

EXAMINERS' REPORT

June 2016 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

Part (i) was generally well-answered, however, many candidates did not understand the guarantee properly, and as a result did not score well, especially in part (ii) of the question which relied on insights from part (i). Many thought that the guarantee related to the surrender charge and answered the question on this basis, which is incorrect – the risk relates to the guaranteed minimum return of premiums biting.

- (i) 4 marks
- The risks posed by offering this guarantee relate to the risk of the guarantee biting in future
 - In the early years, before the policy has built up a positive asset share, i.e. due to commission and other upfront costs, the guarantee will bite on surrenders, resulting in a loss to the insurer.
 - If, in future, investment returns are poor, and the unit fund performed poorly, the guarantee will bite on surrenders, and the insurer will make a loss on these policies
 - If competitors aren't offering a similar type of guarantee, it could result in some policyholders selecting against the insurer, e.g. if there are expectations of market downturns in future
 - Policyholders may be less inclined to keep their policies until maturity given this guarantee, because the final benefit is not guaranteed, so in times of poor performance, significant numbers of policyholders may surrender their policies to capitalise on the guarantee
 - If returns are poor enough, and large numbers of policyholders surrender their policies, this could threaten the viability of the insurer, e.g. it may not be able to cover its overheads, or have enough liquidity to fund the surrender outgo
 - The health insurer relies on charges to the unit fund for its contribution to overheads and to profits. If the surrender terms are favourable, i.e. surrender charge not high enough or if the guarantee bites, then more policies are likely to surrender thus leaving a shorter term for the insurer over which to collect charges.
 - Favourable surrender terms could lead to selective lapsing
 - New business strain if the guarantee is highly effective in selling business
 - Pricing risk for the guarantee as it may not have data or be able to accurately allow for the risk of the guarantee biting
 - [$\sqrt{\quad}$ per valid point plus $\sqrt{\quad}$ for suitable examples/illustrations, max 4]
- (ii) 4 marks
- Do not offer this guarantee
 - Reduce the surrender benefit amount guaranteed (e.g. 75% of premiums paid)
 - Offer the guarantee only after some initial period has elapsed, e.g. after 2 years and the insurer is reasonably certain that the asset share will be positive
 - Offer a similar guarantee on the eventual claim benefit to discourage earlier surrenders when returns are poor (however, this poses the risk

of this additional guarantee also biting, but should reduce the significant early lapse problem)

- Ensure that the surrender charge is sufficiently high to discourage surrenders in times of good investment returns (times in which the insurer gets more money from charges on higher unit funds)
- Research what competitors are offering and offer something similar to reduce the risk of policyholder selection
- Where policyholders have a choice in underlying investments, ensure that these are limited to well diversified, and relatively safe investments, e.g. blue chip shares or government bonds, etc. to reduce the risk of negative/poor returns
- Diversify product offering, so that if the long-term care business performs poorly, other products may be able to absorb this poor performance with minimal impact on shareholder profits or security of policyholder benefits
- Strengthen reserves so that an appropriately large cushion against adverse experience is available
- Derivatives or other investment strategies can be employed to protect against poor performance (bearing in mind that this may be costly, may increase investment risk, and will require additional skills and expertise)
- Transfer some of the risk to a reinsurer

[√ per valid mitigating strategy, max 4]

SOLUTION 2

Part (i) was reasonably well answered. Under part (ii) candidates were not generally specific enough about who is more likely to be affected. Under part (iii) candidates tended to consider either expatriates or local residents rather than both.

(i) 4 marks

Who affected:

- older individuals
- with higher health risk
- likely to have limited income

Risks faced

- need capital to fund accommodation in the event of being incapacitated
- reliance of family members to provide personal care (loss of income)
- unexpected medical expenses
- cost of ongoing treatment for chronic conditions

Health insurance products

- medical expense cover for acute treatment
- long-term care cover for custodial care
- immediate needs can be purchased with retirement proceeds
- better to have funded a pre-funded product (but may not claim)

(ii) 4 marks

Who affected

- Informed people aware of new treatments
- Concerned about serious illnesses
- May have family history

Risks faced

- unexpected serious illness
- high cost associated with new technology
- may not be accessible locally
- may be excluded from medical expense cover

Health insurance products

- PMI products may offer cover on comprehensive option
- Usually clinical evaluation of efficacy of new treatments assessed (and cost effectiveness)
- CI cover will provide lump sum
- Which can be used towards such treatment but not indemnity
- And condition needs to be included in list of conditions

(iii) 4 marks

Who affected

- Local residents some of whom can afford private cover
- Also expatriate residents who want to ensure best treatment available

Risks faced

- not being able to access treatment when sick
- queuing
- poor quality of treatment
- certain medication and specialist treatment may not be available.

Health insurance products

- PMI products to cover private treatment
- If there are private facilities available
- May need evacuation cover for more serious conditions
- CI cover may also assist towards affording private treatment

SOLUTION 3

Parts (i) and (ii) were bookwork questions and well-answered by most. Part (iii) was an application of bookwork to a specific scenario requiring candidates to identify sources of data that could be used to project claim costs, plus discuss their appropriateness for this purpose and possible adjustments. The question was fairly answered by most, however, many failed to score well as the answers were very generic and not applied to the given scenario. Many candidates tended to forget that the exercise is being performed by the reinsurer, and not the insurer.

i)

- No internal experience or data available ✓
- Limited expertise in pricing Cancer or Reimbursement products ✓
- Limited expertise in designing such a product: ✓
 - o Benefit design and definitions ✓

- Policy wording + limits/exclusions ✓
- Underwriting + sales ✓
- Reserving ✓
- and claims management ✓

[Max 3]

ii)

First select a suitable base period over which to collect data for the projection ✓

Would need to determine frequency of a cancer claim event in a particular year ✓, as well as severity of a cancer claim event. ✓

Credit will also be provided for outlining claims per life-year.

Ideally would also want to see how the distribution of the frequency and severity varies around the average. ✓

Experience would need to be trended to the year that the pricing is to be valid for ✓ Allow for claims inflation up to the reference period, and for the period for which the projection is to relate ✓

If data is available, may split these measures by type of claim event, early diagnosis, late diagnosis, type of treatment ✓

Would also split by risk cells (e.g. age, gender, geographic region, medical profile) ✓ i.e. into homogenous groups based on risk factors ✓

Make adjustments to the data, i.e. for different conditions covered, target market, one-offs, etc. ✓

[Max 3]

iii) [Up to 2 marks for identifying 4 relevant sources of data]

Ideally the data used would be relevant to the profile of lives being priced for, ✓

and in sufficient detail to split the experience by risk-cell. ✓

Severity

Obtaining severity data may be a challenge and would require local market expertise, to provide estimates of average costs per event. ✓

This could be obtained from medical doctors in the market or possibly may be available from hospital reports or research reports. ✓

Allow for changes to treatments, diagnosis techniques, etc. ✓

Allow for differences between providers, countries, government cover, etc. ✓

Incidence

a. Critical Illness experience ✓

Can be used to obtain cancer incidence of insured lives ✓

Relevant to the MR product ✓

However, this would often be first time incidence of cancer, and may miss out on repeat claim events ✓
(data which have not been captured in CI in the past as CI typically pays out on diagnosis of a critical condition. Products with “Reinstatements of cover” and “Tiered CI” products may provide more relevant info) ✓
i.e. this would understate the claim frequency for an MR product ✓
Would need to research the proportion of these events which lead to a second (repeat) admissions/treatments in the same year. ✓
Possibly obtained from medical reports/professionals. ✓
Adjust the data to allow for differences between different insurers, e.g. underwriting, conditions covered, limits, etc. ✓

If however the CI incidence is the probability of a claim event happening in a lifetime, as opposed to “in the next year”, the frequency would be overstated ✓

- b. Population statistics on cancer incidence ✓
May not be applicable to insured lives ✓
Population data may be outdated and in a format unsuitable for use ✓
May also only capture first-time diagnosis as opposed to annual frequency, or relapses at a later date ✓
One could look at insured life incidence and frequency relative to population incidence for a country with a similar health system and demographic profile ✓
Will provide a benchmark estimate, although would hesitate to price on this alone ✓
- c. Industry statistics ✓
- d. Consultant reports / WHO reports / others ✓

Statistics won't be available for Medical Reimbursement business, ✓
However stats may be available to obtain certain measures and statistics required, e.g.

- Could be used to benchmark estimates derived ✓
- Proportion of first time cancer events that have a repeat admission in the same year,
- Cost of different types of Cancer treatments
(Credit already given for these points in earlier sections of this solution)

Medical Trend

No medical reimbursement in place so unlikely to have a direct reference. ✓

May look at population statistics or CI experience to see how incidence is changing over time ✓

May look at government information on CPI, or industry reports, to see how cost inflation is changing. ✓

[Max 11]

SOLUTION 4

Candidates who made a reasonable attempt at this question were able to score marks for interpretation. Parts (i) and (ii) tended to be reasonably well answered but some candidates did not provide any comments/interpretation of results. Under part (iii) some candidates multiplied the length of stay by the case mix factor rather than dividing or used the inverse i.e. case mix divided by length of stay which gave an inverse result. Marks were awarded for interpretation even if calculations were not entirely correct. Candidates who struggled with the calculations tended to leave out part (iv) where marks were available for simply setting out the pricing process and how risk adjustment would be incorporated.

(i) 3 marks

- Case mix reflects the severity of each case on a risk-adjusted basis
- And will be affected by things like the age of the patient, diagnosis severity
- The factor reflects the expected relative cost of each DRG relative to the overall average cost per day in hospital taking account of risk factors.

- Change in case mix (1 mark)

Newborns and other neonates	+3.4%
Adult respiratory distress syndrome	-3.6%
Heart Failure and Shock	+2.8%
Knee Replacement	+0.7%
Acute Renal Failure	-1.3%

- indicating more birth complications in 2015.
- while ARDS had a reduction in case severity.
- HF&S had an increase in severity.
- For knee replacement the change is negligible
[Or appropriate suggestions]

(ii) 4 marks

Demand side

- Exposure in terms of number of lives
 - o Appears to be reasonably stable
- Benefit changes
- Changes in burden of disease in population
- Changes in population health seeking behavior
- Changes in management of hospital benefits e.g. pre-authorisation

Supply side

- Changes in provider practices with respect to treatment
- Access to providers
- Availability of new treatment and technology

(iii) 6 marks

Adjusted = LoS / Case Mix Factor

Base DRG	Average LoS case mix adjusted		% change
	2014	2015	
Newborns and other neonates	0.48	0.48	0.41%
Adult respiratory distress syndrome	0.48	0.50	5.54%
Heart Failure and Shock	0.48	0.47	-1.99%
Knee Replacement	0.48	0.47	-1.42%
Acute Renal Failure	0.48	0.43	-8.74%

(3 marks)

- Change in newborns is negligible
 - Escalation in length of stay for ARDS not justified by change in severity
 - Suggests need to investigate other causes
 - Other cases have a reduction more than suggested by change in severity
 - Could be better managements
 - Or worse treatment (patients dying) in case of ARF
- [Or appropriate suggestions]

(3 marks)

(iv)

Change in hospital cost will be made up of following factors:

- Increase in utilization due to:
 - o Population profile (older, sicker)
 - o Health seeking behavior (number of admission)
 - o Severity of conditions
 - o Length of stay
- Increase in cost due to:
 - o Inflation in costs
 - o Use of consumables and technology

The analysis above indicates the impact of the severity of conditions and length of stay

Still need to consider inflation and technology

And details of population / exposure to look at changes in overall costs

The analysis will be helpful for investigating efficiencies in service providers

And efficiencies achieved by interventions such as managed care

It may indicate where there is fraud/abuse that can be managed

SOLUTION 5

Part (i) was rather straightforward and most candidates scored well here. (ii) Some candidates provided general reasons why an experience investigation is important without saying what needs to be investigated and the reason for this. (ii) and (iii) candidates seemed to lack understanding of medical funds and poor application to the question or medical funds in general was seen. Credit was given where points required under (iii) were given under (ii). Candidates went into pricing detail under (iii), mentioning sources of data (industry etc.) where the question asks for the experience of fund (not pricing). Under (iii) a number of candidates gave a general overall experience analysis summary rather than an approach per factor to be analysed.

(i)

- Government will want to ensure access to the defined benefits for all citizens at an affordable level. (Protection of nation's health.)
- setting contribution rates
 - o keeps cover affordable
 - o will also manage increases in medical costs e.g. hospital and specialist charges
- rating factors (max 2 marks)
 - o may include age, gender, income, region (per rating factor)
 - o will need to balance accuracy and simplicity
- Follow social culture/ political promise.

(ii)

- **Claims experience** – frequency and amount, to see if as expected and identify any trends, chronic incidence will also have an impact on the experience
- **Expenses (Operational & other)** – the profitability of the medical fund will depend on expenses being incurred and so the analysis **is important**.
 - Need to look at:
 - o Is medical run being run as efficiently as possible?
 - o Obtain management accounts showing the breakdown of expenses.
 - o Can medical expenses be compared to other funds? **i.e is competitor experience available?**
 - o How does underlying experience compare to regulated prices?
 - o How do cost increases relate to inflation?
 - o Looking at % of contribution income can be misleading as contribution level can't be controlled.
 - o Member volumes to allow for per member expenses.
- **Investment experience** – if large reserves are held, investment performance may have a significant impact on the results
- **Demographic profile/ Mix of business** – profile of lives, i.e. age, gender, will have an impact on the experience and how this has changed as this will impact claims and profitability

- **Persistency experience** – is there any selective lapsing?
- **Pricing is not relevant** since this is fixed by government

(iii)

Claims experience

- Obtain claims by date incurred; Broken down by discipline e.g. GP, Specialist, Hospital
- Remove outliers; Provide for outstanding claims
- Using run off pattern of claims
- Determine appropriate exposure per month; Based on join and lapse dates
- Obtain claim costs per member or beneficiary per discipline
- Allow for inflation
- Compare to budget or prior year

Operating expenses

- Determine the functions to be analysed e.g. contribution collection, claim payments, marketing etc. (initial, renewal, claim..)
- Determine appropriate expense driver e.g. number of members, amount of contribution, number of claims, claim amounts
 - Looking at % of contribution income can be misleading as contribution level can't be controlled.
- Establish if there are any unusual or one-off expenses
- Split expenses by function
 - Split salaries by function (by department or using timesheets, questionnaires)
 - [Obtain salary ratios per function
 - Allocate salary related functions by salary ratios
 - Allocate other expenses by appropriate ratios]For other departments (overhead) such as HR, IT, management expenses can be allocated proportionally to expenses per line expenses
- Compare functional expenses to budget or prior year
- Consider expenses on a per principal member and per beneficiary basis.

Other expenses

- consider investment management costs relative to assets invested

Investment experience

- Look at market returns of assets held over the past period under investigation
Compare to assumptions or expectations

Demographics

- Look at changes to age/disease profile over period under investigation
Compare to what was assumed
- Level of lapses against what was expected – could be influenced by market movements (downturn in economy resulting in more lapses).

(iv)

Improve **membership** profile

- attract members where government rates higher than *risk premium*
- loyalty schemes, etc. to attract and retain healthy members

Manage **claim costs**

- through pre-authorisation/ limits/ co-payments
- case management
- negotiate with providers/ networks
- employ drs or purchase clinics

Management of **expenses**

- operational efficiencies

Improve **investment returns**

- mismatching
- good investment management

SOLUTION 6

Part (i): Most candidates did quite well on this section as it was standard bookwork. A few candidates misunderstood the question and gave answers relating to the modelling process.

Part (ii): The performance on this section was relatively poor. Most candidates gave general answers relating to market size and target markets without realising that the data needs to relate to the take up of health insurance amongst smartphone users. Strong candidates tended to score well in this section.

Part (iii): Candidates struggled with this part with almost no candidates scoring well in this question besides a handful of consistently strong students. However, even the strongest candidates lost marks for failing to mention obvious adjustments such as IBNR, seasonality etc.

Strong candidates also explained the expected changes in claims well by linking the usage of smartphones to a younger demographic, as well as explaining the effect of the using the GP as the gatekeeper for elective care. Marks were awarded for sensible suggestions about how claims should be adjusted in lieu of the expected change in protocols and demographic profile. It was also necessary for the candidates to realise that they have most of the required data in the form of the Classic option and that this should be used as the basis for adjustments.

Amongst the weaker candidates, most had run out of time on this question and others answered with option pricing techniques or failed to explain the required adjustments to the data for the new profile and concentrated on the modelling process. While they received some marks, they would have failed the question as this part makes up the bulk of the marks.

Almost all candidates failed to suggest the necessity of sensitivity testing in their answer.

Part (iv): Most candidates scored well in this section but a significant number of candidates gave answers relating to the general product design process rather than the pricing process. The question specifically asked for the remainder of the pricing process and not the product design process.

i)

Elements of a cashflow pricing model

- Premiums
- Expenses
- Commission
- Claims
- Contribution to statutory reserves
- Contribution to solvency capital requirements
- Interest on cashflow and reserves (investment income)
- Tax

Could also have:

- Allowance for Reinsurance net in/outflows

- Allowance for lapses
- Premium holidays
- Benefit level changes
- Contribution to profit

Max 4 marks. Half point for each item

ii)

Data Required:

Ideally, one would need market data on the smartphone users:

- Number in target market
- Age data
- Gender data
- Income data
- Geographical distribution of smartphone users
- Number of smartphone users that have health insurance, and
- If possible, the type of insurance
- Employment status and industry
- Number of current policyholders who own smartphones
- Number of policyholders on Classic option who would move over to new option (cannibalisation rate)

Half point per item. Max 3 marks.

Points awarded for any reasonable item that tries to link the number of smartphone users to those that may use health insurance.

iii)

The base data for the model should be drawn from the claims data of the Classic option for previous years. ✓

However, the base data should still be recent enough to be relevant ✓

In addition the data should be of sufficient volume to allow for credibility of the analysis. ✓

The data should be adjusted for claims inflation between benefits years ✓

The data should then be split into homogenous groups, in terms of risk factors or rating factors, as far as possible. ✓

The homogenous groups should also ideally reflect factors that determine smart phone usage such as age and locality. ✓ (some wider thinking required for this mark)

However, it is necessary to ensure that the groups are credible and statistically robust while capturing the risks inherent in the groupings ✓

The data should also be adjusted for any outstanding claims ✓

Adjustment should be made to remove any outliers or unusual experience from the claims data ✓

The base data must also be adjusted for changes in cover as benefits years have progressed ✓

As well as seasonal variation ✓

And changes in the cost of reinsurance ✓ The BCP is calculated for each risk cell as $\text{Total claims} / \text{Total Exposed to Risk}$. ✓

However, this will be the BCP for the Classic option as it stands before adjustments are made for changes to the expected level of claims and exposure on the new option. ✓

Now it is necessary to start making adjustments for these.

Claims for healthcare services that have not originated from a GP referral will not be paid under the new option. ✓

This means that the expected number of GP consultations will need to be increased as members who went directly to the specialist will now see the GP first. ✓

It is likely that the number of GP consults will increase by the number of unreferral consults to secondary providers. ✓

However, only a certain proportion of the GP consults will result in a referral to further levels of care. ✓

Therefore, the number of specialist consults and services used by the average policyholder will need to be decreased ✓

The new option will direct policyholders to certain networks of providers which may have different treatment methods. ✓

Therefore, an adjustment needs to be made for any differences in the cost of treatment at the network providers relative to the base data. ✓

The new option will receive preferential tariffs from network providers, so discounts need to be allowed for in the claims data ✓ The option is designed to attract younger members who are tech-savvy. Therefore, the claims experience will need to take account of the demographic profile of the target market. ✓

Specifically, the adjustments to claims need to take into account:

- Younger Age
- Gender split
- Locality (urban centres)
- Changes in family sizes
-

{ award one full mark for giving at least two factors that will affect the underlying risk profile, which should be adjusted for in the price }

The total claims experience can then be found by applying all these adjustments and the expected change in risk profile, and then, assuming our amount of exposure doesn't change, we can find our adjusted burning cost premium. ✓✓

Bear in mind the level of actuarial judgement employed in making these adjustments and getting to a singular answer. It may be worth considering some sensitivity testing by applying a range of adjustments and getting a feel for the variability of the BCP before the final premium is set. ✓✓ (some higher order and practical thinking required here!)

Max 11 marks

iv)

Given the BCP calculated above, these values should be projected forward to allow for:

- Option movements – A number of current policyholders may change to this option and an allowance needs to be made for selective effects of these movements ✓
- Claims inflation between the mean payment dates of the base period and the exposure period of the new product ✓
- Long term trends in claims experience such as increasing utilisation levels ✓
- Other changes in cover levels ✓

The required office premium can then be calculated by then adding loadings, allowances and margins to the projected base value:

- An allowance for investment income ✓
- An allowance for statutory reserves that need to be set up ✓ given the short term nature of the product these elements should be a small component of the final premium ✓ (bonus mark)
- An allowance for the required profit margin of the insurer ✓
- An allowance for commission ✓
- An allowance for the expenses allocated to the policy ✓
- An allowance for a risk margin given the uncertainty associated with launching a new option ✓

The total office premium can then be calculated by applying the required premium to the expected mix of business sold. ✓

Half mark per item

Max 4 marks