EXAMINERS' REPORT

November 2017 examinations

Subject F101 — Health & Care Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principal Examiner. General comments are provided on the performance of candidates on each question. The solutions provided are an indication of the points sought by the examiners, and should not be taken as model solutions

SOLUTION 1

Candidates generally performed well on this question however many did not adequately apply part (i) to the specifics of the question and missed out on the points relating to lapse and re-entry and anti-selection.

(i) Considerations

- Offering more comprehensive benefit suite should increase sales for insurer leading to greater profits; √√ this should appeal to advisors too who are more likely to offer insurer's products if more flexible product range √√
- Price of standalone benefit is higher than accelerated benefit due to fixed expense charges and admin fees, anti-selection risk loading, etc.; √√ insurer will need to decide whether to continue offering accelerated benefit alongside standalone so consumer has choice of cheaper option √
- The increased price may also not be well-received by the market, resulting in reputational risk for the insurer √
- Anti-selective risk increases with standalone benefit as main reason for purchasing cover is the CI benefit and not the death cover; √ this could increase with giving option above as the anti-selective purchasers will opt for the standalone cover and the lower risks buying the cheaper (accelerated) option potentially √√
- May have to change underwriting and acceptance practices for these products √
- Other complexities, e.g. systems/admin and policy wording needs to be considered√
- Intermediated business will further increase anti-selection as policyholders could be guided by advisor to take out standalone if feel at greater risk of claiming √
- Cannibalisation of book possible if sales were being made to policyholders wanting CI but having to purchase Life cover too; they can now circumvent the life cover purchase. Insurer can decide whether to make the standalone option significantly different so as not to compete directly with accelerated. √√

[Max 5]

(ii) Product considerations:

- Increase number of illnesses/conditions covered √
- Make tiered structure √
- Terminal illness rider – aligns nicely with death plus accelerated version √
- Child cover as % of main member sum assured √
- ADL catch all clause to cover conditions not listed but intention is to pay √
- Reduced/no underwriting if already a policyholder √

[Max 2]

SOLUTION 2

This was a bookwork question which was poorly answered. Some candidates may have 'spotted' as this section has not been regularly tested in the past, and as a result paid the price.

(i)
A one-way analysis ignores correlations and interaction effects between variables (√), for example age and disease, age and smoker status (√ for each example, max √√). As a result, the model may underestimate or double count the effects of the variables (√).
A GLM produces estimates of the true value of relativities (√), by taking account of correlations and allowing investigation of any interactions between variables present in the model.(√)

(ii)
Assumptions of the classic linear model:

- Error terms are independent and come from a normal distribution (√√)
- Mean is a linear combination of the explanatory variables (√)
- Error terms have constant variance (homoscedasticity) (√)

(iii)
GLM advantages over the classic linear model:

- More general than just the Normal Distribution as a GLM can take on any distribution from the exponential family e.g. Poisson, Gamma, Tweedie (√√)
- Using a Link function, can take account of the multiplicative nature of explanatory variables and their effects and transform them to linearity, as opposed to a classic linear model which assumes the effects of the explanatory variables are additive. (√√)
- The variance of the response variables (Yi's) is a function of its mean (√) and can often increase with the value of its mean (√) e.g. the Poisson distribution (√) and as is usually the case when modelling claim amounts)(√)

SOLUTION 3

Overall candidates seemed to struggle with this question with only the stronger candidates outlining their question well and tackling each part of the question asked. For part (i) there was evidence of students not reading the question properly with many missing the part to describe the features of cash as an investment vehicle first. Weaker attempts made the error of assuming that other investment types could not be converted into cash once liquidated i.e. that cash was the only investment which could produce actual money to pay for expenses, for example. Cash is one investment type - a highly liquid investment which yields low positive returns. However other investments (for example equities) can be redeemed or sold, at varying degrees of liquidity, and cash is received as a result.

Candidates specifically found the CI product (part d) challenging with many assuming that since lump sum payout in fixed monetary terms, cash would be a good asset to match the liability. The longer term nature of the liability means that cash is not suitable (being a better match for shorter term liabilities).

Weaker candidates missed the point that cash would not yield the higher returns needed to ensure the asset matched the much higher expected liability payout for LTC products.

Part (ii) was bookwork and was generally well-answered.

(i)

- General
  - Cash typically yields low positive investment returns
  - But is very marketable and liquid
  - With very little risk attached
  - Great for meeting regular outgo, such as expenses or claims in payment
  - [√ each, only once (no additional credit for repeating it under a. to d. multiple times]

- a.
  - Liabilities are short-term, and claims are likely to be settled with minimal delays, so significant investment into cash (or cash equivalents) is appropriate√√
  - Premium income is likely to match claims outgo quite closely on average, so it is unlikely that there will be significant scope for investments other than cash or near-cash instruments, e.g. short-dated bonds√√

- b.
  - Liabilities are long-term in nature – uncertain inception dates and then uncertain survival periods post-inception√
  - If benefits are indemnity, then amounts are also uncertain as they are subject to trend on home and care costs which may not be in line with inflation. √
  - Amount of cash required depends on level of expenses and amount of claims in payment (possibly fund both from regular premium income)√√
  - Relatively large investment in cash unlikely to be appropriate given long-term nature of benefits, but to the extent which claims may exceed premium income, some cash may be required√√
  - Cash unlikely to yield the higher returns needed to make the product more marketable and price competitive. Longer term, higher yielding investments may be more suitable eg. Equities, property, long term bonds √√

[max 2.5]

- c.
  - Payment of liabilities starts immediately, so some need for cash investments to meet this outgo√
  - Uncertain survival duration, so some longer-term investments also appropriate, given that they are sufficiently liquid to realise as and when required√√

- d.
  - Liabilities are long-term in nature with uncertain incidence of individual critical illnesses and hence claims√
  - However with a large enough portfolio, incidence in any one year should be stable, reducing the need for relatively large cash holdings √
  - Some cash needed to meet:
    - Claims as they fall due
    - A reserve in case a larger proportion of lives with higher benefits claims
    - regular expense outgo√
  - However, significant cash investments likely to be inappropriate√

[Max 8]

(ii)

- Restrictions on the type of assets the insurer can invest in
- Restriction on the amount of any asset that can be used to demonstrate solvency
- Restriction on the maximum exposure to a single counterparty/country
- A requirement to hold a certain proportion of total assets in a particular asset class
- A requirement to match assets and liabilities by currency
- A requirement to hold a mismatching reserve
- Limit the extent to which mismatching is allowed (if at all)
- Restrictions on the valuation method(s) that may be used
- Custodianship of assets

[√ each, max 4]

SOLUTION 4

For part (i) candidates spent an unnecessary amount of time explaining the anti-selection risk presented by individuals relative to groups. This left candidates with very little room to address the differences in underwriting approaches – which was what the question required.

Part (ii) was bookwork which candidates answered well.

For part (iii) candidates were somewhat creative in the design most of which seeming to have some merit - credit was assigned accordingly. There were a lot repeating points for each benefit e.g. using a network of providers or Price = number of claims (incidence) x cost per claim. Candidates were given credit for the first occurrence of a particular point. Candidates failed to identify high risk groups that could yield the most cost effectiveness if the preventive benefit is introduced.

(i) 6 marks

Large Group:

There needs to be a definition of what constitutes a large group

Will require cover to be compulsory

The health status of the actual *individual* members of a group scheme is not taken into account (may be a free cover level but less likely for medical expense business).

Rather, a more global view is taken in assessing the expected experience of the group as a whole – eg demographics and prior experience

Some lives in poor health may be accepted because they will be balanced out with lives in good health.

Account may, however, be taken of the actual experience of the group and an "actively at work" requirement may be imposed.

Small Group:

More likely to be underwritten as individuals but less rigourous

May be considered for compulsory membership

Data received may not be as granular as with individual applications. Data may be handled by an intermediary.

Individuals:

Will collect individual medical questions, and perhaps also tests.

May load, exclude or decline

There may be restrictions on the extent of underwriting allowed.

(ii) 5 marks

- Listing of employees
- Including age, gender, occupation, family size and dependent information, salary levels (1)
- Details of previous cover
- Claim experience where available
- Type of industry
- Location
- Whether cover is compulsory
- May collect general (short list of questions) health status
- Worksite information such as whether a wellness programme is in place, Health and Safety protocols in place
- Details on the benefits applied for by the group
- Historical Movement patterns in and out of the group

(iii) 8 marks
Price = number of claims (incidence) x cost per claim
Annual dental checkup
All members likely to be eligible
Need to estimate take up (per age category)
Need to define what is included
To get accurate cost per claim
May have preferred network where benefits are available
May restrict frequency eg one per annum
Capitation as a reimbursement method for this benefit
Could identify secondary treatments which could be eligible for payment

Mammograms
Very effective screening for breast cancer
But expensive
Need to focus on higher risk cases
Eg by age
And family history (i.e. set eligibility criteria)
Likely to be a marketable benefit
Also need to consider take up in at risk population
Might increase overall incidence of breast cancer, since some might have left the group or died before detection.

Blood glucose tests
Important test to identify diabetes
Screening test relatively inexpensive
Need to cover medication and treatment if identified
Effective in lowering claims
Likely to be a marketable benefit
Higher risk for those with family history of diabetes
Could be setup as part of wellness days / wellness programmes for the group
Also consider regulatory requirements and what competitors are doing.

SOLUTION 5

Part i) was well-answered given that it was bookwork.

Part ii) was not well-answered. Few candidates recognised that risk adjustment was necessary although most at least recognised that seasonality and IBNR adjustments will be required. Weaker candidates seemed to not understand the question and some gave an explanation of how to calculate PLPM figures

Part iii) was relatively well-answered.

(i)

Bookwork

- Update assumptions for future experience
- monitor actual compared to expected experience and take corrective actions as needed
- monitor any trends in experience
- provide management information to aid business decisions
- make more informed decisions about pricing and about the adequacy of reserves.

(ii)

- The focus of the experience analysis is to determine what is driving the higher claims experience.
  This could be as a result of higher utilization, more expensive claims, or simply a result of a changing profile.
- Extent of analysis will depend on having valid data available.
- And the experience being credible (will need quite a large number of lives for inpatient claims which have a low frequency and potentially very large costs)
- An allowance needs to be made for outstanding claims/ IBNR.
- The analysis needs to consider large or exceptional claims. It could be the case that the increase is driven by a multitude of abnormal claims.
- An allowance needs to be made for the seasonality of claims given that the full year 2016 is contrasted against 2017 claims up until the end of May.
- Alternatively, one could consider claims for only the period that is fully run off, however this would decrease the amount of data available and thus the credibility of the analysis.
- An allowance needs to be made for benefit changes between the 2016 and 2017 year.
- Claims need to grouped into homogenous risk cells. However, it is necessary to ensure that there is sufficient data in each risk cell to ensure credibility.
- Risk-adjustment must be allowed for in the analysis given that case mix may have changed over benefit years.
- Similarly, an allowance needs to be made for changes in the demographic profile between benefit years.
- An allowance needs to be made for changes in medical treatment and technology between years.
- If the majority of lives were underwritten in 2016 and the experience was expected to be low, there may have been an expectation for claims costs to increase dramatically in 2017 i.e. out of waiting period experience driving the poorer experience
- Changes in regulation if any between years need to be accounted for.

- Hospital claims per life per month is a function of both claims frequency (number of admissions) and claims severity (cost per admission). The analysis needs to examine each component in turn.
- Reviewing the experience may lead to analyses on the member risk factors, the different benefit categories (although post-hospitalisation may be expected to be small), or the different providers.
- The experience of the insurer should also be compared to industry or market experience to identify whether the trend is specific to the insurer or whether the trend occurs at an industry level.

(iii)

- The insurer can implement a stricter pre-authorisation process to identify claims that do not require hospitalization.
- The insurer can form provider networks which exclude doctors who admit patients unnecessarily.
- Similarly, the insurer can approach hospitals and form hospital networks with facilities which agree to refuse unnecessary admissions for minor ailments.
- Networks could also allow for an alternative reimbursement structure where hospitals are incentivized to only treat conditions that really require admission
- The insurer can adjust its benefit design:
  - include basic out of hospital treatment for minor ailments so that hospitalization is not necessary. This will impact price however
  - Apply a co-payment or deductible for specific treatments
  - exclude treatment for common ailments which do not require hospitalization.
- Alternatively, the insurer could implement case management for cases where the insurer suspects patients are admitted unnecessarily to ensure that they are immediately discharged once identified.
- The insurer can target policyholders who are healthier and thus less likely to fall victim to these minor ailments.
- The insurer can also implement wellness programs and preventative treatment methods to ensure that policyholders do not fall sick where possible.
- The insurer could also simply do nothing and adjust premiums to allow for this trend if it appears to be an industry wide problem.

SOLUTION 6

This question was generally well answered as there were a number of marks available. Candidates that scored highly considered a broader perspective as well as a detailed solution. Marks were awarded for considerations of gross premium valuation methodology and reserves, describing the assumptions, describing how they would be derived and the source of information, and also stating as to what the prudent assumption would be.

A prudent basis, rather than best estimate should be used with appropriate margins for adverse deviations.
Regulatory requirements need to be taken into account
Professional guidance should be consulted
Interest rate
Take account of currency
Regard to yields on existing assets
Regard to yield on sums to be invested in the future Credit/default risk
Term of the liabilities

A low rate is prudent

Mortality

Need to consider mortality both pre and post claim.

Pre claim

Take account of sex and age Underwriting policy

Territory of insurance

A low rate of mortality is prudent.

Post claim

Factors as above:

Take account of sex and age and extent of impairment

Duration of claim (note this is for active lives) NB: Cause not required as this is for active lives Source of data eg published statistics

A low rate of mortality is prudent

Morbidity

Need to consider both probability of claim and claim recovery rate (probably very low)

Pre claim

As for mortality

Take account of sex and age Underwriting policy Territory of insurance Occupation class

A high rate of incidence is prudent.

Post claim

As for pre claim

Take account of sex and age and extent of impairment

Occupation class

Duration of claim (note this is for active lives) NB: Cause not required as this is for active lives Source of data eg published statistics

A low rate of recovery is prudent

Expenses

Gross valuation so would look to allow for expenses in line with best estimate plus margin

Allow for:

Product design features

Territory

Claim costs Administration costs Commission

Need to allow for future expense inflation. Should be based on analysis of recent experience Surrenders generally aren't allowed for as they are unlikely to be prudent (insurer expects to make a profit on surrenders.

SOLUTION 7

Candidates performed well on part (i) if they took a structured approach to describing the data requirements and then the calculation process. A large number of candidates omitted basic points like an adequate data collection period. Part (ii) was generally well answered. For part (iii) a large number of candidates multiplied the risk factor by the average cost per admission thus compounding the differences and getting non-sensible results. This suggests that candidates are acting by rote rather than thinking about what the risk adjustment factors mean and what a normalizing process aims to achieve. Some candidates also applied the demographic risk factors to the average admission cost rather than the risk adjusted average. There was some confusion around the wording for part (iv) and so credit was given for a general description of risks as well as these applied to reimbursement methods.

(i) 9 marks

Need sufficient data over a representative period

Eg 3 years

- For each hospital admission need data on:
  - Date
  - Duration
  - Facility
  - Patient details
    - Age
    - Gender
    - Other conditions
  - Type of admission
  - Costs
    - Broken down per cost category
- Also need data per covered population
  - Age
  - Gender
  - Other conditions
  - Region

For case mix factors calculate cost per admission type
Normalise for demographic risk factors
And determine cost of that admission type relative to overall average cost per admission
For demographic risk factor calculate cost per member for each unique category
Relative to overall average cost per member

(ii) 4 marks

- Case mix factors are used to measure efficiency
- Enable a like for like comparison between hospitals with different admission types
- And different patient base
- So factor is the relative cost of that procedure
- To the average procedure cost
- for the average patient
- 1 mark for appropriate style and tone

(iii) 9 marks

Case mix calculation

Admission type	Hospital 1	Hospital 2	Hospital 3	Hospital 4
A	3500	1750	2000	0
B	1500	375	0	600
C	800	400	4000	0
D	2800	350	1000	1400
E	1400	350	0	0
Ave cost per admission	25700	21800	12100	32600

Demographic risk factor	0,987	1,025	0,93	1,086
Case mix	1,0000	0,8293	0,5147	1,4882
Adj cost/adm	25 700	26 288	23 511	21 906
Risk adj	26 039	25 647	25 281	20 171

Calculation 6 marks

- Hospital 1 has highest volume and highest risk adjusted admission cost
- High volume could lead to deteriorating standards
- Hospital 2 is smaller with lower risk adjusted admission cost i.e. appears more efficient
- Hospital 3 seems to focus on lower cost cases – could be a day hospital
- Hospital 4 seems to focus on higher cost cases
- And is most efficient
- Could be specialized facility

Alternate solution:
Obtain CMA per admission by: Sum(Adm#(i)/CMA(i))/Sum(admissions)
Then dividing the above by demographic factor for each hosp respectively, gives the demographic risk adjusted cost per admission answers.

CMA cost per admission		Demographic RA cost per admission	
1	34 725.18	1	35 182.55
2	35 139.16	2	34 282.11
3	27 896.15	3	29 995.86
4	24 739.29	4	22 780.19

(iv) 6 marks

Reimbursement methods

- Modified fee for service
    - Can negotiate tariffs
    - May include accommodation and professional fees
    - Most risks remain with fund
- Global fee (per diem or per case)
    - On a per procedure basis
    - May include per diem rates
    - Admission risk remains with Fund
- Capitation
    - Calculated on a per prospective patient basis

    - May contract with network of facilities
    - Transfers admission risk to hospital as well as intensity risk
- Budget allocation
    - Provides operational budget to facility to cover all costs
    - More appropriate for state-owned facilities

Credit was also given for a general description of risks including frequency, severity, pricing, patient satisfaction and fraud.