**2017 S1**

**Q1** a) i. *preferred approach for the calculation of the policy liability for the BIGCO group scheme:*

To: CFO

Subject: Methods used for Policy Liability Calculation

Dear CFO,

Regarding your question on the methods that could be used for calculating the policy liability, I would like to propose using accumulation method for the new Group business.

Compared to the projection method, accumulation method is a simplified approach. It is particularly being used for group risk business which is short term and with low acquisition cost.

Also it explicitly allows for claim reserves, which could be useful for the 10% Group death claims.

The results will not be materially different from the projection method.

Regards, Valuation Actuary

To: CFO, AUSLIFE

Subject: Valuation method for BIGCO scheme

Dear CFO,

In response to your query, I recommended using the accumulation approach for valuing the policy liabilities for the BIGCO scheme because, compared to the projection approach:

* It is simpler and more cost efficient to produce;
* It is not expected to result in a materially different result (so is allowed under prudential standards as an alternative to the projection approach);

The primary reasons why we are able to get comfortable that the result would not be materially different are:

* The acquisition expenses are relatively small (in relation to the first year’s premium); and
* The duration of the liabilities is relatively short (the contract is no more than 3 years in this case).

Both of these factors imply that there should not be large effects from discount rate changes nor lapse assumption changes (which may come through in the case of a projection approach which wouldn’t come through an accumulation approach).

ii. PL = UPR + claim reserves – DAC

Policy liability at outset = UPR – DAC

For the Lump Sum RPG = $12.5m – $0.75m = 11.75m

For the GSC RPG = $12.5m – $0.75m = 11.75m

**(At the outset, no claims have occurred so no claim reserve is required.)**

1b) i. Increase GSC incidence assumption by around 30% based on the company experience.

This could be adjusted by also considering the industry experience.

The pricing assumptions are recommended for **termination**, as no experience (industry or BIGCO) indicates the pricing assumptions are not appropriate.

For **incidence**, it is recommended the pricing assumptions be is strengthened by 30% reflecting the internal and industry experience. An argument exists to increase the assumption beyond 30% given the adverse industry trend (as BIGCO’s study is only for 9 months – further deterioration could have occurred), however it is recommended 30% be adopted this year. This should be monitored closely over the following year.

ii. (10\*130% + 1.5 + 5% \* 10 \*130% - 12.5) \* 2 = 5.3

*Outflows – Inflows*

= Expected Claim Payments for New Claims + Expected Claim Expenses + Expected Maintenance Expenses – Expected Premiums

= 105%\* $10m\*130%\*2 + $3m/2\*2 - $25m/2\*2 = 105%\*$26m - $22m

= $5.3m (positive BEL at the end of Year 1, seems it will be in loss recognition)

iii. **GSC RPG**

Under the accumulation approach, and if loss recognition did not occur, then the Policy Liability = UPR – DAC + CICP (incl. claims handling) [no IBNR or RBNA]

= 0 - $1.5m\*50%\*(1-1/3) + 105% \* $10m \* 130% \* (7/12)

= -$0.5m + $7.9625m

= $7.46m

**N.B. 7/12 represents that on average 1 month of waiting period and 5 months of payments have been made as of the end of the first year, leaving 7 months of payments left for claims incurred in the first year.** Equal credit given for using 6.5/12, or similar, with appropriate justification.

**However**, the positive value in part ii) indicates that the future premiums are insufficient to cover the future new claims and expenses.

This implies that the GSC RPG **is in loss recognition** and as such the result from the normal accumulation formula cannot be used.

Instead, the accumulation approach formula becomes:

**Policy Liability for the GSC RPG = UPR + CICP +PDR (Premium Deficiency Reserve)** [no IBNR or RBNA]

*Where:*

UPR = 0

CICP (incl. claims handling expenses) = 105%\* $10m\*130%\*(7/12) = $7.96m

PDR equals the value from part ii)

Policy Liability = 0 + $7.96m + $5.3m = $13.26m

**Note that the outstanding DAC does not feature in the revised formula as it is now unrecoverable.**

The PDR reserve represents the future new claims and expenses that cannot be covered by the future premiums.

If however there was sufficient premium to cover both the future new claims and expenses, and the unrecovered DAC then the normal formula applies. **If premiums are only available to cover a portion of the unrecovered DAC then the DAC needs to be reduced to the amount that can be recovered.**

**It is important when using an accumulation method to consider the sufficiency of the premium and the recoverability of any DAC.**

**Death RPG**

Policy Liability = UPR – DAC + IBNR [no RBNA] = 0 - $1.5m\*50%\*(1-1/3) + $10m\*10%

= -$0.5m + $1m

= $0.5m

1c) i. **AUSLIFE profit for GSC RPG = premiums – claims paid – expenses – increase in PL**

= $12.5m - $10m\*(5/12)\*130%\*105% - $3m\*50% - $1.5m\*50% - ($13.26m – 0) = -$8.70m

**AUSLIFE profit for Death RPG = premiums – claims paid – expenses – increase in PL**

= $12.5m - $10m\*90% - $3m\*50% - $1.5m\*50% - ($0.5m – 0) = $0.75m

Total AUSLIFE profit = -$8.70m + $0.75m + $48m = $40.05m

ii. It is deemed appropriate to have two RPGs in this instance because the nature of the risk for each benefit component is very different between Death and GSC.

One argument for a single RPG would be that the pricing structures between the two benefit components are not materially different, reflecting that:

* Pricing is likely driven by negotiations at BIGCO level, and not more granular than that.
* There is a degree of cross-subsidisation between the two benefit components.

1d) i. Enter into a reinsurance for the GSC business.

Reduce the maintenance expense by improving the internal function efficiency.

*In light of the developments over the past 12 months in relation to the BIGCO scheme, I make the following recommendations to improve the profitability over 2018:*

1. Frequent monitoring of experience for BIGCO during the year. This is important to give an earlier warning to senior management on profitability implications than what was the case for the current year.
2. Increased focus on the claims management following the claims lodgement including rehabilitation effort to help claimants return to work. While this may incur extra expense for AUSLIFE, it is expected that a higher termination rate of open claims can significantly improve the profitability of the GSC business. Therefore, increased claim management effort is expected to give rise to higher claims termination.
3. Source quotes for reinsurance in respect of the existing BIGCO scheme and if quotes are reasonable then proceed with reinsurance. This is to reduce risk for AUSLIFE from any future adverse experience developments.

ii. Negotiate the premium structure.

*The following recommendations are made to the Board in relation to the group scheme tender process:*

1. Conduct a pricing review ahead of any future new schemes for which AUSLIFE wishes to tender for, and ensure such pricing allows for cost of reinsurance. Such a review pricing should improve the profitability and more specifically if pricing is uncompetitive, taking into account cost of reinsurance, then this may indicate to AUSLIFE that it is more appropriate not to take on the new Group business at all. Also consider not guaranteeing the premium rate for 3 years (i.e. allow more frequent repricing).
2. When required to submit a tender response well in advance of the commencement date, include a clause that allows for the premium to be increased if experience deteriorates by more than a specified amount.

**Q2** a) The business is new to the company, which means there are more uncertainties may arise:

* The new business volume is crucial to the future projection. A lower than expected volume could cause unrecoverable initial expense, including setting the underwriting process and IT systems.
* No historical experience: the assumption used might be subjective given we do not have any historical experience to refer to when setting assumptions. **Hence it tends to deviate.**
* We may experience more operational risk, such as system malfunction, than those who have sold the Death cover for some time.
* More stress to be set in case our underwriting process is not robust enough as a it is just newly set up.

The random and future stress margins are **not** prescribed by the Prudential Standards. The appointed actuary must determine the appropriateness of stress margins regarding the relevance to the business and to achieve a 99.5% probability of sufficiency.

We can therefore expect there will be differences across the industry. The stress margins we have proposed are higher than other companies with similar business size. These margins are reasonable because:

**Future stress:**

* The level of maturity – other companies will have some historical experience compared to ABC Life. Given the lack of internal experience for setting of pricing and valuation assumptions, the possible deviation from the BE assumptions is relatively larger when compared to other companies for the purpose of determining the future stress. As a result of this, the future stress for ABC is currently higher compared to many of our peers.
* Quality of experience studies and analysis. ABC Life doesn’t yet have processes and systems in place to facilitate accurate experience studies, whereas the comparable peers likely do. ABC Life’s underwriting and claims management processes are untested in practice. These may not deliver the expected experience that the assumptions have been based upon. Again the future stress will be higher compared to our peers whose processes have been refined over a number of years as their staff have gained experience.
* Uncertainty over volumes and mix. ABC Life has not yet written the policies that would make it a comparable size to the others, hence there is uncertainty around attaining this which is reflected in the margins.

**Random stress:**

* For random stress, the stress margin can be impacted by the reinsurance arrangement that ABC Life implemented for the risk business. In this case a quota share arrangement implemented for our retail risk does not reduce the volatility of claims caused by large sum-insured like what surplus reinsurance can do. This means that the skewness of our claims distribution will result in a higher random stress margin.
* There are many other factors that contribute to the stress margin such as the distribution of sum insured which is different for each company and impacts the random stress, while view on future trend can be different, resulting in different future stress.

2b)

* The prudential capital standards do indeed allow for a diversification benefit between insurance and asset stresses for each statutory fund.
* However, the insurance business needs to be set up in a separate statutory fund compared with the investment-linked business as per the Life Act requirement.
* Hence, the only aggregation benefit that does exist will be between whatever asset risk charge exists for the insurance business (which may be small) and the insurance risk charge. There is not likely to be an insurance risk charge for the investment-linked business as the fees can withstand a 10% increase in expenses.

2c) see spreadsheet

2d) **Memo**

*To: CFO of PQR Insurance*

*CC: CFOO of ABC Life*

*From: Appointed Actuary, ABC Life*

*Subject: Disadvantage of increasing ABC Life Quota Share Reinsurance with AussieRe*

Dear CFO,

Increasing the level of quota share reinsurance ABC Life holds with AussieRe does have a potential disadvantage from a capital viewpoint.

This is due to this potentially causing ABC Life to hold a sufficiently large concentrated exposure to a single counterparty (AussieRe). Under Australian capital requirements, there may be an increase in capital (through a concentration risk charge) required as a result, to protect policyholders against the risk of AussieRe defaulting on the reinsurance in adverse circumstances.

This risk however can be mitigated, for example by:

* Maintaining a 20% share with AussieRe and taking out additional quota share reinsurance with another reinsurer (thereby not increasing the counterparty concentration to AussieRe).
* Agreeing to special terms with AussieRe which reduce ABC Life’s exposure to AussieRe under Australian capital standards (e.g. by paying reinsurance premiums twelve months in arrears, which offsets ABC Life’s exposure to AussieRe).
* Ask for collateral from reinsurer.

Regards,

Appointed Actuary, ABC Life

**Q3** a) i. *In relation to the 31 December 2016 valuation results, it is expected that:*

**VSA**

* Given that the actual investment experience is captured within the VSA, the VSA will have decreased since the September position. As a large proportion of the assets backing the participating business are invested in long term fixed interest securities, the recent upward movements in the yield curve will have reduced their value materially. This reduction would outweigh any actual investment earnings.

**BEL**

* The discount rate to value the best estimate liability will have increased due to the upward movements in the yield curve, resulting in a lower BEL.
* However, as the asset duration is longer than the liability duration, proportionally, the VSA will reduce more than BEL. As such, BEL as a proportion of the VSA will increase. Given the level of BEL was already 95% of VSA, there might be a chance that this business will be in loss recognition.

**BE Supportable Bonus Rate**

* All things being equal, there will be downwards pressure on the supportable bonus rate, as the VSA have reduced by more than the BEL (reducing the PV BE Bonus component of the policy liability).

ii. As a result of the mismatch in assets and liabilities, the bonus that can be supported has deteriorated (the resulting declared bonus might be a lot lower than historical levels and may not meet **policy owners’ reasonable expectations**).

Therefore, MEDLIFE must address the mismatch after the annual valuation by:

* Conducting a full review and proposing a **new investment strategy** that is suitable for the current market condition, the existing liability profile and help to deliver the policy owners’ reasonable expectations of future bonuses.
* The review should ensure that assets and liabilities are regularly monitored so that any developing mismatch is addressed in a timely manner (i.e. rebalance the duration of the underlying fixed income assets to better match the liabilities).
* [In the question, asset duration is longer than liability duration] This is likely to be implemented through selling longer term fixed interest assets and purchasing shorter duration fixed interest assets to match the liabilities.

3b) i.

* The recent reduction in the surrender experience has persisted for the last couple of years which provides strong justification in reducing the surrender assumption Therefore the surrender assumption should be revised down.
* However, it should be noted that:
  + The past bonus declaration have been generous post the global finance crisis when compared to other available investment options. This could have contributed to the much lower surrender experience than expected.
  + In light of recent yield movements, the supportable bonus is expected to be lower and the actual bonus rate is likely to experience downward pressure, which may increase surrenders in the near future.
* Lower surrender experience also could be due to the conservative surrender basis particularly as a growing proportion of the policies approach their maturity date.
* Therefore, reducing the assumption down to 3.5% is unlikely to be appropriate as a long-term assumption.
  + A lower surrender assumption will reduce the level of future supportable bonus rate, and lower future supportable bonus rate, which may ultimately result in higher surrender experience.
  + Hence, a better middle ground might be somewhere between 8% and 3.5%, with ongoing monitoring of experience recommended.

ii.

* Given the surrender assumption has been maintained at 8% where there was evidence of a downward trend, you would expect to see surrender experience losses in the last couple of years.
* Lower surrender experience than expected results in a surrender experience loss for this business. This is because a conservative surrender basis implies the surrender value paid to policy owners will be less that the actual reduction in the policy liability. **In other words, every surrender generates a surrender profit.**
* To a small extent, lower surrender experience will potentially result in a potential expense profit as the cost of paying surrenders reduces.

3c) **Claim decrement experience is mainly:**

* Mortality experience item – more deaths than expected will result in experience losses. This is due to the claim payment of the Sum Assured plus reversionary bonuses exceeding the reserve held.

**Non-claim decrement is mainly:**

* Surrender experience (per part b) (ii)). The policy liability is released upon surrender and a surrender value paid, which drives this experience item.
* Paid-Up experience item – this arises when the policyholder decides to cease paying premiums at some point before the end of the contract term. As the company also adopts a conservative basis for Paid-Up policies, every Paid-Up should also generate a Paid-Up experience profit. This is similar to the surrender experience item discussed above.

**Expense experience:**

* Expense experience profit/loss may result from lower/higher actual expense as a result of genuine changes in the level of management expenses (i.e. staff costs, rent or IT costs) with respect to the product.
* Alternatively, this could result from lower or higher than expected inforce count which might have affected the actual expense apportionment between participating and YRT risk products.

**Investment experience:**

* There will be **no investment experience profit or loss** for participating business as the variances will be all absorbed into VSA.
* **Differences between actual and expected investment returns affects the current year best estimate cost of bonus and the value of future best estimate bonuses,** which are both included in the policy liability.

ii. **Claim decrement experience:**

* This is consistent with YRT risk products in direction i.e. higher than expected deaths will lead to an experience loss.
* However, the proportional impact per death will be much more significant for YRT risk products than traditional participating products. This is due to the sums at risk – YRT policies have significantly higher sums insured which are fully at risk (ignoring reinsurance) whereas the sum at risk reduces for participating policies as the reserve grows.

**Non-claim decrement experience:**

* The equivalent to surrender experience for YRT risk products is the lapse experience.
* However, the impact is different – higher than expected lapses leads to an experience loss for YRT. This loss arises from the unrecovered acquisition expenses (DAC) needing to be capitalised for the additional lapsed policies.
* The loss can be sizeable for YRT products if the additional lapses occur in the early durations of the policy. For participating policies, the experience profit reduces as the policy approaches maturity – i.e. the surrender value should approach the maturity value (even with a conservative basis).
* There is no equivalent paid up experience for YRT policies.

**Expense experience:**

* The expense experience is determined similarly for participating products and YRT risk products. In both cases, higher than expected expenses will lead to an experience loss.

**Investment experience:**

* Unlike participating business, an investment experience will be reported in the Analysis of Profit for the YRT risk products.
* **Investment experience for YRT will reflect:**
* Any changes to the policy liability due to changes in discount rates over the valuation period.
* The difference between the discount rate and the actual rate of investment return on the policy liability and cashflows over the reporting period.

3d)

* Any expense experience loss of the MEDLIFE participating business is split 80% to policyholders and 20% to shareholders. This can therefore significantly impact the **future** bonus rates declared to policyholders on the product.
* It is important that the Appointed Actuary is fully aware of the reasons for the experience items prior to setting bonus rates.
* It is important to understand whether the large expense loss is a new occurrence as this will help provide guidance as to what items to investigate. If it has existed previously it is important to understand what actions were taken and why given the potential impact on bonus rates.
* A large Expense experience loss could indicate either:
  + a genuine direct expense overrun; or
  + an overhead mis-allocation; or
  + a one-off expense (e.g. a project).
* As the old participating business is in run off, the expense allocation should be decreasing over time – if this is not the case then the allocation should be investigated further to understand why this is not the case.
* There might still be a possibility that the expense reduction is not fast enough to be reasonable for a participating book.
  + This may be due to the difficulty in reducing fixed expenses relating to the participating products (i.e. legacy system costs).
  + Or this may happen as a result of apportionment methodology deficiency or difficulty in identifying the true expense cost for the participating book.
* The Appointed Actuary can exercise their judgement and bypass the allocation and propose a capping to the total expense allocated to Participating business with appropriate justification (e.g. when the policy holders have been unfairly or adversely impacted by expense allocation). Such a capping may be in the form of setting an expense per unit assumption that is indexed each year, with the expense overrun allocated to the shareholder.

**1. [Group Death & GSC]**

1a. Why use accumulation method compared to projection method

1b. Calculate PL for Group Death and GSC

*\*DAC is not recoverable if in loss recognition or to be reduced to the amount that can be recovered.*

1c. Calculate profit = premiums – claims **paid** – expenses – increase in PL

1d. How to Improve Profitability

**2. Capital / Insurance Risk Charge**

2a. Why Future/Random stress for a new entrant are higher than others respectively

2b. No aggregation benefit across different SF.

2c. Detailed calculation of IRC (compare with textbook spreadsheet) ==> **SUMMARISED**

2d. Reinsurer concentration risk / mitigation

**3. Experience Analysis**

3a. IR up, impact on VSA / BEL / Bonus Rate

3b. Surrender assumption for [Par Endowment]

3c. Claim decrement / Non-claim decrement / Expense / Investment experience for [Par] & [YRT]

**Investment experience for [Par]:**

*No investment experience profit or loss as the variances will be all absorbed into VSA.*

*Only affects the current year best estimate cost of bonus and the value of future best estimate bonuses, which are both included in the policy liability.*

**Investment experience for [YRT]:**

*An investment experience will be reported in the Analysis of Profit for the YRT risk products:*

*o Any changes to the policy liability due to changes in discount rates over the valuation period.*

*o The difference between the discount rate and the actual rate of investment return on the policy liability and cashflows over the reporting period.*

3d. **AA** to consider regarding the expense experience loss