INSTITUTE OF ACTUARIES OF AUSTRALIA

LIFE INSURANCE 2001 EXAMINATIONS
SOLUTIONS PAPER 1

The purpose of this document is to assist candidates in their preparation for future examinations. It is emphasised, however, that the solutions herein are not necessarily the only solutions or the best solutions, especially for those questions testing judgement. They should be regarded as illustrative only. However, a candidate who covered all the points in the specimen solution in the examination would have scored a very comfortable pass. This document should be used in conjunction with the 2001 Examiner's Report which is on the IAAust web site.

QUESTION 1 **16 marks**

a) Components should include:
   - mortality/morbidity
   - lapse
   - investment earnings (actual experience & change in yield impacts)
   - expense and commission
   - tax
   - loss recognition/reversal of losses
   - release of planned profit margins
   - reinsurance

   marks: 1 mark for stating that the analysis is comparing actual experience to the expected experience based on the previous valuation best estimate assumption

½ mark for each item above and ½ mark per brief explanation, maximum 6 marks

b) The steps should be to review the following:
   - data validity (review checks and reconciliations carried out; perform additional statistical checks if necessary)
   - methods (check comply with valuation standard - AS1.02) and models
   - assumptions (review experience investigations and process to arrive at best estimate assumptions)
   - results (check profit margin calculations; run output; ratios of PV’s, etc)
   - review analysis of profits (items as expected in magnitude and direction given other knowledge e.g. from experience investigations)

2 marks per section; 1 mark for identification and one mark for practical suggestions for information that could be reviewed.

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QUESTION 2 **20 marks**

(a)

General Points

- The number of model points created will depend on the importance of the task being performed and the variability of the results for individual model points. Also relevant is the size of the product block and the computer processing speed. **(1 mark)**
- The main aim is to ensure the model points are representative of the entire range of policies for the product. Different series within a product type will have different profitability and each series must be included pro rata. **(1 mark)**
- The key driver of profit must be modelled accurately for each product and the model points must cover the range of values for the key driver. Examples of drivers include size of sum insured / premium for risk policies, duration in force for savings policies with high initial charges, policy term for endowment policies. **(1 mark)**
- The overall total of the "model points multiplied by their weightings" must match the in force statistics and reserves at the start date. This includes policy count, in force annual premium, in force sum insured and total surrender values. In addition, the model should attempt to match the actual values for average premium per policy, average duration in force, average current age and average policy term. **(2 marks)**

Whole of Life **(2 marks)**

- Need to model the main types of policies, with considerations for limited premium policies, paid-up policies, non-participating policies and the various reversionary and terminal bonus rate series.
- The key profit drivers will be the surrender value basis and the linkage between the fund earning rates and the reversionary and the terminal bonus rates.
- Ensure the total modelled surrender values, in force reversionary bonus and terminal bonus, in force sum insured and in force premium match the actual values at the start date. Also check the modelled range of "durations in force" matches the actual range.

1 mark per point, max 2 marks

Unit Linked Superannuation **(2 marks)**

- The main considerations are single versus annual premium policies; use of initial and growth account structures where surrender penalty scales apply; various types of policy charges based on premium, assets and flat dollar amounts; commission options selected by agent or broker; and premium / contribution holidays.
- The key profit drivers are funds under management and level of charges. It is important to model the SV scales accurately as well as durations in force, policy terms and initial and growth account balances.

- Other considerations are the mix by asset type e.g. cash, capital stable, balanced and growth investment options and the amount of assets in the Virtual Prescribed Super Trust compared to the statutory fund for tax modelling.

1 mark per point, max 2 marks

Yearly Renewable Term **(2 marks)**

- The main considerations are range of current ages, range for size of sum insured, mix by sex and smoking, policy expiry ages, take-up rates for TPD riders and CPI increases, and premium rate discounts for large sums insured.
- The key profit drivers will be the premium rate scale compared to the mortality table and the average policy size.
- Other considerations are use of reinsurance, premium loadings for health or hazardous pursuits and commission clawback arrangements.

1 mark per point, max 2 marks

Immediate Annuities **(2 marks)**

- Need to model the main types of annuities, with considerations for fixed term annuities, lifetime annuities, single or joint life, minimum payment period, payment frequency, reversionary option for joint life, and indexation.
- The key driver of profit will be the monthly or quarterly payment.
- Ensure the modelled values for average current age, current age distribution, average payment per policy and average duration in force match the actual values closely.

1 mark per point, max 2 marks

Group Life **(3 marks)**

- For master trust business where the age, sex and sum insured details are held for each life insured, it is possible to model each life accurately, using actual premium rates.
- More commonly, the individual details of each life insured in a group life arrangement are not easily accessible and a loss ratio method is used to model all business. This means the premium is allocated into claim, commission, expense, experience refund and profit components.
- The model will also allow for tax, delays in reporting claims, average scheme size and use of reinsurance.
- The unearned premium reserve for each scheme i.e. premium frequency and amount is important in setting policy liabilities.
- The key profit driver will be the assumed profit margin in each premium plus interest received on IBNRs and on notified claims awaiting approval and payment.

1 mark per point, max 3 marks

(b)

Variables to be modelled**: (2 marks)**

Age at entry	Sex	Claim indexation option
Duration inforce	Smoking status	Medical loadings
Waiting period	Occupation category	Claim start date (for current claims)
Benefit period	Monthly Benefit size	Duration of claim (current claims)
Use of reinsurance		

¼ marks per point, maximum 2 marks

Cashflows included in projections**: (2 marks)**

Premiums
Claim payments
Interest on policy liabilities
Commission (initial, renewal, clawback, overrider)
Expenses (initial, renewal, claims)
Reinsurance (premiums and claim recoveries)
Change in policy liabilities (active life reserve, claims reserve)
Capital adequacy liability (for EV projections)
Tax
Profit

¼ marks per point, maximum 2 marks

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QUESTION 3 10 marks

a) Students should refer to the principles for distribution of surplus (para 25.21 of textbook) and show an ability to put them into practice:

- Equity – fairness in this context – the whole of life policyholders have provided the capital support and should receive a return for that. Certainly, the crediting rate should reflect the guarantees offered to the Investment Account policyholders, and thus be more closely related to the bond yield than the equities return.
- Acceptable to policyholders – consider marketing material, projections, etc.
- Beneficial to the office – protect solvency – hold back some of the return to build reserves for future needs. The sales have exceeded expectations, and it is possible that this might continue.
- Consistency with premium bases and surrender scales – consider profitability of the product from fees versus expenses and surrender profits angles. It is unlikely that these considerations will contribute significantly to the crediting rate.
- Simplicity – e.g. one rate rather than several different rates.

Ideally a crediting rate philosophy would have been put in place at the time the product was developed and launched. If so, this also is a primary consideration.

Marks:
1 mark each for identifying equity, acceptability, and beneficial to office.
1 mark each for interpreting equity, acceptability and beneficial to office in the context of this scenario.
½ mark each for identifying consistency and simplicity and ½ mark each for simple explanation.
1 bonus mark for mentioning the potential for there to be a bonus rate philosophy to be in place.

Maximum 8 marks

b) the recommendation probably wouldn't differ at all. Even if the rate is designed to pass on some of the equity returns, it makes little difference whether or not the assets have been turned over. The solvency risks, etc, are the same with the exception that it is possibly preferable to have a deferred tax liability (DTL) that could go down with asset values, than have a current tax liability and then a future income tax benefit (FITB) that may not be able to be utilized for solvency calculations.

1 mark for saying it probably wouldn't make any difference ,or that it might be better to have unrealized rather than realized gains due to tax considerations.

1 mark for explanation (e.g. reference to solvency, tax position).

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QUESTION 4 16 marks

The aim of this question is to test the student's understanding of the responsibilities of the appointed actuary under legislation, APRA's powers, and also the student's ability to consider the general business issues surrounding this situation.

(a) Legislation to be considered

Note: Students do not need to identify the particular section numbers of the Act, but should be aware of the provisions.

Under Section 67 of the Life Act, every life company must comply with the solvency standard. (1 mark)

If the solvency standard is breached, then under Section 62 of the Life Act the company may not make a distribution of retained profits to either shareholders or policyholders. (1 mark)

Under Section 98 of the Life Act, the appointed actuary must draw to the attention of the company any matter that comes to the attention of the actuary and that the actuary thinks requires action to be taken by the company or its directors:

- to avoid contravention of the Act; or
- to avoid prejudice to the interests of the owners of policies issued by the company. (1 mark)

Also under Section 98 of the Life Act, if the appointed actuary thinks:

- that there are reasonable grounds for believing that the company may have contravened the Act; and
- the contravention may effect the interests of the policyowners; then

the appointed actuary must inform APRA in writing. (1 mark)

Under Section 136 of the Life Act, APRA may give a show cause notice (for investigation) if the company has breached the Act. (1 mark)

APRA may ultimately apply for the judicial management of the company under Sections 157 and 159 or wind up under Section 181. (1 mark)

(b) Actions

(1) Notify company management immediately. (1 mark)

(2) Establish whether the auditor is correct.

Review Solvency Standard and nature of asset to determine whether you believe it to be inadmissible. (1 mark)

If you disagree with the auditor, this disagreement needs to be resolved. (1 mark)

This may initially be by discussion with the auditor, but may require reference to other actuaries or ultimately to APRA. (1 mark)

(3) Notification to Board

The Board should be notified prior to any formal notification being provided to APRA. (1 mark)

(4) Notification to APRA

The actuary will need to determine the point at which APRA should be advised of the situation due to there being reasonable grounds for believing that the company has contravened the Act. (1 mark)

It would be reasonable for the actuary to undertake certain of the investigations in 2. before notifying APRA, particularly if the actuary is satisfied that the interests of policyholders are not prejudiced by the situation. (1 mark)

(5) If the auditor is incorrect:

The company is not insolvent.

However, the company should review investment and other guidelines to ensure that there is no (or little) risk of future disputes. (1 mark)

(6) If the auditor is correct:

The company is insolvent.

The actuary must inform APRA immediately, if this has not already been done. (1 mark)

Need to consider ways to resolve issue, although this is unlikely to be done within the 2 day timeframe. (1 mark)

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QUESTION 5 **13 marks**

Part (a)

One mark was given for pointing out the importance of examining both the incidence and duration of claims.

The remaining four marks were given as half a mark per relevant point. These points were grouped under the two main categories of product features (e.g. agreed value Vs indemnity, reviewable premium rates, etc) and Australian market/product conditions.
As this was a "complex judgment" question insightful comments scored higher than bookwork type answers such as listing the rating factors.

Part (b)

To achieve the full 2 marks available students had to identify 6 investigations (e.g. mortality, morbidity, lapses, expenses, investment returns, paid up/dormancy rates).

Part (c)

Four marks were given to the explanation of uses of expense analyses. Students received half a mark per use by listing the possible uses. To receive the full four marks required an explanation of the uses and of the fact that different purposes may require different expense analyses.

Two marks were available for explaining the factors that may affect the increase in expenses. One mark was awarded for questioning whether the increase was in total expenses or unit expenses, half a mark was given for mentioning one-off expenses and the remaining half a mark was awarded for any other relevant comment.

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QUESTION 6 **25 marks**

a) Note key words 'adequately' and 'one **or more**'

profitability
identify sensible KPI such as
- growth in shareholder profit from year to year
- growth in 'planned profit plus experience profit' (removing interest on retained earnings)
- other provided sensible

return on equity
identify sensible KPI such as
- (growth in PV profit margins plus profit) / start of period shareholder retained earnings {bonus for identifying cost of capital – perhaps a rough discount based upon figures from the solvency note}

expense management
identify sensible KPI such as
- unit costs : maintenance expenses (excl. commission) as a percentage of assets or of premium received; acquisition expenses (excl. commission) as a percentage of single premiums plus growth in regular premium plus allowance for lapses of say 10% of the previous year regular premium. Growth in non-commission expenses might also be a reasonable KPI in certain circumstances (e.g. where the company has acknowledged expenses overrun issues and has business plans which say that non-commission expenses can be maintained at current $$ levels with growing volume reducing unit costs.

Capital position
Identify sensible KPI such as
- trend of assets in excess of solvency requirements
- trend of assets over MTV
- solvency ratio for non-linked funds

marks 4 marks per proposed KPI (scale 2 marks for reasonable identification, 1 mark for reason and 1 mark for shortcomings)

b) & c)

advantages include:
- simplicity – cheaper cost of production
- simplicity – no conflicting reports "one-truth"
- based on audited figures

disadvantages and alternative sources of information include:

- information not frequent enough
- not enough detail to use actual cost of capital or allow for risk in the product design (better to use EV)
- development in such things as products/systems and distribution capability won't match expense and revenue due to time lags (better to use AV)
- no depth of analysis (e.g. by product line) – use EV or FCR
- profitability of new business (or indeed new business losses) not transparent (use EV)
- no comparison of experience to product pricing/loadings, etc (use s116 report or FCR)
- figures can be influenced by 'one-off' experience items that might not be transparent in the PR35 accounts (use FCR)

Marks – ½ mark per point, maximum 5 marks for advantages and disadvantages and 4 marks for alternative sources of information.