EXAMINERS' REPORT

November 2013 examinations

Subject F101 — *Health & Care*
Fellowship Principles

INTRODUCTION

The attached report has been prepared by the subject's Principle 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.

QUESTION 1

Examiners remarks

*(i) The question asked students to **evaluate** the drawbacks of using a formula approach to pricing (as opposed to list or state). We were looking for students to be able to apply the standard list of drawbacks to a short-term medical insurance product. The vast majority of students ignored the scenario that they had been provided with, and did not attempt to evaluate the relevance of the listed drawbacks to this type of product.*

(ii) This was a straight bookwork question. However, a large number of students were not able to distinguish between reserves and solvency capital. No marks were given for students who defined the purpose of solvency capital as "to remain solvent".

*(iii) The question word in this part was **explain.** As with part (i) students largely ignored this prompt and provided a list of the standard uses for a long-term projection with little or no explanation of how the projectoin would actually be used.*

*(iv) The question word here was **describe.** This together with a mark allocation of 8 marks should have prompted students to provide more detail than they did. Marks were not given for merely listing the parameters of a cashflow model. The solution comes almost directly from the notes so it was surprising how poorly this was answered.*

(v) The question asked about allowing for uncertainty in a long-term projection. The vast majority of students answered this question by considering how uncertainty can be allowed for in pricing (margins, risk discount rate) - marks we not given for these answers.

i. The formula approach has the following drawbacks:

- does not allow for the proper timing of events: this is less of an issue for short-term business as all events occur within a relative small time frame
- does not allow for the accumulation of reserves and proper allowance for capital needs: also less of an issue for short-term business where reserves are less significant and the product is less capital intensive
- It is not possible to allow for the desired rate of return required by shareholders on their capital - in effect we assume that any capital needed can be borrowed at the discount rate used: this may be a reasonable assumption in the short-term
- does not allow for separate inspection of premium related flows i.e. we cannot track expenses, claims, premiums *etc* separately each year and does not allow for changes in future experience: this concern is only relevant if we need to do a multi-year projection
- does not allow for the variation in returns and uses one fixed discount rate: appropriate matching for short-term product likely to be in money market instruments where there is little variation in real returns and returns over the long term are largely irrelevant
- cannot easily allow for more complicated product structures, *eg* unit-linked: not relevant for short-term product.

Looking at the above list of drawbacks, it will be seen that most of them are only of major concern when pricing long-term contracts. The formula approach can therefore be useful for pricing short-term contracts.

ii. The purpose of a solvency capital requirement is to provide an additional layer of protection for policyholders. The solvency capital requirement provides a cushion against adverse experience, particularly claims experience or investment conditions. Can be set at a level to ensure that the probability of the insurer becoming insolvent is acceptably low.

iii. Long-term projections are useful for aiding decisions relating to:

Capital modelling

- Assessing capital adequacy over a number of future scenarios, in future time periods
- For example, modelling how long it would take to recover from a shock in a year or modelling the future premium increases required to maintain a target solvency level

The impact of renewals

- PMI business incurs higher expenses when a policy is first sold compared with its renewal, and it is usual to spread the cost of the high initial expenses over the expected number of renewals of the policy. Cashflow modelling is sometimes used to quantify this.

Investment strategy for free assets

- Investments to match liabilities might be short-term. However, free assets may be invested in longer term investments. Would need long-term modelling to aid investment decision making.

Long-term premium adequacy

- Once a premium structure has been determined for a short-term product, cashflow techniques may also be employed to assess the adequacy of the proposed premiums over a longer term. For example, the company may have a long-term profit criterion (eg based on the expected present value of future profits at a given risk discount rate) so cashflow techniques could be used over, say, a ten-year period. Assumptions will be required for expected future renewal rates and premium increases. This would be useful if the insurer wishes to limit premium increases to a given percentage each year, for example.

iv. A full model office is the sum of a new business model and an existing business model.

A new business model projects all the expected cash and profit flows arising from future sales of new business. The new business model points might be the product of a separate sales projection model, perhaps building up the business levels expected from each distribution channel.

Existing business model is a cash and profit flow projection from all the existing business a company has in force at a particular time.

Each model will require (among other things) a *policy liability model*, an *expense model*, and an *asset model*.

The liability model will project *cashflow*s and other related values (*eg* supervisory reserves required) for policies over their future term to expiry. This involves defining aspects such as product type, charging structure, surrender values, and any special features such as options.
As input, the policy liability model will take model points (or full policy data) and parameter values for variables such as claim incidence rates and withdrawal rates.
One of the key functions of the policy liability model is to project forward, to the end of each future year of the projection period, the in-force portfolio of policies in order to calculate the supervisory reserves and required solvency margins at the end of each projection year.

The expense model for the full model office would need to calculate the total expected expenses of the company, building them up from staff numbers, resultant salary costs, system costs, property overheads, *etc*. It is important to note that, at least for the full model office, the fixed overhead expenses should be modelled globally

The asset model will almost certainly vary in its complexity according to the overall type of model and the purpose for which the model is being used:
● At one extreme the asset model for the profit test will commonly consist of a future total annual expected investment return only.
● At the other extreme, if using a full model office to assess the company's future investment strategy, we would need a stochastic asset model capable of producing an appropriate distribution of returns for each asset class, that projected income and gains separately, and of course that reflected the mix of assets held by the company from time to time.

Care will be needed to ensure that the parts of the model interact properly

v. Future uncertainty can be accommodated by using sensitivity testing, scenario modelling and stochastic modelling.

Some of the parameters in a stochastic model (e.g. number of claims or claim amounts) are allowed to vary and have their own distribution functions. A stochastic model must be run many times using random samples from the distribution functions and the model produces results in the form of a probability distribution. Disadvantages are time and computing constraints, and sensitivity of the results to the choice of distribution.

We could use a range of possible deterministic scenarios, ranging from pessimistic to optimistic, assign some probabilities to each outcome and take an expectation based on this.

This approach is highly subjective in terms of the scenarios chosen and the probabilities assigned to them.

Sensitivity tests can be performed with the full model, to assess the financial impact on the company as a whole of the likely range of variation in experience. Deterministic sensitivity tests will be carried out on some or all of the variables. Each parameter would generally be varied on its own, within the range of feasible long term possible outcomes for the variable, to see what effect such parameter shifts would have over the long term. However, the values chosen should reflect the known correlations and dependencies between the parameters.

QUESTION 2

Examiners remarks

Part (i) was well answered by candidates who addressed each item in turn rather than making general remarks, For part (ii) many candidates failed to address both alternatives.

i. A prudent basis, rather than best estimate should be used with appropriate margins for adverse deviations.

Regulatory requirements need to be taken into account

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

ii. In some countries it is standard practice to price using prudent assumptions and then to use the same assumption for supervisory purposes.
In other countries, it is standard practice to calculate premiums using assumptions that broadly reflect future experience, with the risks to the company being allowed for mainly through the risk discount rate. In this case, it would not be appropriate for the same assumptions to be used for both pricing and reserving.
Pricing basis will include an allowance for initial expenses (including commission)

QUESTION 3

Examiners remarks

(i) In general the marks for this question were low as many candidates did not refer to the specific element of the question regarding regulation of prices and answered on regulation of insurers or regulation in general. Those candidates that focused on the pricing aspect and connected it with distinct features of healthcare markets scored good marks.

(ii) Candidates generally identified the broad risks for each product correctly but did not differentiate sufficiently between general product risks and pricing risks as a result of unregulated prices.

(iii) Candidates generally provided a comprehensive list of risk management measures that were appropriate for a PMI product and therefore scored well.

i. The key reasons that the prices for medical goods and services are regulated in many countries:
   - Access to healthcare is seen as a basic human right (public good characteristics)
   - The existence of health insurance may distort market price determination mechanisms (third party payer effect)

- Consumers experience challenges in making informed decisions about healthcare services needed. Information about the range and quality of healthcare services relative to cost is difficult, if not impossible, for consumers to obtain. This is compounded by:
    - irregular consumption of healthcare services and lack experience in evaluating the service
    - experiences of different individuals, which are often not comparable and therefore one cannot use the recommendations of others in making decisions
    - the fact that the results are often not related to the quality of the service, but rather to biological processes. The quality of the service therefore cannot always be assessed by the improvement of health.

ii. The insurer is only exposed to the risk of prices being higher than expected on indemnity products. For critical illness products there will be a pre-defined sum assured so there is no risk to the insurer. For long-term care, the risk will depend on the product design. If the product provides indemnity cover the insurer will be exposed to changes in price over the long term – the longer the term, the more unpredictable future prices will be. For PMI cover the insurer is also exposed to prices being higher than expected but only in the short-term.

iii. The insurer can implement the following:

Approved provider networks where policyholders are encouraged to seek services from healthcare service providers who are registered with the insurer. By developing relationships with a network of healthcare service providers the insurer is able to manage claims costs through *negotiating fees and service standards* with healthcare service providers. (marks also given for alternative reimbursement e.g. capitation)

Limitations on benefits to protect the insurer from higher than expected claims. Benefit limits may have a negative impact on unhealthy policyholders in need of cover who exhaust their benefits.

Co-payments and levies require policyholders to pay a fixed amount or proportion of the cost of the healthcare services used. The co-payment makes the insured responsible for some of the cost associated with the service and increase their sensitivity to the price being charged. Co-payments may have a negative impact on access for lower-income policyholders.

Medical savings accounts where policyholders are required to self-fund day-to-day medical expenses – i.e. the insurer can transfer the risk for these benefits to the policyholder.

QUESTION 4

Examiners remarks

i) Students that quoted 'nature, term and currency' verbatim from their notes without relating the answer specifically to the question i.e. the linkage to PMI features received no marks
Many students spoke about maximising return but the focus of the question was rather aimed at matching assets for PMI products. Very few students managed to cover the points around diversification and security.

ii) In addition to the marking schedule the following points also received credit:
- *Custodianship of assets*
- *Availability of reinsurance in the market*

iv) Some students misread the question and only discussed relative advantages and disadvantages on either the admissible or allowable basis and not both

i.

Term – liabilities tend to be short-term so liquidity is important

May be some longer term liabilities if writing age at entry rates or guarantees

Currency – liabilities tend to be local currency denominated but if medical equipment and medication is imported there is still some exposure.

Nature – Medical inflation tends to exceed CPI so liabilities that are real in nature are more appropriate. (but offset by short term)

Diversification – need to ensure a good spread of liabilities, self investment limited

Security – classes such as derivatives may not be allowed

ii.

- Process involves understanding existing regulatory environment
- Levels of compliance with any existing regulations
- And nature of products written
- Size of market
- Availability of assets in the market
- Assess current exposure of existing players to different asset categories
- Consider implications on the market/price of assets of changing regulations
- Consider levels of expertise in insurers to monitor and comply
- Consider expenses of complying with regulations
- Consider ability of regulator to monitor
- Alignment with other areas of regulation e.g. solvency capital requirements
- Regulation of other types of insurance
- And overall philosophy of regulation (e.g. twin peaks, rules based)
- Report in a professional way

iii.

- Admissable assets means some assets may not count for solvency regulations
- Allowable assets means that it is an offence to invest in assets outside of the regulations

iv.

- Regulating on an allowable basis is more restrictive
- Provides greater protection to policyholders
- But may exclude some high yielding classes
- May also force insurer to rebalance in classes where performing well
- Regulating on an admissible basis allows more discretion to insurers
- Can take advantage of investment opportunities and manage solvency
- Can lead to inappropriate use of certain assets / exposure

QUESTION 5

Examiners remarks

This question was well answered although many candidates did not provide well-structured answers. Since a specific number of points was required it makes sense to structure the response distinguishing these points.
(mark only eight, 1 mark each)

- Variability in claim size (over time and at one time) – the variability of claim sizes creates uncertainty about whether changes in claim costs from year to year are due to changes in underlying risk or some random variation

- Characteristics of policyholders, including anti-selection – has there been a change in the marketing or channel that has resulted in a shift in profile of clients insured?

- Risk that lower premiums charged are inaccurate and attract poor risks that are not priced for correctly.

- Policyholder's attitudes to claiming (more awareness) – policyholders are maybe now more aware of the cover that they have

- Burden of disease (affecting extent to which people are ill) – incidence rates show considerable variation from year to year creating uncertainty about whether increases are going to occur

- Decision relating to imprecise policy wording can create new classes of claims. Interpretation of wording – if it is worded imprecisely this may result in claims that were never intended to be covered arising.

- Legislation – these can be fiscal (tax etc) changes or changes restricting the use of certain factors in underwriting (e.g. chronic illness, genetic tests). The first is difficult to foresee and the second introduces anti-selection risk

- Accumulations of risk – aggregation of claims triggered by a single event e.g. epidemic outbreak

- Catastrophes – e.g. disease spread in a flood, earthquake injuries

- Currency risks – e.g. imported equipment/prostheses/drugs

- Reinsurance risks – inability to make reinsurance recoveries, failure to comprehend the true limits/coverage of a reinsurance arrangement

- Claim exclusions might not have been applied or too leniently stipulated

- The differences will lie in the expected claims cost which in turn will be attributable to either frequency or severity. The latter two aspects need to be analysed in depth - separately

- Inadequate risk differentiation – a competitor doing better risk differentiation and attracting the better risk leaving our insurer attracting the poorer (poorly priced) risks

QUESTION 6

Examiners remarks

(i) Few candidates achieved the correct final answer but part marks were given for interim workings where appropriate. In many cases candidates did not correctly apply the first day and subsequent day charges and the split by medical and surgical admissions.

(ii) Candidates generally scored well on this question by giving a comprehensive list of additional data fields that could be used, or by provided a few fields and explaining why they would aid in getting a more accurate rating.

(iii) More candidates answered this question correctly compared to part (i). Part marks were given where interim calculations were correct but it was more often the case that candidates answered entirely correctly or incorrectly.

(iv) Most candidates did not answer this correctly, pointing to limitations in the data, rather than limitations in the application of the result in pricing the benefit.

i.

Cost (41-60)

Assume 5+ = 7

Day 1	0,2
Subs	0,17
Hosp cost	2380
Total cost	3141.60

ii. The additional data that will be useful:

- split by gender
- split by risk level (underwriting effect) – co-morbidities
- region
- occupation
- multiple years, but not too many so still relevant
- compare to industry data
- compare to competitors rates

iii.

Age group	2 day wp with franchise	
21-40	0,17	85
41-60	0,17	85
60+	0,2	100

iv. The presence of cover may change pattern of utilization so may need to allow for change in length of stay.

The level of cover proposed does not come close to covering expenses so may be fewer admissions if policyholder has to cover balance of cost.

QUESTION 7

Examiners remarks

Part (i) was well answered although many candidates did not refer to the data collection and analysis benefits aspects. For part (ii) many candidates did not identify the effect of medical advances on the prevalence of multiple conditions. Parts (iii) and (iv) were well answered. Under part (v) candidates tended to be not specific enough in their responses. For part (vi) only a few candidates addressed the cost-benefit considerations in a call centre approach.

i.

An agreed definition will draw upon the experience of lots of insurers, and is more likely to be free of ambiguity.

In addition, insurers will want to be able to settle claims quickly with few disputes (and so reduce the expense and threat to reputation that a disputed claim settlement produces). Agreed definitions will help here, as there is less possibility of claimants producing case law from other insurers to support their disputed claim.

There will be a sharing of current and future expertise in the interpretation of current medical conditions and future advances, and so the costs of developing and maintaining policy conditions will be shared, resulting in reduced costs for each insurer.

With standardised claim conditions, policies are likely to be easier for prospective policyholders to understand, sales staff to explain and for comparisons to be made between products from different insurers.

Industry-wide information and education may make the definitions better understood. The result will be more sales in general, leading to increased business for all insurers, and bigger increases for those who offer better customer service *etc.*

With standardised definitions it will be easier to collect compatible industry-wide data.
This will mean better information on which insurers can assess risks.

This increased information may result in lower risk loadings and lower premiums, benefiting policyholders thus further increasing the potential size of the market.

ii.

Improved medical treatment and recovery rates for many conditions, increasing the probability of policyholders having more than one CI in a lifetime.
As a variant on the standard product, it also permits the insurer to differentiate itself from its competitors.
Multiple claims are possible, which enhances policyholder satisfaction and retention.

iii. Increases the modelling complexity significantly as the transition possibilities (and associated transition probabilities) are more numerous. This in turn increases data requirements for all the additional parameters. The more diseases that are covered, the greater the complexity introduced. The need to allow for future trends will mean allowing for changes in the inter-relationships between conditions.

iv. The main distribution channels for CI products:

- Independent intermediaries
- Tied agents
- Own sales force
- Direct marketing
- Worksite marketing

v. The fewer conditions that are covered the simpler and cheaper the product will be. This will enable the product to be sold through direct marketing channels, and possibly tied agents (e.g. bank staff).

Fewer conditions will mean that the product is more easily comparable, and competition is likely to be on the basis of price and commission. This may mean that the product is not well suited to being sold by independent intermediaries who will be comparing products across insurers.

A more complex product with a large number of conditions covered will mean that the policyholder requires advice and guidance to fully understand what they are purchasing. Such a product would be better suited to being sold by independent intermediaries.

The intricacy of the cover sold via worksite marketing depends on the sophistication of the staff being targeted, but generally the intention is to offer simple products with a view to attracting those who have not made their own insurance provision for healthcare needs.

vi. Would need to consider a cost-benefit analysis. Anti-selection risk is high for CI and good underwriting is therefore important.

From a cost perspective would need to consider:

- The call centre costs
- The number of staff required
- Staff skills and training
- Might increase upfront costs which has capital implications

The benefits would need to be quantified considering:

- Customer service benefits if turn-around times are quicker (quicker than waiting for doctors report)
- Reduction in anti-selection and non-disclosure (people are more honest when talking to a human than when filling in a form)
- Reduced need to underwrite at claims stage (with associated reputational risk) if initial underwriting is effective
- More flexible than forms – can adjust questions asked depending on responses

END OF EXAMINERS' REPORT