INSTITUTE OF ACTUARIES OF AUSTRALIA

COURSE 2A LIFE INSURANCE **OCTOBER 2009 EXAMINATIONS**

Marking Guide

Level of Difficulty

Question	**Syllabus Aims**	**Units**	**Knowledge & Understanding**	**Straight-forward Judgement**	**Complex Judgement**	**Total Marks**
1a	6,7,8	2,3	4			4
1b	10,12,14	3,4	2			2
1c	11,13,14	3,4		4		4
1d	2,12	1,4		4		4
1e	3,11,13	1,3,4		3		3
2a	8,9,12,14	3,4		4		4
2b	10,12	3,4		6	3	9
2c	1,3,4,5,7,9,10,12	1,2,3,4			8	8
3a	1,6	2		6	2	8
3b	1,9	1,3	4			4
3c	1,5,7,9,12,14	1,2,4		4		4
3d	1,2,4,5,6,7,8,9, 10,12,14	1,2,3,4			7	7
4a	2,5,7,14	1,2,4		6		6
4b	4,5,7	2	2	3		5
4c	4,5,6,7,9,13,16	2,3,4,5			9	9
5a	1,6	1,2	4			4
5b	1,3,6,9,15	1,2,5	4			4
5c	1,2,6,7,11,12,13,14	1,2,3,4		4		4
5d	1,2,3,4,6,7,10,12,13	1,2,3,4			7	7
TOTAL			**20**	**44**	**36**	**100**

Answer all 5 questions.

QUESTION 1 (17 Marks)

Company QRS Ltd. sells single premium investment linked policies through a range of distribution channels. It has been selling these policies for over 10 years and the profitability so far has been in line with pricing assumptions.

(a) What key assumptions are normally required for projecting single premium investment linked policies, for the purpose of examining profitability ? [4 Marks]

(b) What is the goal of profit testing for single premium investment linked business ? [2 Marks]

(c) Describe what you consider to be two appropriate profit measures for single premium investment linked business and explain why. [4 Marks]

Recent information for QRS's investment linked business is as follows:

Date	Net Asset Value of investment linked fund at beginning of day
1/7/2009	$500,000
2/7/2009	$504,000
3/7/2009	$517,465
4/7/2009	$532,695
5/7/2009	$567,672

- The unit price at the beginning of 1/7/2009 was $2.50;
- All purchases and sales of units on a given day are assumed to occur at the end of each day, at the unit price established at the beginning of that day;
- Relevant investment linked purchase and sale amounts are as follows:

Date	Purchases	Sales
1/7/2009	$0	$0
2/7/2009	$30,000	$6,060
3/7/2009	$0	$1,482
4/7/2009	$51,000	$0

(d) Calculate the unit prices applying at the beginning of each day from 2/7/09 to 5/7/09. [4 Marks]

(e) One component of the Net Asset Values (NAV) above is the tax liability on unrealized capital gains. The tax liability was calculated on an undiscounted basis. Discuss what would be the impact on the unit prices calculated in (d) above if the tax liability was calculated on a discounted basis ? [3 Marks]

Solutions

(a) The assumptions normally required would be as follows:

- Fees – including the following-
  - Policy Fees
  - Rebates / tiering levels
  - Initial fees
  - Maintenance / management ongoing fees
  - Exit fees
- Expenses – including the following-
  - Investment expenses
  - Commissions (upfront and trail), including clawback
  - Non-commission and non-investment expense assumptions (initial and renewal)
  - Expense inflation rates
- Surrender/Discontinuance rates (by duration and other factors as applicable)
- Surrender value basis (if applicable)
- Average account sizes (and spread across account sizes)
- Growth rate of unit funds – split by asset allocation mandate
- Risk discount rate
- Rates of tax
- Reserving/capital basis

Marking guide:

0.25 mark for each point in fees (to maximum of 1 mark KU).
0.25 mark for each point in expenses (to maximum of 1 mark KU).
0.5 mark for each other point (to maximum of 2 marks KU).

To a maximum of 4 marks KU overall.

(b) The goal of profit testing investment linked business is to:

- Determine the charges applying on the policy that should be made;
  - and what structure these charges should be (e.g. upfront vs. ongoing, % account or $ per policy, entry vs. exit combinations)
- In order to recoup expenses;
- and make an acceptable profit.

Marking guide:

0.5 mark KU for stating determining charges.
0.5 mark KU commenting on determining the structure of the charges.
0.5 mark KU for commenting on expenses.
0.5 mark KU for stating to make an acceptable profit.

To a maximum of 2 marks KU.

(c)

Two appropriate profit measures can be chosen from the following profit measures:

- Present value of profit/transfers divided by the single premium.

  Single premium investment linked policies require a low level of capital, which means this profit measure is not distorted by a low level of capital as is the case with a 'yield on transfers' profit measure. This profit measure demonstrates the effective value from writing that single premium and can be used to compare relative profitability across different products or account balances that are offered; and/or

- A discounted payback period approach which determines how long it is until a policy recoups the significant acquisition expenses of the policy.

  This is an appropriate measure because a unit linked policy often has high upfront expense/commission but not necessarily equivalent high initial fees. Therefore there is a persistency risk if the business leaves before it has reached the payback period; and/or

- Equivalent annual "profit margin" expressed as % FUM. This could be determined as PV transfers/profit as a percentage of PV future FUM.

  This could be useful in expressing a constant annual equivalent charge allowing for implicit amortisation of the DAC.

[Note for markers: A 'yield on transfers' profit measure (calculated as IRR so that present value of profits / transfers is 0 at inception) is not appropriate as it produces a high value which is not sensible. This is because a single premium investment linked policy requires a low level of capital.]

Marking guide:

1 mark SJ for each appropriate profit measure stated to a maximum of 2 marks SJ.

1 mark SJ for each adequate explanation of why the profit measure is appropriate to a maximum of 2 marks SJ.

To a maximum of 4 marks SJ.

(d)

Set up a table as follows:

Date	NAV at beginning of day	Units in place at beginning of day	Unit price	Net movement of units in day
1/7/09	\$500,000	\$500,000 / \$2.50 = 200,000	\$2.50	-
2/7/09	\$504,000	200,000	\$504,000 / 200,000 = \$2.52	+\$23,940 / \$2.52 = +9,500
3/7/09	\$517,465	209,500	\$517,465 / 209,500 = \$2.47	-\$1,482 / \$2.47 = -600
4/7/09	\$532,695	208,900	\$532,695 / 208,900 = \$2.55	+\$51,000 / \$2.55 = +20,000
5/7/09	\$567,672	228,900	\$567,672 / 228,900 = \$2.48	

Marking guide:

1 mark for each unit price correct from 2/7/09 to 5/7/09 inclusive to a maximum of 4 SJ marks.

[Note for markers: If initial number of units calculated incorrectly but subsequent logic to calculate the 4 unit prices is correct, then apply discretion (up to 2 marks maximum).]

To a maximum of 4 marks SJ.

(e)

- Changing the tax liability basis from an undiscounted basis to a discounted basis lowers the present value of that liability;
- Hence the net asset value used for calculating unit prices would increase to the extent that the tax liability decreases;
- Hence the unit prices calculated in (d) above would increase.

Marking guide:

1 mark for each point above to a maximum of 3 marks SJ.

QUESTION 2 **(21 Marks)**

Going Under Ltd. is an Australian Life Insurer which sells a range of risk products. As the Product Actuary you were involved in setting pricing assumptions and modeling the profitability of all products. Going Under Ltd. generally targets the market of young professional people who have tertiary qualifications, high salaries, and a high level of engagement with the financial services industry, such as use of credit cards, holding existing insurance coverage, and so on.

(a) The CFO is concerned that a recently launched Trauma product required a new IT claims system to be developed. The total set-up cost for this IT system was significant, and 30% of this cost was accounted for within the pricing basis for Trauma as an expense assumption. Discuss the appropriateness of this assumption. [4 Marks]

(b) The CFO also has questions regarding a recently-launched disability income (DI) product. He is aware that the profit modeling you carried out for the DI product was based on adopting the existing in force profile of total and permanent disability (TPD) policyholders as the profile of new business for DI. Discuss:

(i) advantages of this approach. [3 Marks]

(ii) disadvantages of this approach and any strategies you could have employed to mitigate the disadvantages. [6 Marks]

(c) The marketing manager has suggested that Going Under Ltd. should quickly add an additional and novel feature to the TPD product. The suggested feature is that the product would pay out an additional benefit of 30% of the lump sum TPD benefit if a child of the life insured suffers a serious injury. Regardless of the conditions of the underlying TPD product, there would be no claims-exclusion or deferment period for this feature. The CFO thinks that this feature sounds quite risky and is concerned that the feature has not been thought through properly. Describe the main risks with this proposed feature that you would raise with the CFO. [8 Marks]

Solutions

(a) Including 30% of the total IT cost in the pricing basis is acceptable under the following circumstances:

- This is a one off cost and the full cost of the system should be accounted for within the pricing basis. [1 Mark]

  The full cost should be recovered by spreading these costs over the number of years it expects to sell this product at the current premium rates. Thus 30% of the full cost is acceptable if the company believes it will sell this trauma product at these premium rates over the next 3 years allowing for the growth in sales over these 3 years; [1 mark]
- Going Under Ltd. is prepared not to account for the full cost, meaning that either Going Under Ltd. is happy for Trauma to run at a lower profit than otherwise, or even at a loss, perhaps for reasons such as wanting to grow aggressively;
- Or there is some utility of this system with other existing products in the company which themselves may be repriced to account for this cost;
- Or there is some perceived future utility of this system with future products which may be priced to account for this cost.

Marking guide:

Under first bullet point above:

- 1 mark SJ for stating that the full cost of the system should be accounted for.
- 1 mark SJ for stating that the cost should be recovered over a 3 year period.

1 mark for each other bullet point made and discussed to a maximum of 2 marks SJ.

To a maximum of 4 marks SJ overall.

(b) (i) Advantages:

- The TPD profile is on-hand and available, so provides a starting point to model a possible profile of new business;
- The fact that it is a TPD and therefore Disability profile may be more appropriate than profiles of mortality business, or even other morbidity products;
- As long as smoking rates and non-smoking rates are each priced to be profitable, any differences between smoking prevalence of TPD to DI policyholders is unlikely to be too much of an issue;
- Arguably the same point above could be repeated for the mix of male and female policyholders (i.e. within each category of smoking/non-smoking and male/female, it is likely to be the mix of entry ages that is critical to overall profitability).

Marking guide:

1 mark for each bullet point made and discussed under “Advantages” to a maximum of 3 marks SJ for part (b) (i).

(ii) Disadvantages and mitigation of those:

- The marketing targets a specific audience that might well be quite different to the TPD policyholders;
    - So need to make adjustments for that – as a minimum, in terms of adjustments to likely ages at entry;
- The TPD sum insured bears little relation to DI as one is a lump sum and one is a monthly benefit;
    - But it could be used to approximate estimations of high, low and medium sums insured within the available range of DI sums insured;
- An in force profile may not be appropriate as much of this may have been sold many years ago and not reflective of recent or anticipated sales and distribution methods;
    - So probably better to use recent new business sales, say the previous 12 months as a proxy to likely new business for DI;
- There is no data on waiting period and occupation class to help describe the likely profile of new business. These are significant factors in setting appropriate premium rates for DI business which vary by waiting period and occupation class;
    - Reinsure the DI product with a reinsurer. The reinsurer will likely have information with local and overseas experience on DI business not only by waiting period and occupation class but as well by age, sex, and smoker status and benefit period.

Marking guide:

1 mark for each bullet point made and discussed under “Disadvantages” to a maximum of 3 marks SJ.

1 mark for each bullet point made and discussed under “Mitigations” to a maximum of 3 marks CJ.

To a maximum of 6 marks for part (b) (ii).

To an overall maximum of 9 marks for part (b).

(c)

<u>Risk of Inappropriate/illegal/immoral conduct towards children:</u>

- There is a clear risk in which an injury to a child can be seen as a way to gain an insurance payout; [1 Mark]
- This is highly exacerbated by the lack of deferment period and of a claims exclusion period;
- For the setting of 30%, is there a rationale for this in terms of the financial need of the insured upon claim? It is likely that there isn’t in which case the risk of fraudulent or illegal behaviour is exacerbated; [1 Mark]
- The overall payment amount should at the very least be capped – say, the lower of $25,000 or 30% of the TPD Sum Insured as an example.

<u>Product Design and moral hazard risks:</u>

- The definition of "serious injury" needs careful thought, in order to exclude deliberate or careless activity that cause injury, prevalence of high-risk activities in general, and what constitutes "serious" – is it defined by a degree of hospitalization, certification by independent medical experts, or something else ?; [1 Mark]
- Do multiple injuries per child or separate injuries on different children mean multiple payouts, or is it only applicable for one injury per sum insured per time period ?

<u>Pricing risks:</u>

- Adding a totally new feature is likely to add complexity and additional cost on admin / claims system, and if Going Under Ltd. is not fully capturing such costs as per the Trauma product example, this could be risky;
- Which in addition to the additional and perhaps significant cost at claim time means there is additional cost on top of the basic morbidity rate increase to recoup;
- There would be some work involved to form reasonable assumptions about likely numbers of children per policy and rates of "serious" accident, with no existing experience in an insured context to base it on.

<u>Market risks:</u>

- Would make it more expensive than it otherwise would and so put off some prospective policyholders from the main cover;
- The market does not currently offer this cover as told it is a 'novel' feature, so would need to assess market research to see if this feature is necessary;
- Not consistent with the intention to target younger professional people;
- There may not be sufficient advisor and sales capability to accurately and unambiguously explain, illustrate and sell this feature.

<u>Legislative risks:</u>

- May not be legal to provide such a benefit on children off the back of an adult cover.

Marking guide:

1 mark for the following points made above to a maximum of 3 marks CJ:

- First point made under illegal or inappropriate behaviour towards children about the clear risk of injury to child.
- Third point made under illegal or inappropriate behaviour towards children about the setting of the 30% of the lump sum benefit.
- First point made under moral hazard about the definition of "serious injury".

1 mark for each other point made to a maximum of 5 marks CJ.

To a maximum of 8 marks CJ overall.

QUESTION 3 **(23 Marks)**

Get-A-Sale (GAS) Ltd. is a large Australian life insurer that sells a range of standard individual yearly renewable lump sum and disability income products. The disability income product pays benefits for 2 years, 5 years and up to age 65. In addition, GAS sells a product which is a version of a disability income product called Very Important Person (VIP) cover. VIP has been very successful since it was introduced to the market by GAS three years ago. This product has the following features:

- It is sold exclusively to owners of small businesses (defined as having 10 employees or less);
- The benefit is a monthly payment of a fixed amount, independent of business earnings at the time of claim. The benefit amount is chosen at the outset of the policy by the policyholder, and can be set at either $3,000, $4,000 or $5,000 per month;
- The benefit term is 10 years with an age cap on benefits payments of 55 (i.e. claims must cease at the earlier of age 55 or a 10 year claim duration) and the waiting period is either 1 week or 5 weeks, again at the choice of the policyholder;
- As well as benefit amount and waiting period, premiums are rated by age, gender, and smoker status but are not rated by occupation class;
- Any type of sickness is covered under the policy, but injuries arising from accidents are not covered;
- There is limited medical underwriting, but existing sicknesses are excluded for the first month of the policy term;
- Financial underwriting consists of ensuring that the business has been in existence for at least 6 months and has had earnings in the last 6 months, gross of tax and expenses, that exceed $30,000.

GAS is the only company in the market selling this product and given the relatively low sums insured, does not have any reinsurance in place for this product.

(a) For each product on sale, suggest with reasons an appropriate asset allocation. [8 Marks]

(b) In what ways does VIP differ to standard DI products ? [4 Marks]

(c) Describe the major risks to GAS with selling the VIP product. [4 Marks]

(d) The product manager wants to add an additional feature to the VIP product. The proposed feature would provide for the ability to upgrade to standard DI after 3 years with no medical underwriting, but full financial underwriting. Discuss the main issues you would raise with the product manager as to this feature. [7 Marks]

Solutions

(a)

<u>Lump Sum:</u>

- These are short term liabilities, as claims, expenses, tax and possibly a shareholder dividend need to be paid. Thus, the assets backing these liabilities should be invested all in cash, as it provides the liquidity to pay these items. [1 Mark SJ]

<u>Disability Income</u>

For determining asset allocations, disability Income needs to be split into (i) disability income claims not in payment (i.e. Active lives) and (ii) disability income claims in payment, as the nature of their liabilities are different.

(i) Disability Income claims not in payment:

- These are short term liabilities, as expenses, tax and possibly a shareholder dividend need to be paid. Thus, the assets backing these liabilities should be invested all in cash, as it provides the liquidity to pay these items.

  Once a claim occurs, this becomes a part of the liability for disability claims in payment. [1 Mark SJ]

(ii) Disability Income claims in payment:

- As disability income provides benefits for 2 years, 5 years and to age 65, these liabilities are a mixture of short term, medium term and long term. This implies matching assets across all durations from short term through to long term matching assets; [1 Mark SJ]
- There are no assets of suitable length available for the tail of the claim liabilities. A small amount of synthetic assets (options and futures) or equities is required; [1 Mark CJ]
- Claims benefits typically increase with inflation, which implies that indexed linked bonds are appropriate; [1 Mark SJ]
- The assets should also be chosen so that that the expected cash proceeds from the asset match the timing and the amount of the expected disability claim payments. This gives the liquidity to pay the claims, and avoids the need to sell assets. [1 Mark CJ]

The overall asset allocation for disability income depends on the relative size of these two liabilities. If we assume the split is 50% claims not in payment and 50% claims in payment, then a suggested asset allocation is: 50% cash and 50% indexed bonds (40% indexed bonds and 10% options/futures) or 50% cash, 40% indexed bonds and 10% equities.

[Note for markers: Variations from this asset allocation are acceptable provided the asset allocation is reasonable.] [1 Mark SJ]

(iii) VIP

- Liabilities are similar to disability income, but the term of the liabilities for VIP is not as long as DI. VIP benefits are paid for a maximum of 10 years, whereas disability income benefits are paid to age 65. Thus assets required for VIP are cash and indexed bonds but without synthetic options/futures or equities.
  A suggested asset allocation is: 50% cash and 50% indexed bonds.

  [Note for markers: Variations from this asset allocation are acceptable provided the asset allocation is reasonable.] [1 Mark SJ]

Marking guide:

Lump Sum:

1 mark SJ for discussion of suitable assets for lump sum.

Disability:

1 mark SJ for discussion of suitable assets for disability income claims not in payment.

Maximum of 2 marks SJ and 2 marks CJ for discussion of suitable assets for disability income claims not in payment.

1 mark SJ for specifying a reasonable asset allocation for disability income overall.

For a maximum of 6 marks in total (4 marks SJ, 2 mark CJ).

VIP:

1 mark SJ for discussion about distinction between VIP and DI.

To a maximum of 8 marks overall for part (a) (6 marks SJ, 2 marks CJ).

(b)

- The VIP benefit is a set amount and not assessed at claim time, in contrast to DI indemnity value products;
- VIP is for small business owners only, rather than anyone with a financial and insurable need;
- There is less choice of waiting periods and those waiting periods are different to the standard 4, 8, 13, 26 and 52 week waiting periods that are typically available for DI;
- There is only one benefit period rather than a choice of typically 2 year, 5 year and to age 65;
- The lack of medical underwriting;
- The financial underwriting is far less stringent;
- Accidents are not covered;
- The existence of a 1 month claim exclusion period;
- Occupation class is not a premium rating factor.

Marking guide:

0.5 marks for each difference stated to a maximum of 4 marks KU.

(c)
The major risks include:

- Pricing. The morbidity risk with this product may be difficult to ascertain with no existing experience to base it on, given the differences above with standard DI.
- Antiselection is a major risk. This is the only product of its type in the market, and with the lack of medical underwriting, unhealthy lives who cannot get past underwriting for standard DI will consider VIP as an option.
- Morbidity is a risk. Individual sums insured may be low and benefit periods are not long but the morbidity rate itself is the main risk. A higher than anticipated number of claims will have adverse impact on product and company profitability.
- The Financial underwriting basis is a risk, for two main reasons. Firstly, 6 months of accounts may not be enough for audited and verified accounts to be available to any degree of appropriate robustness. Secondly, $30,000 gross earnings in 6 months equates to an average of 5,000 per month, but with deductions, expenses and tax, net earnings will be (perhaps significantly) less than that. In which case the replacement ratio of VIP benefit to pre-claim net earnings may be very high in many cases.
- Claim amount not assessed to situation of policyholder at claim time. Little indemnification in action here which means it is open to abuse particularly if the business is not going well.

Marking guide:

1 mark for each separate and major risk described to a maximum of 4 marks SJ.

(d)

The main issues associated with this feature are set out below.

Primary issues are:

- The ability to go onto a product with claim benefits up to age 65, with no prior medical underwriting, presents a substantial risk; [1 Mark]
- This risk is compounded by the fact that larger (DI) benefits can be taken up if the financial underwriting justifies it, which again substantially increases the risk where no medical underwriting is required; [1 Mark]
- In general then particularly poor health risks may see VIP as a way to get full DI cover after 3 years. All those declined DI coverage for medical reasons may go this way leading to high risk of significant anti-selection. [1 Mark]

Other issues are:

- Commission arrangements – agents/brokers likely to insist on further substantial commission at point of conversion;
- A VIP policyholder would not be allowed to transfer whilst on claim, but can a VIP policyholder transfer if they have already claimed on VIP ?;
- Reinsurance arrangements – DI is likely to be reinsured but VIP is not. Would have to find a way for a reinsurer to accept a non medically-underwritten risk on DI. It is not likely to not be on existing treaty DI terms/rates, in which case identification of the converting policies is required for both reinsurance payments (on different arrangements) and claim recoveries;
- Converting VIP policies would need to be identified separately on administration and claim systems to measure experience (as well as for reinsurance reasons above);
- Conversion option premium would need to be built in across all VIP policies which will add to their relative expense;
- Pricing risks exist on the VIP product with likely higher lapses on VIP after 3 years, and extra expenses at conversion;
- Pricing risks for DI exist also in that if converting VIP policies have significantly worse experience than existing DI, the overall DI experience will suffer and have to be re-priced accordingly;
- Which may lead to DI itself having greater lapses or become less attractive to the new business market;
- This could give rise to considering having a standard DI product, separate to a DI-arising-from-VIP-conversion product. If the latter, this could be built into the VIP product anyway and defeats the purpose of having a conversion option if the DI-from-conversion product differs significantly from standard DI in terms of product design, features and pricing.

1 mark each for the primary issues discussed to a maximum of 3 marks CJ.

0.5 mark for each other issue discussed to a maximum of 4 marks CJ, to a maximum of 7 marks overall.

QUESTION 4 **(20 Marks)**

Watch Out Ltd. (WOL) is an Australian life insurer that specialises in providing group life insurance (death and TPD benefits) to medium and large employers. WOL has significant amounts of in force business, and strong levels of new business sales which have increased further in the last six months.

The majority of WOL's total business in force consists of group life insurance. However, there are also some individual life policies in force which have arisen from former group members exercising a continuation option to continue their life cover as an individual after leaving their respective group.

WOL's typical terms for new business involve the following features:

- Premium rates that are guaranteed for four years, with premiums paid annually in advance based on changes in relevant details of the group in question (i.e. numbers, and salaries of employees);
- No profit share arrangement applies between WOL and each group employer;
- Continuation options are offered for members leaving the insured employer and hence the group scheme. These provide for the same level of benefit that was in place during the group scheme, as long as the continuation option is exercised within 6 months of leaving.

(a) Describe the benefits and risks of WOL's terms for new business. [6 Marks]

(b) WOL is reviewing its reinsurance program. It is considering whether a catastrophe cover is likely to be more suitable for its overall business, or whether an aggregate excess of loss reinsurance arrangement is more appropriate.

(i) Describe catastrophe reinsurance and aggregate excess of loss reinsurance. [2 Marks]

(ii) Appraise the relative effectiveness of each of these reinsurance options for WOL. [3 Marks]

(c) WOL's Board is concerned about occurrences of potential pandemics such as SARS, 'Bird Flu' and 'Swine Flu' – specifically, regarding the particular risks that a company such as WOL might face should an actual pandemic occur. Discuss what you consider the major risks for WOL are, in the event that a major pandemic occurs. [9 Marks]

Solutions

(a)

Benefits with WOL's terms for new business:

- A four year rate is likely to be attractive for some employers, for stability and planning purposes;
- The offer of continuation options on what appears to be very lenient terms may also be an attractive feature or condition of employment for employers to pass onto employees;
- Both of these features above would enhance the relative attractiveness of WOL's group insurance scheme, enhancing the possibility of a successful sale;
- The lack of a profit share means less administration and a simpler arrangement for WOL to manage.

Risks with WOL's terms for new business:

- 6 months is a very long period to exercise a continuation and it also poses significant risk of selection against WOL;
- The lack of a profit share provides less incentive for the employer to lower claims costs (such as encouraging injured or sick employees back to work);
- The 4-year guaranteed premium rate is very long for group insurance, and inappropriate where experience may be volatile or uncertain which is likely for all but extremely large group schemes (and even those may be volatile as well);
- An uncertain economic environment and unemployment risks, presents risks for TPD which are increased because of the long guarantee period;
- Most likely a 4-year rate as well as even 4-year coverage is out of line with the market. As such is it really needed, and can WOL still have attractive new business terms without this feature ?

Marking guide:

1 mark for each benefit discussed to a maximum of 3 marks SJ.

1 mark for each risk discussed to a maximum of 3 marks SJ.

To a maximum of 6 marks SJ overall.

(b) (i)

Catastrophe reinsurance provides protection against relatively high concentration risk likely through its group insurance. This is especially true if some of the large employers are associated with higher-risk activities, such as the potential for one catastrophic event to occur in the mining, manufacturing or construction industries. It also would cover the risk of a group of employees from one employer travelling together to a conference. The list of catastrophes would be defined with an upper limit on the claim amounts to be paid by the reinsurer.

Aggregate excess of loss reinsurance mitigates high claims experience over a specified period on an aggregate level across all of WOL's business. The reinsurer will pay a proportion of total claims once the total claims exceed a predetermined level, with an upper limit on the claims to be paid. For example, the reinsurance arrangement could be structured so that the reinsurer pays 90% of total claims in excess of 2 times the expected claims over the calendar year 2009, with a limit of $10m total claims paid.

Marking guide:

1 mark KU for defining catastrophe reinsurance.

1 mark KU for defining aggregate excess of loss reinsurance.

To a maximum of 2 marks KU for part (b) (i).

(ii)

- Both reinsurance options could be useful to WOL because of the nature of their risks and the scheme arrangements. Thus an aggregate excess of loss reinsurance arrangement could cover the exposure to potential risks across all groups that may not be defined as catastrophe related, such as a pandemic.
  [Note for markers: 1 full mark should only be given if the answer includes why both treaties are useful.];
- The choice will depend on and a more detailed analysis of the nature of underlying risks that WOL is exposed to as well as the interaction of catastrophe/aggregate excess of loss reinsurance with other reinsurance arrangements in place;
- The choice will also depend partly on the price of each cover. The premium for catastrophe reinsurance will depend on a number of factors, such as the assumed exposure to the catastrophe and the profile of sums insured. The premium for aggregate excess of loss can be relatively high as the direct writers (i.e. WOL) may show little interest in the claims experience once the retention limit is exceeded.
  [Note for markers: 1 full mark should only be given if the answer includes details of the setting of premiums for each reinsurance option.];
- The choice will also depend on the availability of each type of reinsurance.

Marking guide:

1 mark for each point discussed to a maximum of 3 marks SJ for part (b) (ii).

To a maximum of 5 marks overall for part (b).

(c) The major risks that WOL would face in the event of a major pandemic include:

- The risk of higher mortality claims. This depends on the contagious nature of the disease, and the associated mortality rate with it (e.g. a disease that is highly contagious but has low mortality rates may not have a significant impact on mortality);
- The ability of reinsurance companies to pay claims may be at risk. Reinsurers are likely to have much higher exposure to pandemics overall and may be impacted by higher claims more so than direct insurers;
- WOL faces significant concentration risk being a group insurer, and also if a lot of its business is concentrated geographically, for example in cities, or industrial areas, etc;
- Capital risks exist if reserves need to be strengthened in response to much higher claims (or possibility of higher claims);
- A pandemic may result in a general economic slowdown and hence investment returns suffer, decreasing further capital strength;
- Reputation risk also exists if liquidity becomes an issue and claim payments are delayed unnecessarily – for example with increased claims, available cash to pay them may be limited or stretched;
- A further risk from this is that cash may have to be sourced from breaking existing longer-term investments, which has immediate costs in terms of charges, and resultant longer-term opportunity costs and lower returns;
- There are significant operational risks if WOL's own staff are affected by the pandemic. The loss of both numbers of staff as well as key skills and expertise (for example, claim managers) at a time when they are likely to be most needed would be very detrimental;
- There may be a resulting much higher demand for life insurance, which ironically could be a risk in terms of capital, and more pertinently if WOL could face reputation risk if it is unable to underwrite, assess and issue new policies in a timely manner (coupled with the lack of key staff above);
- There is a risk that current underwriting methods and knowledge may be inadequate to ascertain reasonable risk factors, or that it cannot be made adequate in a timely fashion;
- If there is a general economic slowdown, and group employees subsequently leave the employer, there may be increased take-up rates of continuation options, perhaps with a further degree or higher impact of anti-selection against WOL.

Marking Guide:

1 mark for each point raised with a reasonable explanation to a maximum of 9 marks CJ.

QUESTION 5 **(19 Marks)**

You work for an actuarial consulting company that has a medium sized Australian Life Insurer, Asterix Ltd., as one of its major clients. The CEO of Asterix Ltd. has come to you to ask a range of questions about the lack of lifetime annuities in the Australian market. The CEO thinks that their use may become far more prevalent with an ageing population and what he perceives as a growing need for security of retirement income. He is frustrated that they are not already in widespread use.

(a) From the perspective of an individual purchaser, discuss the main benefits of purchasing a lifetime annuity. [4 Marks]

(b) Discuss the main reasons why lifetime annuities are not currently popular in the Australian market from the point of view of an individual. [4 Marks]

(c) Despite the reasons outlined above in (b), the CEO still thinks that Asterix Ltd. should develop and market a lifetime annuity product. His Appointed Actuary however has indicated a number of reasons why Asterix Ltd. should not do so at the present time. The CEO wants you to clarify what the main reasons would be for not developing an annuity product. Discuss the main reasons why lifetime annuities are not currently popular in the Australian market from the point of view of a life insurance company. [4 Marks]

(d) The CEO now thinks that a major innovation could involve developing a lifetime annuity product, with a rider attached that guarantees a minimum payment period. This rider would guarantee that benefits are paid out for a minimum of 10 years, regardless of the insured life's survival. That is, if the insured died before 10 years of payments were made, the annuity would continue to make payments until 10 years had elapsed. In addition, a surrender value would be paid during the guarantee period. Draft a note to the CEO discussing the advantages and disadvantages of the proposal. [7 Marks]

Solutions

(a)

- The main benefit concerns the certainty of a future cashflow stream;
- With the timings, amount, and form (e.g. level versus inflation-linked) of payments, selected by the individual to match their perceived requirements into the future;
- Longevity risk – that is, the potential to outlive the financial means to support oneself in the manner envisaged, is mitigated to a degree by the purchase of an annuity;
- As is investment risk, which can significantly impact future income in an adverse manner if returns are less than anticipated.

Marking guide:

1 mark for each bullet point made and discussed to a maximum of 4 marks KU.

(b)

- There is a preference for lump sums (lump sum 'culture') to pay for immediate needs for a recent retiree (such as health costs or debt) or for personal preferences (such as a holiday or car);
- Lack of flexibility in terms of drawing an income – income needs are generally not 'linear' e.g. Retirees may want to spend on holidays for a few years, followed by a few quieter years before health costs start to increase;
- There is already a form of life annuity available to many in the form of the state provided pension;
- No death benefit paid and thus loss of bequest possibilities upon death;
- Not wanting to be locked into a long term product e.g. no surrender possibility in case a policyholder changes their mind;
- The security factor of placing a large amount of money with a company that may or may not be around in 40 years to continue paying what is due – exacerbated by recent high-profile corporate failures;
- The belief that better returns can be achieved elsewhere, or that the money can be managed better by the individual;
- Efficiency of the investment in terms of tax and an income stream that can offset State provided pension entitlements;
- Lump sum proceeds at retirement may not be sufficiently large to make an annuity purchase worthwhile (e.g. why part with $20,000 for a future income stream of $30 per week);
- A lack of awareness of product features and benefits, and what an annuity actually provides;
- Annuities are perceived as expensive or not 'actuarially' fair;
- Which is exacerbated by the self-selection of those who do take out annuities who are generally healthy;
- A lack of awareness of need for longevity protection;
- Reliance or 'fallback' on other things, e.g. family support, or working into traditional retirement ages.

Marking guide:
0.5 marks for each bullet point to a maximum of 4 marks KU.

(c)

- First and foremost there is the obvious lack of demand as per (b) above;
- The company has the longevity and investment risks, and the profits made from lifetime annuities may not compensate for these risks;
- Insurers have in force a range of profitable business already in this market e.g. Allocated Pensions, where the client retains longevity and investment risks, so there is little incentive to change the status quo;
- Annuities have high capital requirements;
- There is a lack of suitable long dated securities, or those with appropriate features, to match the long term liabilities;
- Profitability is very sensitive to longevity and mortality improvements are very difficult to forecast, making such a product risky;
- A general lack of advisor knowledge and awareness of annuities would require significant investment from insurers to develop this market;
- Superannuation lifetime annuities are subject to minimum payments as set out in legislation, which may reduce the return for the company. *[Note for markers: This is technical point which may be raised by candidates.];*
- The company could pass on the costs of providing the minimum payments for a superannuation lifetime annuity to the purchaser by reducing the yield. However, this would be a disadvantage to the company in terms of marketing this product. *[Note for markers: This is technical point which may be raised by candidates.]*

Marking guide:

1 mark for each bullet point made and discussed to a maximum of 4 marks SJ.

(d)

MEMO

To: CEO
From: Consulting Actuary
Re: Guaranteeing a Minimum Payment Period for a Lifetime Annuity

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Dear CEO,

You are considering developing a lifetime annuity product, with a rider attached that guarantees a minimum payment period. This rider would guarantee that benefits are paid out for a minimum of 10 years, regardless of the insured life's survival. In addition, a surrender value would be paid during the guarantee period.

As requested, I have set out below the advantages and disadvantages of this proposal.

<u>Advantages include:</u>

- In the Australian market this would be reasonably innovative and may provide a reason / incentive for new marketing and new interest in the area;
- It would alleviate some (but not all) concern of policyholders about the lack of bequest with a lifetime annuity;
- Offering a surrender value during the guarantee period, provides flexibility which could be attractive to policyholders.

<u>Disadvantages include:</u>

- The major disadvantage with this is likely to be the cost associated with the rider. The rider would have a significant cost in that it must allow for all payments to be paid for a period between 10 years and time of death, rather than 0 years and time of death. If the price of annuities without such riders is a disincentive for individuals, the perception of high cost would be made worse with this rider attached;
- This perception of high cost would be exacerbated if the rider is not well understood by individuals nor portrayed well by advisors, which is always a risk with an innovative feature;
- The lead time to develop this product and associated costs of training, administration systems, reinsurance etc could be significant;
- Potential complexities and associated costs with the need for the administration system to calculate surrender values during the guarantee period;
- The same pricing risks would exist as for lifetime annuities without the rider, in that appropriate longer term assets are scarce, assumptions about mortality improvement are not straightforward, etc;
- The company may have already have low returns from the superannuation lifetime annuity portfolio as these are subject to minimum payments as specified in legislation. Offering a guarantee for 10 years, may further reduce the return for the company. *[Note for markers: This is technical point which may be raised by candidates.]*

Kind regards
Consulting Actuary

Marking guide:

Format of Answer:

1 mark CJ for answer in memo format and appropriate language. This should include an introduction in the memo.

Advantages:

1 mark CJ for each advantage discussed to a maximum of 3 marks CJ.

Disadvantages:

1 mark for discussing the cost of the rider.

1 mark for any other disadvantage discussed to a maximum of 3 marks CJ overall.

Overall 7 marks CJ for part (d).

END OF PAPER

