	54.4	19.5	-21.3		4.6	2.2
11	13.9	2.8	1.4	5.6	-36.6	48.8	17.5	-19.1		4.2	2.0
12	12.6	2.5	1.3	5.0	-32.8	43.8	15.7	-17.1		3.8	1.8
13	11.3	2.3	1.1	4.5	-29.5	39.3	14.1	-15.4		3.4	1.6
14	10.2	2.0	1.0	4.1	-26.4	35.2	12.6	-13.8		3.1	1.5
15	9.2	1.8	0.9	3.7	-23.7	31.5	11.3	-12.3		2.7	1.3
16	8.2	1.6	0.8	3.3	-21.2	28.3	10.1	-11.0		2.5	1.2
17	7.4	1.5	0.7	3.0	-19.0	25.3	9.1	-9.9		2.2	1.1
18	6.7	1.3	0.7	2.7	-17.0	22.6	8.1	-8.8		2.0	1.0
19	6.0	1.2	0.6	2.4	-15.2	20.2	7.3	-7.9		1.8	0.9
20	5.4	1.1	0.5	2.2	-13.5	18.1	6.5	-7.1		1.6	0.8
21	4.9	1.0	0.5	1.9	-12.1	16.1	5.8	-6.3		1.5	0.7
22	4.4	0.9	0.4	1.8	-10.8	14.4	5.2	-5.6		1.3	0.6
23	3.9	0.8	0.4	1.6	-9.6	12.8	4.6	-5.0		1.2	0.6
24	3.5	0.7	0.4	1.4	-8.5	11.4	4.1	-4.4		1.1	0.5
25	3.2	0.6	0.3	1.3	-7.6	10.1	3.6	-3.9		1.0	0.5
26	2.9	0.6	0.3	1.1	-6.7	8.9	3.2	-3.5		0.9	0.4
27	2.6	0.5	0.3	1.0	-5.9	7.9	2.8	-3.1		0.8	0.4
28	2.3	0.5	0.2	0.9	-5.2	7.0	2.5	-2.7		0.7	0.3
29	2.1	0.4	0.2	0.8	-4.6	6.1	2.2	-2.4		0.6	0.3
30	1.9	0.4	0.2	0.8	-4.0	5.4	1.9	-2.1		0.6	0.3
31	1.7	0.3	0.2	0.7	-3.5	4.7	1.7	-1.8		0.5	0.2
32	1.5	0.3	0.2	0.6	-3.1	4.1	1.5	-1.6		0.5	0.2
33	1.4	0.3	0.1	0.5	-2.7	3.5	1.3	-1.4		0.4	0.2
34	1.2	0.2	0.1	0.5	-2.3	3.1	1.1	-1.2		0.4	0.2
35	1.1	0.2	0.1	0.4	-2.0	2.6	0.9	-1.0		0.3	0.2
36	1.0	0.2	0.1	0.4	-1.7	2.2	0.8	-0.9		0.3	0.1
37	0.9	0.2	0.1	0.4	-1.4	1.8	0.7	-0.7		0.3	0.1
38	0.8	0.2	0.1	0.3	-1.1	1.5	0.5	-0.6		0.2	0.1
39	0.7	0.1	0.1	0.3	-0.9	1.2	0.4	-0.5		0.2	0.1
40	0.7	0.1	0.1	0.3	-0.7	1.0	0.3	-0.4		0.2	0.1
41	0.6	0.1	0.1	0.2	-0.5	0.7	0.3	-0.3		0.2	0.1
42	0.5	0.1	0.1	0.2	-0.4	0.5	0.2	-0.2		0.2	0.1
43	0.5	0.1	0.0	0.2	-0.2	0.3	0.1	-0.1		0.1	0.1
44	0.4	0.1	0.0	0.2	-0.1	0.2	0.1	-0.1		0.1	0.1
45	0.4	0.1	0.0	0.2			0.0	0.0		0.1	0.1

MARKING GUIDE

5 marks for correct calculation of expected BEL and Policy Liability at end of year

Deduct:

- 1 mark for each major calculation or formula error (fundamental error)

- 0.5 marks for each minor calculation or formula error

No deduction of marks for trivial errors (e.g. the projection term being out by a year)

b)

i) Key points to include in explaining the policy liability figure:

- The negative liability does indeed behave similarly to an asset and represents a realistic expectation of future net cash inflows from policyholders.
- That is, there is not an expectation of future claims and expenses exceeding premiums (which is generally the case of savings style products).
- However, there is actually no 'obligation' for policyholders to commit to premiums as they may lapse their policy at any time.
- The policy liability of -\$55.7m is negative, reflecting AUSLIFE has incurred large upfront acquisition expenses (commission (and underwriting /administration) in the first year, which it expects to recover from future premiums.
- The policy liability is allowed to go negative under MoS standards to offset the negative net cash flow in the first year, to prevent a loss being made on business which is expected to be profitable.
- The shape of the liability changes over time. It usually starts negative, and may even become slightly more negative in early years, but then increases, moves back to zero and can even become positive depending upon the shape of the premium rates. In this case it starts negative and increases each year (though remaining negative), reaching zero by the end of the contract.

MARKING GUIDE

Up to 1.5 marks for explaining that it represents an expectation of future net cash inflow from policyholders

Up to 1.5 marks for explaining that it is preventing the large upfront acquisition expenses from causing a loss in the first year (with an expectation that the expenses will be recovered from future premiums)

1 mark for any other valid point

Up to a maximum of 3 marks

Maximum of 2.5 marks if "no obligation for policyholders to pay future premiums" is not discussed.

ii) Either:

Forecast MoS profit gross of tax = profit margin % x carrier = $56.95 / 158.6 * 16 = \$5.75\text{m}$

OR

Forecast MoS profit gross of tax
 = premiums – claims – commissions – expenses – increase in Policy Liability
 = $40 - 16 - 50 - 24 - ((-55.75) - 0) = \5.75m

Forecast MoS profit net of tax = $\$5.75\text{m} \times (1 - 30\%) = \4.0m

Marking guide

0.5 marks for applying formula correctly

0.5 marks for correctly applying tax rate

No penalty for any incorrect calculations in earlier questions

iii) Key points include:

- Capital requirements are concerned about policyholder protection, meaning an insurance company's ability to fulfil its obligations to policyholders in an adverse scenario.
- A negative liability represents expected future net cash inflows and is not liquid nor freely available to be used to pay losses which the insurer may incur in the short term.
- In order to absorb losses it would need to be sold to a 3rd party and the realisable sale proceeds may be deemed to be uncertain in the case of a stressed scenario. For example, if potential buyers are also under stress.
- There is a possibility that the expected future net cash inflows may not be realised (e.g. if policies terminate earlier than expected).
- As such, negative policy liabilities are not eligible to be counted towards meeting capital requirements.

For example, a model solution could be:

The negative policy liability is in effect an intangible asset, representing the expected excess of future premiums over expenses. One feature of an intangible asset is that it has no readily realisable market value. Hence, in a wind-up situation it has no value which can be used to support policyholder benefits. Whilst it may be able to be sold or potentially reinsured, there is no guarantee that such a transaction could be structured or without significantly reducing the value. Consequently, in order to protect the policyholder interests the Australian prudential regulator, APRA, has deemed that the policy liability cannot be used to support the capital base.

MARKING GUIDE

1 mark per well explained point (0.5 marks if not well explained), up to a maximum of 2 marks

- iv) Target surplus aims to provide a buffer such that a company can be reasonably confident it can maintain its Capital Base in excess of its Prudential Capital Requirement during a set period e.g. 12 months. It is also held to maintain an acceptable credit rating.

The commencement of writing of significant YRT new business poses a risk of a reduction to the capital base due to the high initial expenses and termination value floor (and potentially adverse lapse and claims experience, and the fact that AUSLIFE isn't experienced in writing risk business), and as such it may be appropriate to hold some additional target surplus to protect against the risk of breaching capital requirements, should the planned new business materialise.

Marking guide

1 mark for identifying purpose of target surplus

1 mark for identifying the specific risk of future new business that is not otherwise captured in the capital standards

c)

- i) Considering the capital (net assets) required at the end of the first year:

The termination value (and hence the adjusted policy liability) for the YRT business is assumed to be zero, given there is no IBNR or RBNA (as the question states there is no claims delay), and there is no unearned premium (as all sales occur at the beginning of the year).

As such, the difference between the termination value and the policy liability needs to be held as capital because it is not eligible for the capital base. That is, the amount calculated in part a) of \$55.7m is the liability adjustment.

Furthermore the question states that there is no insurance risk charge, asset risk charge, and asset concentration risk charge.

The only contributor to the Prescribed Capital Amount (PCA) of SF2 therefore is the Operational Risk Charge.

Based on LPS1 18, the Operational Risk Charge for risk business (ORCR)
 $= 3\% \times [\max(40, 0) + \max(\text{abs}(40 - 0) - 0.2 \times 0, 0)]$
 $= 3\% \times 80\text{m} = \$2.4\text{m}.$

Assume no regulatory adjustment to PCA so Prudential Capital Requirement (PCR) = PCA.

Assume the capital supporting the investment-linked business exceeds \$10m, so the floor of \$10m for the PCR is already met. Hence PCR for the insurance business = \$2.4m.

As such, total capital (net assets) of \$55.7m (liability adjustment to net assets to obtain capital base from net assets) + \$2.4m (PCR) = \$58.1m is required to

support the new business at the end of the first year.

MARKING GUIDE

0.5 marks for recognising termination value of zero

1.5 marks for additionally noting the (negative) policy liability (i.e. termination value of 0 less policy liability) is capital required

2 marks for correctly calculating Operational risk charge (deduct 0.5 marks for each error in the calculation)

0.5 marks for other relevant points (e.g. mentioning supervisory adjustment, stating the \$10m minimum PCR for the life company is already reached, so no "top up" is required)

Up to a maximum of 3 marks

ii) The insurance risk charge for the YRT business can be zero if the business is highly profitable so that:

- The maximum of (shocked risk free best estimate liabilities, shocked adjusted policy liability) in 12 months' time; plus
- The shocked claims and expenses over the next 12 months; less
- The shocked premiums over the next 12 months

is less than the termination value/adjusted policy liability (of zero in this case).

That is, there is enough stressed profit margin emerging over the next twelve months (under the insurance stresses) to cover any increase in the stressed adjusted policy liability over the next twelve months due to the insurance stresses applied, and enough profit margin to ensure the stressed RFBEL in 12 months' is still negative.

MARKING GUIDE

1 mark for identifying that highly profitable risk business is likely to have IRC = 0

0.5 marks per point for commenting on certain aspects of the IRC (stressed policy liability in 12 months' time; stressed year 1 cash flows; these can be less than current APL)

Up to a maximum of 2 marks

- iii) The estimated dividend capacity at the end of the year is determined by subtracting the capital required to support the new business from the profit expected to be earned from the new business, and adding the \$20m from the old business:

That is,

Distributable Profit from SF1: \$20m (equal to profit, as capital requirements expected to be stable – assume the same as previous year)

Distributable Profit from SF2: \$4.0m – \$58.1m = -\$54.1m.

Therefore, there is no ability for dividends to be paid to ASIANLIFE but instead a **capital injection into SF2** is required (which exceeds the distributable profit from SF1).

(**Note:** A capital injection will be required at the beginning of the year in order for AUSLIFE to meet its capital requirements. The above figures are determined at the end of the year assuming no capital has previously been injected into AUSLIFE before the end of the year.)

The reason for the difference to the CEO's expectations is the capital requirement for the new business. This arises mainly from the ineligible negative policy liabilities (i.e. the capital strain from high upfront commission and other initial expenses due to writing new business) and partly from the need to increase the Prudential Capital Requirement.

MARKING GUIDE

2 marks for correctly calculating dividend capacity (reduced marks for reasonable attempt)

1 mark for concluding that a capital injection is required (0.5 marks for there is no ability for dividends)

1 mark for explanation of difference to CEO expectations

Up to a maximum of 2 marks

d)

MEMORANDUM

FROM: Valuation and Capital Actuary, AUSLIFE

TO: CEO, ASIANLIFE

SUBJECT: Return on Equity of AUSLIFE

Dear CEO,

i)

In response to your concern around the Return on Equity (ROE) of AUSLIFE, below I have set out the underlying calculations that demonstrate the expected ROE with the insurance business is **13.5%, compared to 16.7% without the insurance business:**

Profit after tax for SF1 for the year = \$20m

Profit after tax for SF2 for the year = \$4m

Shareholders' equity at end of year with insurance business

= beginning of year equity + profit earned during the year + necessary capital injections

= \$100m + \$20m + \$4m + \$54.1m

= \$178.1m

(Note: this assumes that \$54.1m is injected, as the \$4m in profit is available to meet the capital requirements at the end of the year. It is also acceptable to assume \$58.1m is injected, as capital is technically required before the profit emerges.)

Shareholders' equity at end of year without insurance business

= beginning of year equity + profit earned during the year + necessary capital injections

= \$100m + \$20m

= \$120m

Therefore the expected ROE:

Without insurance business = $20 / 120 = 16.7\%$

With insurance business = $24 / 178.1 = 13.5\%$

Therefore, while the target ROE of 12% p.a. is met with the new distribution agreement. This is due to the investment-linked business's ROE of 17% subsidising the ROE of the insurance business (which is below 12%).

MARKING GUIDE

0.5 marks for equity at end of year without insurance business

1 mark for equity at end of year with insurance business (\$58.1m instead of \$54.1m for necessary capital is also acceptable, resulting in a ROE of 13.2%)

0.5 marks for ROE without insurance business

1 mark for ROE with insurance business

0.5 marks for concluding ROE is met as a whole

1 mark for Memo format & appropriate language for CEO.

ii)

In terms of enhancing the ROE of AUSLIFE, I present below two suggestions

1) Issue Tier 2 capital: If Tier 2 capital is issued then this will be treated as debt for accounting purposes and therefore not be included within the denominator of the ROE calculation. Assuming the interest paid is relatively low, this will be ROE accretive.

Pros

- Means that it is not necessary for a capital injection to be provided and ASIANLIFE's capital can be put to alternative uses

Cons

- Interest cost reduces profit
- Only limited scope to effectively issue tier 2 debt under APRA capital regulations. Effectively limited to 20% of PCR
- Requires regulatory approval
- Will consume management time and external legal costs to attract external investors, produce legal documents etc.

2) Externally reinsure the business: If the business is externally reinsured under a quota share structure then the reinsurer would be expected to pay significant reinsurance commissions which effectively fund part or all of the commissions to the distributors and neutralise the impact on the capital base.

Pros

- Means that it is not necessary for such a large capital injection to be provided and ASIANLIFE's capital can be put to alternative uses
- Also transfers mortality and morbidity risks to the external reinsurer meaning less exposure to extreme events for AUSLIFE
- knowledge and expertise from the reinsurer should be able to help AUSLIFE manage YRT business, leading to better cost savings and risk mitigation in the long run.

Cons

- Likely to be a significant leakage of profit to the external reinsurer
- The reinsurance arrangement would need to be explained to the regulator
- The reinsurance arrangement would need to be justified to be on arm's length terms to the tax authorities
- May need some system development to ensure the reinsurance contract is appropriately administered.

Regards.

An Actuary

MARKING GUIDE

Per suggestion (can differ from above suggestions):

0.5 marks for listing a valid suggestion

1 mark for explaining why ROE improved

0.5 marks for 1 advantage of the suggestion (regardless of validity) (x1)

0.5 mark for 1 disadvantage of the suggestion (regardless of validity) (x2)

(Up to a maximum of 3 marks per suggestion)

Deduct 0.5 marks if unable to implement within one year.

(Up to a maximum of two suggestions)

END OF QUESTION 1 MARKING GUIDE

QUESTION 2

- a) i) The adjusted net worth (ANW) is \$9.1m.
 ii) The Value of Inforce business (VIF) is \$378.1m.

This gives a total embedded value of \$387.2m.

Full calculations are included in the spreadsheet tab "Model (a)".

MARKING GUIDE
i) ANW calculation:

1 mark for correct IF policy count per year

0.5 marks for calculating expected annuity payments

0.5 marks for calculating expected expenses

1 mark for BEL correctly

0.5 marks for Policy Liability = BEL (loss recognition)

0.5 marks for PCA

1 mark for formula calculating ANW based on Balance Sheet inputs, PCA and PL amounts

(In each of the above, deduct 0.5 marks per conceptual mistake, subject to a minimum of 0 marks – minor errors in the spreadsheet whilst demonstrating the correct understanding should not be penalised)

ii) VIF calculation:

1.5 marks for correct profit formula

1 mark for correct investment earnings formula

1 mark for correct allowance for tax in the previous two formulas

1.5 mark for correct distributable earnings formula

1 mark for correct PV of distributable earnings formula (0.5 for discounting earnings, 0.5 for using the correct discount rate and timing).

(In each of the above, deduct 0.5 marks per distinct mistake, subject to a minimum of 0 marks)

Up to a maximum of 5 marks

Note: Flow on errors from part a) should not be penalised in subsequent parts.

- b) i) The two main components driving the EV are:
- the gradual release of the \$263m capital supporting the business, including investment earnings on this capital;
 - an assumption that 5% investment earnings is able to be achieved compared to the discount rate used for liability valuation of 3%. This reflects differences between the discount rate requirements for the valuation of policy liabilities and the investment strategy adopted by ANNUITYLIFE.

MARKING GUIDE

1 mark for each component with reasonable description (0.5 marks if point raised but not well described), for a maximum of two components

Stating the risk discount rate as a component driving the size is also eligible for 1 mark (0.5 marks for stating it has an effect, 0.5 marks for linking this to the size).

Up to a maximum of 2 marks

ii) Possible assumptions/allowances which could be changed, if appropriate, include:

Expenses:

- It may be that there are some expense synergies between DIVERSIFIEDLIFE and ANNUITYLIFE such that the additional expenses incurred to service the annuity policies are less than those assumed in the ANNUITYLIFE EV calculation. Reducing expenses would increase distributable profits.
- In order to reduce the expense assumption there would need to be a detailed integration plan put together specifying where the synergies would arise. For example, head count reduction by function, system cost savings from migration projects etc.

Capital Benefits:

- It may be that the additional capital required to support the annuities on the DIVERSIFIEDLIFE balance sheet is less than the capital required to support the annuities on a stand-alone basis for ANNUITYLIFE. If so, this would increase the Adjusted Net Worth and reduce the Value of Inforce business with the net effect being positive due to the discounting effect on the capital. That is, a greater release of capital now with smaller future capital releases.
- Diversification benefits could arise due to the relatively low correlation between longevity risk and mortality risk or possibly also by improving any interest rate mismatch.
- It would be necessary to do a Part 9 transfer in order to realise any diversification benefits as otherwise the capital calculations would remain separate (if separate statutory funds are maintained).
- It would be necessary to do a pro forma calculation of the capital base and prudential capital amount after the acquisition and subsequent Part 9 transfer and compare this to the pre-acquisition figures.

Investment Return:

- It may be that the asset mix of predominantly bonds (where credit quality is not mentioned) and the small property portion is more conservative than what DIVERSIFIEDLIFE would prefer to invest in.
- A more aggressive asset mix would tend to increase the assumption for future investment earnings within the VIF (and hence increase the VIF) but would also potentially increase capital requirements (which would reduce ANW).
- The net impact of these two effects from a more aggressive asset mix would need to be determined before altering the assumption.

Reinsurance:

- It may be that a reinsurance structure could be put in place to reduce the capital requirement and hence increase EV. For example, reinsuring the longevity risk via a longevity swap.
- It would be necessary to first obtain an indicative quote from a reinsurer to determine what premium would need to be transferred to the reinsurer for the risk transfer.

Imputation Credits:

- It is possible depending on the ownership structure of DIVERSIFIEDLIFE for Imputation Credits to be recognised as increasing the EV of ANNUITYLIFE. Imputation credits are tax benefits that are passed to shareholders with their dividend distribution. Shareholders may utilise these credits to reduce their own tax liability.
- However, not all shareholders can do this. Foreign shareholders generally are not able to obtain any value from imputation credits.
- It would be necessary to consider the ownership structure of DIVERSIFIEDLIFE, particularly the proportion of overseas shareholders, and determine an appropriate level of usage of imputation credits. Typically only a proportion of imputation credits are valued in an EV.

Risk Discount Rate:

- A lower risk discount rate will increase the EV, as the future distributable profits and capital are discounted at a lower rate increasing the value of the VIF.
- The risk discount rate is usually set at a margin above the risk free rate, with margins between 3% and 5% commonly used. The risk discount rate used to value ANNUITYLIFE's EV is 10%, which is significantly higher than the 3% rate used to discount the policy liabilities. This high rate may represent a high profit volatility or investment and other risks associated with ANNUITYLIFE.
- It would be necessary for DIVERSIFIEDLIFE to consider whether its profit volatility and/or associated risks are lower when the annuity book is combined with its other businesses. While DIVERSIFIEDLIFE do not have any annuities, it is a large company with a large portfolio of group and YRT business. Overall risk may be reduced given the natural offset between longevity risk and mortality risk.

Marking Guide per assumption/allowance change (two assumptions/allowances are required)

1 mark for identifying an assumption/allowance

1 mark for an explanation as to why it could improve the EV.

1.5 marks for reasonable outline of important matters to consider before allowing for the increase in value from the change

Up to a maximum of 6 marks.

c)

i)

The ANW is (\$122.3m) and the VIF is \$459.6m, giving a total embedded value of \$337.3m. Full calculations are included in the spreadsheet tab "Model (c)" with cells highlighted in green showing cells which have been added / altered from a) (alternatively changing PCA % to 15% would achieve the same outcome).

MARKING GUIDE

2 marks for obtaining correct ANW and VIF figures:

- **1 mark for calculating the target surplus correctly as 50% of the PCA (either adding a target surplus column with correct formula or changing PCA input to 15%).**
- **0.5 mark for impacting the ANW (i.e. flowing through to cause a reduction in the ANW)**
- **0.5 mark for impacting the VIF (i.e. flowing through to cause an increase the VIF)**

ii)

The ANW falls by the full amount of the target surplus as this now forms a constraint on what is immediately distributable.

The VIF increases but not by as much as the fall in the ANW. This is because the target surplus is only returned slowly over time and earns an investment earning rate lower than the risk discount rate.

The ANW is now negative, reflecting a capital injection is required if the stated amount of target surplus needs to be held (as there are insufficient net assets to provide for both the PCA and target surplus).

MARKING GUIDE

2 marks for a reasonable explanation of the movement in value making reference to principle of cost of capital:

- **0.5 mark for stating ANW falls by the full amount of target surplus, 0.5 marks for stating why**
- **0.5 marks for stating VIF increases, but by less than the fall in ANW, 0.5 marks for an explanation of why**

(1 mark for ANW, 1 mark for VIF)

1 mark for reasonable explanation of what negative ANW means for DIVERSIFIEDLIFE.

Note: Some candidates may make an error in calculating the ANW and hence, it may still be positive. Provided the comment is appropriate for the change in ANW from part a) they still should be awarded 1 mark e.g. a positive but reduced ANW effectively means there is less "capital" the company can immediately release.

- d) i) Refer to the analysis of change in spreadsheet solutions tab "Part (d)(i) AOC" for the full working.

The results should be displayed per below.

	ANW	VIF	EV
Embedded value at 31.12.2016	9,116,081	378,123,175	387,239,256
Unwind		+37,812,318	+37,812,318
Expected distributable profit over year	+58,311,586	(58,311,586)	-
Experience profit over year	(1,029,840)		(1,029,840)
Investment return reduction from 5% to 4%		(109,993,503)	(109,993,503)
Mortality assumptions from 100% of base to 95%	(49,704,731)	+6,101,805	(43,602,926)
Embedded value at 31.12.2017	16,693,097	253,732,209	270,425,305

MARKING GUIDE

1 marks for correct expected movement in VIF from unwind of discount rate.

1 mark for expected distributable profit coming out of VIF and going into ANW

1 mark for correct expense experience variance in ANW (reduce by half mark if tax effect is missed)

1 mark for keeping expense assumption the same for year 2 onwards in calculations.

1 mark for investment earnings assumption change impact on VIF

1 mark for changing mortality formulae correctly (deduct 0.5 marks if mortality in the first projection year is impacted)

0.5 marks for fixing the 31 Dec 2016 policy liability

0.5 marks for fixing the 2017 investment return

1 mark for recognising the need to adjust ANW for the policy liability movement

1 mark for recognising the need to adjust ANW for the associated PCA movement

1 marks for remaining adjustments to get ANW to work

1 mark for building an appropriate check that the movement analysis is materially complete

(In the above, deduct 0.5 marks per distinct error, subject to a minimum of 0 marks in each)

Up to a maximum of 8 marks

ii) Dear CEO,

I am writing to inform you of the change in Embedded Value (EV) of ANNUITYLIFE during the period from 31 Dec 2016 to 31 Dec 2017. The key changes were as follows:

EV at 31 Dec 2016 of \$387m

Expected change in EV of +\$38m:

This relates to the increase in EV which is expected purely as a result of the passing of time and the fact that one less year of discounting needs to be applied to the cash flows.

Expected 2017 profit and capital release

There is no impact on the EV from the expected 2017 profit and expected release of capital as the business runs off an additional year. This is because it has been taken into account in determining the EV last year.

Expense experience variance of (\$1m):

This relates to the additional expenses paid out over the past 12 months (after tax) of \$1,500 per policy, compared with the assumed expense outflow of \$1,200 per policy which was incorporated in the 31 Dec 2016 projection. That is, the actual profit after tax over 2017 was less than expected a year ago by \$1m due to higher expenses, which directly reduces the net assets of ANNUITYLIFE.

Impact of investment earnings assumption change of (\$110m):

This has no immediate impact on the net assets of ANNUITYLIFE, but reduces the future distributable profits due to lower investment returns expected to be earned on the reserves and capital of ANNUITYLIFE (4% p.a., down from 5% p.a.). This has a large impact due to the size of the policy liability and capital held.

Impact of mortality assumption change of (\$44m):

This relates to an expectation of higher future annuity benefits being paid out to policyholders as a result of policyholders expected to live longer. Due to the business being in loss recognition it is required to increase the policy liability immediately for this assumption change meaning the net assets are reduced now. This also results in an increased capital requirement, reducing the free assets further, but these are expected to be released gradually if experience emerges in line with the (revised) assumptions.

Gives the EV at 31 Dec 2017 of \$270m

MARKING GUIDE

0.5 marks for explaining expected change in VIF

0.5 marks for explaining no impact of expected/budget distributable profit

0.5 marks for explaining experience variance

1 mark for explaining why EV falls with investment assumption change

1 mark for explaining why EV falls with mortality assumption change

0.5 marks for appropriate language

(Up to a maximum of 3 marks)

END OF QUESTION 2 MARKING GUIDE

QUESTION 3

a)

MEMORANDUM

TO: CFO, STARLIFE

FROM: Valuation & Capital Actuary

SUBJECT: New Business Policy Liability Approach for Monthly Valuations

Dear Ms. CFO:

In the absence of full projection result and to meet the Working Day 4 time frame for month-ends not falling on a quarter-end, we would like to propose the following **accumulation** approach to be adopted for valuing the policy liability for policies joining since the previous quarter-end.

(i) Approach Overview

The policy liability (net of reinsurance) for policies joining since the previous quarter-end will be determined as follows:

APPROACH 1

Determine the policy liability by assuming the actual profit over the period from these policies (as a % of actual premiums) is **the same as** the expected profit (as a % of expected premiums), i.e. determine policy liability as:

- Actual gross premium received;
- Less Actual gross claims (claims incurred, but see below for further discussion);
- Less Actual Commission (commission paid or payable);
- Less Other actual acquisition expenses;
- Less Actual non-acquisition expenses;
- plus Actual investment income;
- Less Reinsurance premiums (typically no reinsurance premiums are paid in the first year of a policy, so this is likely to be zero);
- plus Reinsurance recoveries on actual claims;
- Less Estimated profit (i.e. expected profit margin release).

(all items e.g. investment income are in relation to the policies being valued only)

No experience profit/loss will emerge under this method.

OR

APPROACH 2

Determine the policy liability similar to the approach above, except substitute most of the Actual items with Expected items to **allow some experience items to come through** (e.g. claims), i.e. determine policy liability as:

- **Expected** gross premium received;
- Less **Expected** gross claims (claims incurred, but see below for further discussion);
- Less Actual Commission (commission paid or payable);
- Less Other actual acquisition expenses;
- Less **Expected** non-acquisition expenses;

- plus Expected investment income;
- Less Expected premiums (typically no reinsurance premiums are paid in the first year of a policy, so this is likely to be zero);
- plus Reinsurance recoveries on expected claims;
- Less Estimated profit (i.e. expected profit margin release).

Note: under this method, commissions and acquisition expenses should still be **ACTUALS** to ensure these are deferred appropriately.

OR

APPROACH 3

Determine the policy liability as:

- Unearned Office Premium (i.e. the portion of the last premium paid that represents payment for cover beyond the end of the month being valued, e.g. due to annual prepayments, monthly payments mid-month, etc. – these premiums haven't yet been earned so must be held as a liability);
- less Unearned Reinsurance Premium (same as the above, except for reinsurance premiums. Typically no reinsurance premiums are paid in the first year of a policy, so this is likely to be zero);
- less Estimated Deferred Acquisition Costs (this represents the amount of expenses that were incurred and are to be deferred from an accounting perspective, expected to be recovered from future premiums over the life of the policy).

(Alternatively the Estimated Deferred Acquisition Costs could be reduced by the initial reinsurance commission, and the unearned premium adjusted by the unearned gross reinsurance premium.)

(Claims reserves– IBNR, RBNA, CACP – can be included here – or, can be ignored because it is an 'estimate' and these items for new business will be quite small, and then this can be listed as a potential disadvantages in part (iii))

OR

Any other valid approach

Additional points:

- The approach proposed would produce the same outcome as a projection approach if the profit margin release/ acquisition expense deferral is valued accurately, but our approach will use certain approximations in order to meet the timetable suggested.
- If the approach uses cash flows (e.g. the first two methods above) then all the types of cash flows that are in the projection model should be accounted for to ensure consistency.
- Any other valid point

Note: Another valid approach (which does not utilise the accumulation method) is to use the projection model in conjunction with grouped or approximated model points (since the full policy extract is not available). These model points could be constructed, or the previous quarters' extract used with appropriate scaling, to reflect new business volumes since the last quarter (e.g. sum insured, premium, policy count).

MARKING GUIDE

1 mark for appropriate format and language (applies to all of part a, but allocated to part i)

1 mark for simple formula which illustrates a correct approach for the valuing new business policy liability which doesn't refer to a projection utilising the full policy extract – no penalty if reinsurance items are omitted

Up to 3 marks for explaining key components, 1 mark per key component explained (0.5 marks if not clearly explained)

1 mark per additional distinct valid point not mentioned before

Up to 5 marks for part (i)

(ii) Source of Data and Approximations

ALL APPROACHES:

Claims reserves:

- To obtain an accurate view of profit, claims reserves (for incurred claims that have been unreported - IBNR, still awaiting admission - RBNA, or disability claims in payment – CICP/DLR) should be incorporated into the liability.
However, since we are only valuing one or two months' worth of new business using the approximate method proposed in part a), these are likely to be small so can be assumed to be zero.
- For approach 1, since the expected profit is emerging, this would implicitly include an allowance for IBNR and RBNA
- If a more accurate approach is needed, can approximate:
 - IBNR using past experience (e.g. derive a % of premiums from past new business tranches in advance)
 - RBNA using the actual number of claims reported in the last two months, sourced from the Claim Database/System or Claims team. This is expected to be negligible.
 - CICP (if any disability claims have been admitted) can be approximated using a projection from a previous quarter-end, and scaling for the sum insured (or including an estimate: Monthly Payment x Max no. of payments x Factor, where Factor roughly approximates the impact of claim indexation, discounting and termination).

APPROACH 1 SPECIFIC:

- Actual cashflow can be sourced from the general ledger (but would need this for the new business tranche only – may not be readily available)/ sales statistics for the actual month. We may want to approximate the other expected cashflows, such as interest earned on cashflow and the profit margin release.
- For example, Interest could be determined as the risk free rate at end of month applied to the capital supporting the new business.
- The profit margin release can be the profit margin from last quarter's new business times the profit margin carrier (e.g. premium perf above, multiplied by the assumed loss ratio if carrier is claims).

APPROACH 2 SPECIFIC:

- Expected cash flows can be sourced from the budget set at the beginning of the year, which should be split into in-force and new business at the time.
- Alternatively, these can be based on new business sales data. For example, expected premium received could be based upon sales statistics for the actual month(s) and the past experience of annual versus monthly, etc sales proportions.
- The profit margin release can be the profit margin from last quarter's new business times the profit margin carrier (e.g. premium per above, multiplied by the assumed loss ratio if carrier is claims).

APPROACH 3 SPECIFIC:

- Unearned premium can be derived using statistical sales data (relating to new annual premiums), as well as past experience (e.g. the % of policies that pay annually).
- Deferred acquisitions costs can be approximated as the actual commission and acquisition expenses paid in excess of the recurring/maintenance equivalents

MARKING GUIDE

1 mark per relevant point raised, 0.5 marks for brief/other points or supplementary examples.

Up to 2.5 marks for sources of data.

Up to 2.5 marks for approximations

Up to 4 marks in total for part (ii)

(iii) Disadvantages

- In all the approaches, there will need to be an estimate of the profit margin release **or** amount of acquisition costs to defer, as related to the specific cohort of new business, without performing a projection of the profile. One possible approximation is to use the profit margin from the previous cohort of new business. If profitability is stable and similar, then this will be a good approximation. However, there is a risk there are significant shifts to the profile and hence profitability, which will cause the result to change significantly at quarter-end when actual projections are performed.
- The same argument applies to expected claim cost. For example, the claim cost is estimated using a loss ratio based on last cohort of new business and if there is a change in mortality or morbidity assumptions (or the new business profile), then this approximation will also yield a greater variance to the true policy liability.
- For Approach 1, where actual cash flows are used instead. This poses a couple of issues.
 - First, actual vs expected difference will not come through as a profit item in the current period.
 - If actual cash flow is consistently different to project/expected cash flow, for example, modelling of certain cash flow is inadequate, then, this will mask the modelling issue in the absence of detailed reconciliation and checks.

- Even getting the correct actual cash flow relating to this cohort of new business can poses some challenges. Alternative data source may be required of all the detailed info is not available in the general ledger. For example, actual premium from new business may need to be sourced directly from the administration system.
- The approach does not strictly test for loss recognition (adequacy threshold) and hence may not comply with LPS340/AASB 1038 in the event the new business is not profitable and the inforce business doesn't have enough margins to cover the loss making business.
- The approaches outlined in part i) is not sensitive to changes in economic assumptions (e.g. the discount rate and inflation), but to the extent these change dramatically over a month it could reduce the accuracy of the approximation.
- Any other valid disadvantage related to the proposed approach

MARKING GUIDE

Up to 1 mark for each distinct, valid disadvantage (0.5 marks if not outlined well/clearly).

Up to 3 marks for part (iii)

(iv) Mitigations to ensure robust results

- Monitor the new business profile using key statistics (e.g. proportion male/female, stepped/level, disability income/lump sum, ordinary/super, by age, by distribution channel, etc.), to ensure no large swings in the profile in a given month that might cause a shift in the profitability.
- Related to the point above, where there is any known major shift in profitability or assumption changes, the way the loss ratio or profit margin is derived from previous cohorts of new business should be adjusted to avoid material deviation (e.g. by understanding the difference in profitability of certain segments).
- To get comfort that the new business isn't in loss recognition, understand what levels of sales are required to cover the fixed acquisition expenses (Assuming the inforce is in loss recognition, or close to it). Have a methodology in place to adjust the policy liability when sales are around or below this threshold to make the policy liability estimate more accurate.
- Understand the sensitivity of the new business policy liability to changes in economic assumptions (e.g. through sensitivity analyses at quarter-ends) to ensure the suggested approach remains appropriate when there are large movements in discount rates during the month.
- At quarter end, projected policy liability should be used for the new business. The two sets of policy liability for new business will most likely to be difference. Where there is a difference, there will be a true up effect to Profit and Loss. Also, the difference should be small in order to get comfort over the accumulation approach. Where differences are big, detailed reconciliation and analysis should be carried out.
- Given it is only one or two months of new business that we are estimating, variances to the projected policy liability may not likely to be material. A

tolerance threshold should be established and understood amongst all skate holders include the auditors.

- Any other valid mitigation

MARKING GUIDE

Up to 1 mark for mitigations related to one of the disadvantages from (iii). Only 1 well described mitigation is needed to obtain the mark.

Up to 3 marks for part (iv)

b)

- Assuming a journal accruing for the expected additional stamp duty payment will be put through this quarter, this should flow through to the acquisition expense component of the new business policy liability.
- This amount will then be deferred as part of the acquisition expenses
- Due to the deferral of the expense, there is nil impact on Profit and Loss for the quarter as this will be absorbed into the policy liability
- If some of the stamp duty is not treated as acquisition, there will be an impact on profit and loss – by reducing profit reported for the previous quarter.
- To the extent the error was material, previous years' profit/loss may need to be restated.

MARKING GUIDE

1 mark for describing as acquisition-related, or related discussion

1 mark for stating acquisition expenses will be deferred as part of the usual process

1 mark for profit impact (nil if assume all acquisition-related)

1 mark for other valid points (e.g. may need to restate previous years' profits if material)

Up to 3 marks

c)

Dear Auditors,

I agree with your observation that both the new business sales and new business policy liabilities in the year are significantly different to the Budget.

Sales volumes were indeed lower, leading to reduced cash in/outflows for new business.

However, the new business policy liability allows for this by ensuring the acquisition expenses and initial commission from the sales (which are the largest cash flows in the first year of a policy) are deferred. This ensures only a small portion of the expected profit over the life of the policy is released in the first year (with expected profit being recognised smoothly over the life of the policies). Since sales volumes were lower, these deferred acquisitions were also lower, meaning the actual policy liability for new business differs from the budget figures (which were based on budget sales).

So looking at the new business cash flows and policy liability in isolation when comparing against the budget will not be useful; they must be considered together. And since the

budgeted profit is small in an absolute sense, any variations in this will also be small in an absolute sense (particularly compared to the inforce component).

Finally, you shouldn't be concerned that the non-quarter end process may have caused an error in the year-end accounts. The year/quarter-end process means the policy liability is "trued up" at this point, from the monthly estimates. That is:

- The new monthly valuation process is only applied for non-quarter ends
- For year-end accounts, the full process is used, using all available data (from model point files) and no steps from the new non-quarter end process are used.

I trust this addresses your concerns.

Regards,
An Actuary

MARKING GUIDE

0.5 marks for appropriate format and language

1 mark for describing the cash flows must be considered with the new business policy liability

1 mark for explaining how profit is released, and expected to be small in the first year anyway.

1 mark for stating monthly process has no impact on the year-end results.

Up to 3 marks

d)

i)

- This should not be too onerous as it is a general principle of an actuary's Professional Standards that any report should provide sufficient discussion of these items such that another actuary picking up the report should be able to produce a similar result based on the same data.
- Currently, the AA is already required to include this information in their FCR.
- However, practical process differs from AA to AA in whether this is summarised within the FCR or fully detailed. Hence, some AA's may need to expand their existing documentation to cover more details. This is particularly relevant for STARLIFE, which is small and so may not have existing documentation to the level of detail being required by the regulator.
- Also being such a technical appendix, it is not uncommon for many AA's to exclude this chapter from the distribution of the FCR to the Board with a note stating it is available upon request (with other technical based appendices).
- Regardless of whether it is currently covered within the FCR, the requirement for the separate report will increase the workload of the AA and the actuarial team when taking into account the governance process associated with every formal report.

- One issue that is not clear is the audience of the ILVR - whether this will go to the Board, to APRA and/or the auditor. This will impact on the language used in the ILVR.

1 mark for appropriate discussion of existing FCR requirement.

1 mark for appropriate discussion relating to extra effort required

1 mark for appropriate discussion of audience of the report.

1 mark for any other valid point.

Up to 3 marks for part (i)

Maximum of 2.5 marks awarded if STARLIFE is not discussed in the solution.

ii)

- The AA is not permitted to fulfil other roles within the Company i.e. cannot wear two hats (known as dual hatting). Roles the AA is not permitted to hold simultaneously include CRO, CEO and Director. This may be particularly relevant to STARLIFE, which is small so may have, in the absence of such requirements, preferred to have the same person fulfill the roles of AA and CRO.
- This requirement helps to manage the potential of conflict of interest by recognizing the different responsibilities of the AA from other officers of the company. For example, the CEO may be focused solely on maximising profit for the shareholder, whilst the AA may be concerned with the equitable treatment of policyholders.
- Another advantage of not permitting the AA to hold multiple roles is that it helps to delineate the different lines of defence in managing risk. The Appointed Actuary's responsibilities include both first line of defence, advice, as well as second line of defence, review and challenge. The CRO role is purely second line of defence.
- The Life Act and subsequent Prudential Standards also require the Actuary to provide Advice to the Company/Board under a number of circumstances and theoretically provides protection including whistle blowing requirements should AA advice not be heeded. This allows the AA to undertake their statutory role more effectively in the face of commercial conflicts.

MARKING GUIDE

Up to 1.5 marks for discussing the restrictions on AA holding certain other positions simultaneously.

Up to 1 mark for each additional appropriate point (examples above).

Up to 3 marks for part (ii)

END OF QUESTION 3 MARKING GUIDE