

# **EXAMINERS' REPORT**

*November 2015 examinations*

## **Subject F101 — *Health and Care Principles* 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**

*This was bookwork question that was handled quite well by candidates. The application to health products was required to score well.*

### ***Why might stochastic modelling be useful?***

With health products, the future incidence experience is very difficult to predict.

The particular difficulty lies in the potential benefit amount, which may vary, *eg* by:

- policy-specified inflation (LTCI, IP)
- medical inflation (PMI)
- changes in accepted medical protocols (PMI).

With such uncertainty and hence volatility of cashflows, it is important to be able project the *distribution* of possible future outcomes, and this is what stochastic modelling enables us to do.

It achieves this by:

- allowing some of the variables in the model (eg number of claims or claim amounts) to vary and have their own probability distribution
- simulating random drawings from the probability distribution many times, and hence producing simulated random outcomes from the model.

The set of simulated outcomes from the model can then be used to form an estimate of the probability distribution of the outcome.

Stochastic models and simulation also enable us, where appropriate, to assess the impact of financial guarantees.

### ***Disadvantages compared with deterministic modelling***

There may be time and computing constraints – so stochastic modelling work might have to be done with a very simplified version of the model.

The outputs from the model are sometimes very sensitive to the (deterministically chosen!) assumed values of the parameter(s) involved.

We may have little confidence about the probability distribution (and its parameters) chosen for the stochastic variables.

The preceding two points can therefore lead to spurious accuracy, and hence render the results of the modelling of very little practical use.

## Solution 2

*This question was not always well attempted. In order to answer correctly, the candidate needed to note that the models were nested. This was well answered by those who understood the question and this section of the notes but was poorly answered by the remaining candidates.*

i.

Two properties of the exponential family of distributions:

- The distribution is completely specified in terms of its mean and variance.
- The variance of  $Y_i$  (the response variable) is a function of its mean.

ii.

The two models are nested models.

- Where the scale parameter is known, the  $\chi^2$  test for the change in scaled deviance can be used.
- Where the scale parameter is unknown, the F statistic can be used as the ratio of the change in the deviance and the scale parameter estimate is distributed with an F-distribution.

iii.

- Consistency of the factor over time.
- Consistency of the factor with other factors.

## Solution 3

**(i)**

*Several candidates provided guarantee structures relating to generic Unit Linked products, however marks were only awarded for solutions that considered fund protection as defined for LTCI.*

LTCI claims are paid out of the non-unit fund. To the extent that claims are paid directly from the unit fund determines the extent the fund is “protected”. ✓

There are different levels of fund protection:

- protecting the entire investment fund (ie both the initial investment from the single premium and the investment growth), ✓
- protecting the initial investment only, or ✓
- allowing the entire fund to be exhausted. ✓

Depending on the level of protection, the policyholder could draw down from his/her own unit fund through regular partial withdrawals before the policyholder begins claiming. ✓

**(ii)**

*Few solutions answered this question well. Some candidates discussed remedies to the situation rather than the impact. Some solutions focused on a single impact and discussed it in detail, but missed out on the other aspects.*

*The crux of this solution was to:*

- *identify which part of the insurer's liabilities would have been matched with equities and properties*
- *Discuss the impact on the insurer*
- *Discuss the impact on the different types of policyholders*
- *Discuss how the above consideration change in the light of fund protection*

Depends on the investment underlying the Unit fund, which depends upon the life-stage of policyholders ✓

Benefits that are to be paid soon with relative certainty (e.g. claims) will likely be matched by guaranteed / safe investments (eg. Money markets, Bonds) ✓

While policyholders are not claiming, the liability will likely be matched by equity and property ✓ in order to keep up with medical inflation, and nursing care costs, which exceeds CPI. ✓

To the extent that funds are invested in equity/ property, there will be an impact by poor investment performance.

Poor investment performance will impact the insurer:

- To the extent that benefits are guaranteed independently of the performance of the underlying assets ✓ e.g. indemnity product, protected fund, limited capacity to vary the terms of the contract, e.g. increase deferred period before benefits paid or reduce maximum period of paying claims. ✓
- Insurer will be required to hold additional reserves in order to meet its liabilities as equity/property prices drop. ✓
- A significant drop in the asset values could result in solvency issues. The insurer may need to cede some of its risk (reinsurance). ✓
- A drop in the unit fund values may make the product appear less attractive if competitors unit's perform better. ✓
- There may be withdrawals from the fund – this would increase the expenses paid by the remaining policyholders. It is also likely that withdrawals would be selective. ✓
- A drop in the unit fund values may leave the unit fund unable to cover risk charges, management fees, expense charges.  
This may result in policyholder's expectations not being met, and regulatory investigations, or reputational damage. ✓
- This risk is exacerbated by the single premium structure ✓
- A drop in the Unit Fund means that for unprotected LTCI products, the claims paid from the Unit Fund will decrease. This will require claims from the non-unit fund to be paid earlier, and there will also be more payments to be made. ✓

### **Current policyholders not claiming**

Impact on policyholders little at this stage, however a risk that funds do not grow sufficiently to meet their funding needs when they might become eligible for a claim. ✓

This is of higher concern when their fund is not protected and benefits will be drawn down from the entire unit fund. ✓

There will be less scope for policyholders to make ad hoc withdrawals from the unit fund. ✓

A drop in the unit fund values may leave the unit fund unable to cover risk charges, management fees, expense charges. This means that continued coverage would require an additional premium ✓

### **Impact on claimants**

If the investment Fund is protected this will have the result of poorer investment returns than anticipated, however there will not be a risk of losing the amount completely. ✓

If solvency of insurer is threatened, there may be some restriction around benefits paid out.

However, these benefits should be largely matched with assets. ✓

### **Other impact**

- Poor performance often leads to strain on businesses and employees, and climate may result in increased claims. ✓
- Increased withdrawals if policyholders who are personally invested in these assets need funds ✓

## **Solution 4**

*Many candidates failed to consider the carry over nature of MSA contributions. Some candidates assumed that the PPO would not cover out of hospital costs even though the premiums were stated to be the same. Candidates were given credit for well-reasoned arguments.*

Louise: Plan A – She is very healthy and low probability of incurring claims, MSA contributions will carryover each year and can grow savings for future claims or even retirement

Sandy: Claims are R35 000

Plan A: She would have high co-insurance liability as MSA would be exhausted. Recommend Plan B since OOP costs are lower for her, she may have to change to using a preferred provider.

Rose: Plan A – currently she has very little medical expenses. Preventive care is covered under all plans, and she should see a doctor. She is a smoker and will eventually likely have higher claims. The MSA rollover amounts will allow her to build up money to pay for those future claims.

## Solution 5

*This question looks to answer what the objectives are of the regulator, as opposed to the objectives of the state. Candidates tended not to make enough points especially on part (iii). Candidates who organised their answers by stakeholder tended to do well.*

i)

Protect the policyholder – complex financial products with a long-term impact on people's lives ✓

e.g. regulate contract types sold, investment portfolios, taxation, benefits and premiums, treat customers fairly, solvency ✓

Provide confidence in the industry ✓

Ensure private sector interests aligned in furthering public sector's interests ✓

e.g (protect the nations health, subsidise the poor, balance the budget, follow social, political promise) ✓

ii)

- Service providers might be charging excessive fees on treatments covered by minimum benefits, driving up costs and premiums ✓
- Removing minimum benefits would allow for considerably cheaper products ✓
- However this could exclude coverage for the majority of treatments needed, the regulator may allow for schemes to still cover those treatments, but schemes may limit the extent that these benefits are covered. ✓
- Or these benefits may be more effectively provided within the public sector than the private sector, but requires buy-in from the entire population. ✓
  
- Alternatively, such a product could allow people that are fully reliant on the public sector access to the private sector for specific treatments (e.g. Outpatient treatments) (i.e. availability of Private Healthcare to a wider group) ✓
- This could reduce the burden on the public sector. ✓ use means-testing for population to access these benefits in the public sector. ✓
- This may also prevent undermining of the Private Health industry from insurers that are providing fixed benefits at a reduced rate while risk-rating. ✓  
e.g. Short-term insurers providing restricted Health benefits take the young and healthy lives out of the private healthcare risk-pool. ✓

iii)

Insured lives:

- Wider variety of benefits to choose from and more able to match benefits with needs ✓
- Young and healthy lives that have full coverage may buy down – leaving the existing benefit plans with worse risk pools – Increase in premiums for existing products – further buy-downs ✓
- Increased premiums for lives that remain on plans with Minimum benefits ✓

Uninsured lives:

- May attract lives that are looking for limited access to private coverage ✓
- May attract lives that are currently accessing private coverage via short-term insurance ✓
- Lower benefits and premiums may provide more affordable products ✓

State:

- Potential to capture more lives within the private sector => less strain on public system ✓
- If the private health insurance sector can now provide a wider range of health benefits, including those health benefits currently covered under short-term and long-term insurance, it may be easier for government to coordinate Health objectives by engaging with only the Health regulator, instead of also the long-term and short-term regulators. ✓
- Buy-downs from the existing benefits by the young and healthy may reduce the effectiveness of solidarity ✓

Insurer:

- Will need to price for new benefits, as well as a make provision for a possible changing profile of lives, as well as volumes ✓
- Will need to investigate new products and possibly change systems to deal with regulatory changes.

Distribution:

- May encourage churn with new products in market, although less commission likely on these cheaper products ✓
- Simpler products may allow for alternative channels (affecting mix, lapses and expenses) ✓

Reinsurers:

- Insurers should be able to price for existing products. Although with a potentially changing mix of lives, there may be increased reinsurance sought. ✓

## Solution 6

*This question was poorly answered. Candidates simply did not provide enough points. Candidates that scored well had identified the key concepts for headings and organised their answers on this basis. For part (ii) it was important to recognize that the hospital group may not have exposure data thus a simple burning cost approach was not necessarily feasible.*

(i)

- Customer acceptability
  - Does this product meet a need and is there a market for it–
    - Likely, given uncovered young working members
    - Employers may realise there is a benefit in having healthier employees
    - Product must be simple to understand
  - Benefits provided must be attractive to the market/Benefits should meet the needs of the employees
    - Full cover is attractive to employees due to advantages of private care vs. public care, eg shorter waiting periods
    - Could include additional benefits such as wellness programs to promote healthy lifestyles – also reduces risk on hospital groups side. Benefit for employers would be less absenteeism
  - Impact on take home salary should be considered. If the employer pays for medical cover at the cost of decreased salaries, employees may be unhappy, particularly if they don't see the need for the product (assuming all employees are forced to take up the cover)
- Geographic spread
  - Hospital group will need to consider whether they can treat all the employees in a geographic area i.e. what happens to employees in rural areas with no access to a hospital?
- Price competitiveness
  - Premiums must be attractive to employers
  - Must be cheaper than PMI cover otherwise no benefit for employers
  - Fixed amount per employee, easier to administer
  - Premium set for each employer or across all employers
- Take up of product
  - Need to determine whether the product will be compulsory for all employees of the employer or if it will be on a voluntary basis
  - Will require a minimum number of lives in order have an adequately sized risk pool and to cover expenses
- Regulatory requirements
  - Rules governing provision of health insurance
  - Solvency reserve requirements for health insurance products
- Distribution
  - Likely have specialised salesforce to distribute or sell this product
  - May contract with external salesforce but unlikely
  - Consider costs of distribution channel selected

- Profitability/ Return on Capital
  - Premiums must cover benefits and expenses of providing the product to the market
  - Shareholders will require a certain level of return on capital for the product provided, must be balanced against the requirement for low premiums
  - Must have certain number of lives covered in order to be profitable
- Consistency with Current Core business (adapted from company culture point – probably only the strong candidates will get this one)
  - Will be moving into health insurance effectively and competing with health insurers who pay for procedures at their facilities
  - Could have repercussions on relationship with health insurers
  - Will require staff training
  - If procedures for scheme are offered at lower rate may cannibalise procedures at higher PMI rates if employed PMI policyholders move to employer arrangement
- Systems implications
  - Will require systems development to capture relevant premium and claims data
  - Will need to adapt system to limit benefits for the members of the scheme
  - Will have claims side system but will not have premium capture system
  - System must allow for adequate data capture to allow monitoring of experience of product
- Underwriting
  - If offered on a voluntary basis then underwriting is required
  - Level of underwriting must be such that it is not prohibitively expensive
  - Could allow less underwriting as employees at work must at least be healthy enough to work
  - Or allow for no underwriting below certain ages with full underwriting above certain ages
  - Depends on benefits offered, could allow for claims stage underwriting or procedure specific waiting periods – think maternity/ deliveries
  - Could also have minimum take up level at each employer
- Pricing
  - New to insurance business but will have the data to price the procedures
  - May not have exposure data such as number of lives covered, could obtain from industry data/ reinsurer
- Risk appetite
  - Risks associated with product must be of an acceptable level for company to absorb through reserves
  - Providing full cover for procedures hence indemnity cover, so high level of risk
  - Could be mitigated by providing only certain procedures which have predictable costs ie exclude high cost procedures such as transplants
- Reinsurance
  - May look to limit losses from complications so will take out excess of loss reinsurance
  - May also seek to lower regulatory requirements for capital reserves by taking out reinsurance

- Financing requirements
  - Company will have substantial balance sheet But will look to minimise requirements in order to maximise return on capital
  - Full cover for fixed amount means substantial reserves may be required
  - The cost of additional capital for this will need to be considered when designing the product
- Cross-subsidies
  - May use other business to cross subsidise prices on the product
  - Also, if charge on a group business will have cross-subsidy between employers
  - Charging one amount per life will mean some cross subsidy between policyholders
  - Level of cross subsidies must be acceptable to employers/ customers / shareholders
    - Too high would make the product uncompetitive towards healthy members who may be able to obtain better rates under individual PMI
    - Shareholders must find level of cross subsidy between business lines acceptable.

(ii)

- Choose the base period over which to collect claims and exposure data√
- Collect data and check accuracy and appropriateness√
  - Will have claims data for procedures but not necessarily exposure data
  - The exposure data can be gained from other sources, e.g. industry statistics for covered lives if available√
    - Using hospital market share in covered lives to adjust for actual exposure at hospital group facilities
    - Regardless, need to find proxy for exposure so any creditable suggestion will gain a half mark
- Split data into homogenous groups Bearing in mind the balance between credibility of data volume and homogeneity of risk cells√
- Calculate the burning cost premium per group (BCP)√
  - = total cost for basket of procedures / exposure per group√
- Adjust the Calculated BCPs for:
  - Unusual experience, e.g√
    - Procedures may have had an unusually high cost due to variation in complication rates
    - Unusually light experience is also possible
    - Remove or limit unusually large claims
  - Changes in treatment costs, e.g√

- New treatment methods may have changed the cost of providing care for the basket of procedures
  - Also, past data may not always be relevant and changes in treatments over time need to be accounted for
- Seasonal variation in claims experience√
- Changes in agreements with suppliers, e.g√
  - Eg surgical equipment prices and changes over time may impact the treatment costs
  - Volume discounts that may have come into effect
- Changes in risk, eg√
  - Changes in the likelihood of the procedures being claimed for not accounted for in the risk cell groups. ie changes in admission rates
  - Underwriting methods must be allowed for
- Differences in the population i.e. differences utilisation, chronic conditions etc. √
- The effect of reinsurance, eg√

## Solution 7

*Candidates tended to perform well on this question. Many candidates lost marks by not commenting on their calculation results under part (ii).*

(i)

- Cover fewer people (e.g. means test)
- Reduce benefits on non-essential items (eg dental, optometry and prosthetics)
- Introduce managed care (eg. Hospital pre-authorisation and management of large claims)
- Amend reimbursement methods (e.g. reduce fee schedule, look at global fees)

(ii)

(a)

- Risks to the plan:
  - More complex visits than expected
  - Changing in coding practice to get higher fee
  - Change in population leading to more complex visits
  - Such as ageing or increasing disease burden
- Risks to GPs
  - Overall inadequacy of reimbursement for income and expenses
  - Need to categorise visits – added administration
  - May have different patient mix by age and risk
  - Some may have increases and some decreases (unhappy)
  - Income may be unstable

(b)

Risk mitigation strategies

- Thorough analysis

- Stress testing of models
- good communication to GPs
- pilot study to test effects
- Guidelines on coding
- Auditing and spot checks
- Monitoring and investigate outliers

(c)

Type	Cost per visit	Proportion	Adjusted
High	500	0,15	0,20
Med	300	0,3	0,28
Low	200	0,55	0,52
		275	288

- calcs = 2 marks
- overall cost is a reduction – need to be clear to doctors
- change in utilisation will increase costs by 5%
- still lower than original costs

## Solution 8

(i)

- Sensitivity analysis – vary key assumptions
- Scenario analysis – vary sets of assumptions
- Stochastic analysis – simulations using distributions applied to key assumptions
- appropriate method depends on purpose (average or outliers), audience and level of detail required.

*Marks were also awarded for describing how risk could be managed:*

- *reinsurance could be used,*
- *Checking reasonability of results with past experience*
- *Fixed fee agreements with providers or third parties (although this mark would not be duplicated in part iii).*
- *Increasing margins / capital / reducing risk discount rate (they have equivalent impacts on the pricing).*

(ii)

*This question was relatively straight-forward. There were different interpretations of what the net-premium represented, and particularly if expenses should be included over and above the net premium.*

Alternative approaches to the one below were awarded marks.  
 Some candidates included net profit from previous year which was incorrect.  
 Some candidates also charged tax on negative profits. Marks would have only been awarded for this if mention was made of using the tax credit to offset taxes on other lines of business that was profitable.

√√ (if in correct income statement format and included all critical fields)

Rm	2015	2016	2017	
Net premium	108	108	108	√
Less				
Claims	95,04	92,88	91,8	√
Expenses	16,2	12,96	11,88	√
Profit	-3,24	2,16	4,32	√
Tax	0	0,864	1,728	√√
Net profit	-3,24	1,296	2,592	√√

(iii)

*This solution required analysis of the trend, and comments on how the premiums have remained stable, while claims and expenses decreased.*

*Solutions that provided a wide range of ideas, did well in this question.*

Trend in net earnings

- trend is from net deficit to increasing surplus
- volume of business is expected to be level (could be decreasing in real terms)
- level of management expenses declining by 20% and 8%
- level of claims experience also declining 2.5% per annum

Initiatives

- Management of claims experience
  - o Claims underwriting
  - o Benefit definitions
  - o Case management
  - o Contracting fixed cost deals with providers
- Could be holding back on growth
- Attracting a healthier or younger mix of lives that have lower average claims but pay the same premium
- Non inflation of benefits / reduction of benefits / increase in copayments or deductibles
- High initial expenses on business
- Such as commission
- Investment in new systems (should be amortised)
- Reducing numbers of unnecessary staff / automating systems / outsourcing operations

## Solution 9

*Many candidates failed to refer to both demographic and case mix factors in the need for risk adjustment. Candidates needed to provide enough points to score well under part (iii) and many failed to consider factors other than claim costs.*

i.

- Hospitals treat a different mix of cases due to
  - different risk profiles of lives or
  - facilities in the hospital
- For example, some hospitals may have a high proportion of cardiac cases and others may have a high proportion of day cases OR some hospitals may have expensive diagnostic equipment that is not available at other hospitals, or the hospitals focus on maternity while others focus on trauma, etc.
- The differences in mix will impact the utilisation of resources
- as well as the cost of the case
- Therefore, it is necessary to risk adjust to compare on a like-for-like basis

ii.

Demographic data:

- age
- sex
- geographic region

Clinical data:

- principal diagnosis
- severity of principal diagnosis
- co-morbidities
- severity of co-morbidities
- functional status
- treatment protocols

Supply side factors:

- specialist facilities e.g. diagnostic equipment such as MRIs
- number of HC/ICU beds

Socio-economic factors:

- benefit plans (richness of benefits)
- income

### Comments

- The insurer will have access to the demographic data from the membership base.
- The clinical data should be available from the claims data,
- But severity and functional status will not be available
- Insurer will not have access to the supply side factors
- Will have access to the benefit richness

### iii.

#### Renewal assumptions

- the introduction of a hospital network may impact on the number of people willing to renew their membership
- this has an impact on spreading initial expenses

#### Claim amounts

- the aim of the hospital network is to contain hospital costs, so expect a decrease in hospital costs
- Similarly, costs of large claims may be able to be controlled better if the hospital has more effective protocols (e.g. by spending limited resources on a patient with a very poor prognosis, even if a procedure is a 'success')

#### Utilisation assumption

- if the network is restrictive, people may end up going to hospital less
- Drs and specialists may refer fewer cases to hospitals if a treatment is not really required.
- but patients may access more treatment out of hospital, so there may be a spike in out of hospital utilisation.
- or a spike in emergency claims as people neglect required care.

#### Mix of lives

- need to understand whether the introduction of a network will influence the types of lives that remain on the books, i.e. risk of anti-selection
- And what lives will be attracted, what is the risk profile (age, gender, socio-eco) and their likelihood of claiming relevant to current lives.

#### Expenses

- Expenses of setting up and monitoring the network – monitoring network, incentivising hospitals, managed care providers, etc.

#### Assumptions that wouldn't change:

- tax: tax treatment of the policies should not change
- Investment return: same as previously, short term business so not significant
- claims expense: cost of processing claims is the same
- commission: allowed for as charged
- initial expenses: same level of underwriting so no change to initial expenses
- solvency: same as previously

iv.

Access to network hospitals.

- If the hospitals have a poor geographic spread, take up of the option may be low.
- Alternatively the insurer will be forced to pay out of network rates for members and the network will not meet the desired objective of containing costs.

Quality of care at the hospitals.

- If efficiency is high because hospitals undertreat patients and quality of care is sacrificed in order to save costs.
- This may be more expensive in the long run.

Competitiveness

- Competitiveness of the product to the market and to brokers, particularly how this compares to other products on the market.
- this will influence take up rates.

Increased expenses

- consider the costs of setting up and maintaining the network on an ongoing basis

Facilities of the network hospitals.

- Determine whether hospitals are able to adequately treat all types of ailments and patients
- If not, where will policyholders receive this care?

Capacity of the network hospitals.

- Are the proposed network hospitals able to accommodate the expected volumes of patients?
- If not, where will policyholders receive this care?