Institute of Actuaries of India

Subject ST1 – Health and Care Insurance

November 2008 Examination

INDICATIVE SOLUTION

Introduction

The indicative solution has been written by the Examiners with the aim of helping candidates. The solutions given are only indicative. It is realized that there could be other points as valid answers and examiner have given credit for any alternative approach or interpretation which they consider to be reasonable

Q.1 a) “Compared to life insurance, there is more opportunity for fraud in health insurance.” Discuss the validity of this statement and mention the areas in which the staff of a health and care insurer need to have expertise for effective risk control.

Solution:
In life insurance, the benefits are generally paid on death. It takes an extreme scenario to generate a false claim in life insurance.
Compared to this, in health insurance, claims can be exaggerated or falsified more readily.
Expertise is required mainly in the areas of claims assessment and management covering - initial assessment of validity of a claim
- collection of evidence to prove the validity of the claim
- assessment of suitable treatment process
- knowledge of likely inflationary pressures on health claim costs
- knowledge of medical procedures available and
- ongoing assessment and management of the claims

also expertise will be required in the initial underwriting of policies

b) Explain and discuss the concepts of moratorium underwriting and exclusions as applied to PMI business.

Solution:
Moratorium
PMI is a short term contract, typically of one year at a time.
Due to marketing considerations, the insurance company may offer cover without underwriting but subject to blanket exclusion of preexisting conditions.
Preexisting conditions are defined as medical conditions that have received treatment in the recent period before the application for insurance, say, five years.
If the policyholder receives no further treatment for the conditions during the period of, say, two or three years after the policy issue, the exclusion is waived thereafter.
This period (of two or three years) is called moratorium.
Although no formal underwriting is carried out when accepting the risk, past medical history is examined at the time of claim.
This encourages new business and reduces new business costs.
The policy excludes not only the recurrences of the medical conditions but also conditions directly relating to them.
The drawback is that, the insured cannot be sure of what conditions he is on risk unless he is sufficiently aware of different medical conditions and their connectivity.

Exclusions
Here the policyholder is medically underwritten at the time of application and the information on medical history is generated.
The policyholder may be accepted at standard rates but specific preexisting conditions may be excluded by endorsement.
For example, for someone with a history of back trouble, “disorders of the back and associated conditions” may be excluded.

From the point of view of customer understanding such exclusions are a better alternative.

c) Explain the concept of ADL in the context of LTCI plan.

Solution:
ADL i.e. Activities of Daily Living are the alternative criteria for payment of benefit in the LTCI plan
It is an alternative to occupation based definitions which cannot be applied to those who not in employment (e.g. housewife) or those past retirement age.
These are normal everyday tasks and the criteria are the inability to perform them.
-commonly three or four of them
They are feeding, dressing, washing, toileting, mobility and transfer
The definitions are incorporated in the LTCI plan

(Total 13 marks)

Question 2:

a. Explain the terms indemnity policy and deductible under health insurance contracts.

Solution:
Indemnity policy
A policy that provides benefits or cash that is sufficient to restore the insured to the
position he or she was in prior to the occurrence of an insured event. Some policies incorporate cash limits in particular circumstances, and so do not provide full indemnity.

Deductible

1. Deductible is a policy condition whereby the insured is responsible for the first Rs X of any claim.
2. Deductible is the amount of loss that the policyholder has to incur before the insurer will pay anything on a claim.
3. The excess/deductible may also operate not on individual claims but on the aggregate of claims over a policy year; it may also be applied per life or per policy.

b. Explain the relevance of deductible in health insurance contracts and how deductibles could be set in lump sum hospital cash products.

Solution:
Relevance of deductibles

1. Utilisation – deductibles lowers utilisation rate which allows insurance to offer attractive premiums
2. Cost sharing - lowers the ultimate cost of claims which might lead to low premiums
3. Cost control – avoids large number of small claims from being lodged with the insurer which provides operational ease and lower claims handling costs
4. Prudence – if set at the right level, could control anti selection

5. Additionally, from PH perspective, deductible may discourage the PH from incurring the cost of care, if the amount involved is below the level of deductible, thereby likely to lead to worsening of the health and therefore eventually to higher cost of care and claim.

Deductibles in lump sum hospital cash products
Deductibles in lump sum hospital cash products are set as “time excess” where the first few days of hospitalisation are deducted to calculate the number of days for which hospitalisation benefit is payable.

c. You are a product actuary in a life company. In one of the product development meetings, the marketing head says that there are no indemnity products covering critical illness. Assuming that her statement is true, list the pros and cons for a life company in developing an indemnity based critical illness product.

Solution:
Pros:
Currently, CI products offer lump sum benefits. In such a case, the cover amount chosen by the insured might not be adequate for some ailments whereas might be an over insurance for some other. Indemnity product removes this drawback which could be attractive to potential buyers.

First mover advantage: since this is a new concept in the market, the company will have a first mover advantage, if the product is accepted by the market and will result in increased penetration (by increasing sales of CI product) and also increase your market share in CI business (by denting the CI sales of competitors).

Perceived value: policyholders might perceive more value from this product since the benefit is linked to the actual medical cost rather than an arbitrary lump sum

Cons:
An indemnity product would only cover costs related to care and possibly subject to limits; Lump sum benefit product would have meant that the PH could choose the SA in such a way that additional costs such as travel for treatment (of the PH and dependents) and loss of income etc could be covered. This might be seen as a drawback by potential buyers.

Designing of Indemnity products presupposes the ability to quantify the value of loss. In case of critical illness, it is difficult to quantify the loss (as compared to indemnifying surgical cost) and hence it is difficult to price an full indemnity product for critical illness.

Pricing is further complicated by medical inflation and medical advancements (which could give rise to effective but expensive treatments or could lower cost of treatments).

Indemnity contracts tend to have a maximum cover limits (either on a per claim basis or a per life basis) and hence might fall short of full indemnity in certain cases. This might lead to customer dissatisfaction at the claims stage.

Fraudulent claims in lump sum products arise from fraudulent representation of incidence of critical illness event whereas in indemnity products the additional area of frauds is fudged medical and treatment costs. Thus, indemnity products require additional expertise in claims management (the ability to check incidence and the cost of treatment) which might not be available in-house.

Administering indemnity contracts would require different systems and processes as compared to lump sum products which might prove expensive

(Total 10 marks)

Q. 3. As the marketing actuary to a health and care insurer, what are the considerations in keeping an eye on your competitors' products, processes and performance?

Solution:
An analysis of competitor's products, processes and performance, is a necessary part of experience monitoring.

- competitor's approach to risk selection and pricing by subdividing the population by more rating factors
- by offering more accurate pricing to customers, insurer can offer cheaper premiums to less risky customers and thus likely to attract healthier lives; competitor's strategy to cherry pick better risks.
- presents opportunities where market has failed to recognize key features of the risk; opportunity for appropriate segmentation and pricing
- Competitor's underwriting methodologies will indicate the ways in which they classify applicants for deciding the premium to be charged in each case.

Need to keep a close watch on what competitors are doing in terms of product features, pricing, sales methods, underwriting stance and volumes of business.
Need to understand whether the risks in own portfolio are different from those of competitors through differences in product features, sales methods, underwriting stance and regional representation.
e.g. an insurer covering large number of risks from an area where medical care is more expensive compared to other areas;

- if competitors are not in the same position, the company's experience will be very different from that of competitors.

e.g. if competitors' are offering health cover over internet and your company is not, it may be a significant disadvantage

(Total 6 Marks)

Q. 4. a) The holder of a non linked CI policy, which was sold 15 years ago for a term of 20 years with level regular premiums on guaranteed terms, has not paid the latest due premium, thereby lapsing the policy. There is no surrender value payable. Discuss the effect of such lapsed policies on the profitability of the health and care insurer.

Solution:

As the policy has run for 15 years and has an outstanding term of 5 years, the insurer will have probably significant reserves reflecting the high expected claims over the final 5 years.
Compared to the reserves the premiums to be paid in the next 5 years may be relatively small.
Other things being equal, the company will be better off with the lapsing of the policy, instead of having to pay the possible claims in the next 5 years.

- as no surrender value will be payable, the reserve will fall into surplus.

However it is more likely that the policyholder who lapses is in good health rather than in poor health.
This is particularly likely as the current premium under the policy is likely to be far lower than the premium for a 5 year policy at his current age.

- any one with a chance of claiming is more likely to keep his policy in force.

As a result, it is likely that the company would have made more profit from the policy, if he had continued payment of premiums for another 5 years and not claimed.

- in this case the company is likely to be worse off as a result of lapse

b) "Short term products such as PMI do not normally make a profit until the policy has been with the same insurer for perhaps two, three or more years." Discuss this statement and its implications for pricing assumptions and experience analysis

Solution:
The insurer incurs high sales related expenses in the form of marketing costs and in the first year of the policy, commission and set up costs.
All these are not recouped fully out of the first year's premium.
If all these costs were to be fully loaded into one year's premium, the initial premium would be too high and uncompetitive.
Instead the high initial costs are recouped over the years during which the policy is renewed, thereby keeping the premiums level.
If a policy is not renewed for enough number of years, the insurer will make a loss on that policy.
In pricing, the actuary will have to make assumptions as to the likely period for which the policy will be renewed.
Pricing may allow for variations in renewal experience depending upon method and frequency of premium payment, distribution channel etc., subject to availability of experience information.
Renewal is as important as new business for PMI products where renewal is optional.
Impact of lapses will be crucial to profitability, as pricing basis has amortized initial costs over a number of years of renewal.
The insurer will analyse the experience of renewal on ongoing basis, according to different factors as above and use the results to review the rates.

c) List the different ways in which an insurer would encourage renewal of PMI policies which are generally written for term of one year (i.e. by incentives and otherwise).

Solution:
The insurer may reward the policyholders with claim free experience in the following ways

- by increasing the benefits on renewal after every claim free year, subject to a maximum limit
- by reducing the premium after every claim free year, as a reduction in the renewal premium payable
- by giving gifts and freebies on renewal, subject to regulatory approval, where required

The insurer may also limit the premium payment options such as requiring direct debit to customer's bank account.
Guarantee the premium and term of the policy for a longer period, say, 3 years

d) While carrying out analysis of past experience of withdrawal rates, mention the factors which would not be taken into account but would be relevant for withdrawal rates in the future.

Solution:
Withdrawal rates in the future would be affected, among other things, by

- the current economic situation
- the future changes in the economic situation, which is unpredictable
- the competitive situation of the product and
- the perceived value of the product to the customer

These would not be usually allowed for in an analysis of past experience.

(Total 12 Marks)

Question 5:

a. List the reasons why an employer might offer health benefits to his employees and their dependants.

Solution:

1. Forced by statute to provide the benefit - statutory responsibilities
2. Genuine interest in employees - protected workforce and the Keyman
3. Reduce time away from work – cater to health care (preventive care and wellness initiatives) needs rather than just insurance
4. Forced by competitive employers - to attract and retain staff
5. Facilitated by tax regime - tax relief on contribution by employer and tax efficient method of employee compensation
6. Strong perceived value – cost as compared to benefits provided (even for employees seeking cover through employer as a group scheme might be attractive as compared to seeking individual covers)

(Comment: mere listing of reasons would be sufficient)

b. List down the factors that you would consider while setting up a new health insurance scheme for an employer employee group. The health insurance scheme is expected to provide PMI, CI and Major Medical expense benefits.

Solution:

1. Needs of the stakeholders
2. The objectives of the scheme
3. Existing statutory cover if any – is the cover provided as a supplement to statutory cover or designed as a top-up over statutory benefits

4. Who are to be covered – employees and dependants?
5. Benefits to be provided
6. Benefit levels – flat cover or salary related or based on cadre, benefits dependants at similar level as members or not
7. Voluntary benefit top-ups or inclusion of dependants
8. Premium payment – employer or employee or both
9. Eligibility and exit criteria – voluntary or compulsory and clear communication on exit criteria
10. Treatment of pre existing illnesses and employees who are sick and ailing
11. Rating of risks – by industry, occupation, hazards
12. Administrative process – how the scheme will be administered (in-house or out sourced to a third party administrator)
13. Care delivery – tie up with specified hospital and care centres?
14. Claims handling – in house or out sourced (if not insured)
15. Cost control
16. Method of funding – pre funded or pay as you go or insured scheme
17. Continuation options and portability
18. Profit sharing – with insurers
19. Communication with beneficiaries – brochures
20. Competition – what is offered by other employers
21. Tax regime – how to make the scheme tax efficient

(Comment: Mere listing of issues would be sufficient if it is self explanatory)

c. The employees staff union which also acts as a lender of personal, vehicle and housing loans for its members is keen on negotiating with the employer to provide income protection insurance scheme to its members. List the objectives of such a scheme and the additional factors that you would consider while setting up such a scheme (assuming the existence of an employer sponsored health insurance scheme mentioned above).

Solution:

Objectives of the employee staff union in providing an income protection product

(Note: Employee staff unions act as mutuals when they provide benefits to their members. In technical terms, such groups are termed as affinity groups where members sharing an affinity form a group. Affinity groups, by their constitution, have typically loose criteria for continuation of membership and exit. Further such groups, as the one described in the question, are formed as a subset of the total workforce and typically have a higher proportion of workforce from the low income segment. Another key issue to be considered while providing covers for such affinity groups is that even if compulsory cover is provided for all members of such groups, it may have to be borne in mind that taking up an membership and the act of borrowing is voluntary.)

Objectives of the scheme

1. Reduce bad debt on account of employees who are sick – benefits from the income protection scheme could be used to fund the monthly loan repayments
2. Genuine interest to provide additional top up covers to employees and to their dependants
3. Strong perceived value – group covers more attractive than individual covers – value for money and operational efficiency (at entry and at claims stage)
4. Competing unions in a large company might offer this to attract employees

Additional issues that need to be considered

1. Different profile and hence different needs – more blue collared, more propensity for accident and disability, more lenient claim trigger for accidental disability?
2. Vested interest of the sponsor – might not prefer too many ineligible claim; if the scheme has been offered to gain additional (financial/ non financial) benefits for the sponsor, the sponsor might attract "bad" lives
3. Some of the "comforting" aspects of employer sponsored scheme are absent – for instance, employer sponsored schemes are often compulsory with no choice to choose entry or benefit levels. The employees are "active at work" which indicates "class selection". Absence of such "comforting" aspects would have impact on cost of the scheme and terms of insurance cover.
4. Voluntary cover – typically the covers are voluntary (even if the scheme offers compulsory cover to all borrowers, membership in the staff union and borrowing is voluntary)
5. Administration difficulties – staff union might not be adequately equipped to administer the scheme.
6. Accumulation of risk and over insurance are some of the other factors that need to be considered.

d. The life company in which you are an actuary offers both group and individual health insurance products. The marketing manager in your office states that the underwriting criteria under group health schemes are less stringent as compared to those applied on individual contracts. Comment on the statement made by the marketing manager.

Solution:

(Comment: The prime objective of underwriting is to evaluate risks and to set appropriate terms. Hence, underwriting criteria cannot be "lenient" or "stringent" – it can only be either "appropriate" or "inappropriate" to identify risks or to set terms.)

Underwriting philosophy for group and individual are different and hence due care needs to be attached while comparing these two approaches.

Group underwriting, to a large extent, is based on class selection and information that an insurer could receive from the group administrator. Thus the information that is sought from an individual member is minimal, for cover up to free cover limit. .

Risk selection criteria is tuned to the fact that the group insurance scheme rules are not set by individual members but by the group administrator. In particular, the benefit level is not chosen by individual members. This reduces anti selection which is reflected in the risk selection criteria.

Whereas in individual contracts, the individual chooses to get insured, chooses the cover amount and the type of benefits that suits the individual's assessment of his/her health status. Hence, the underwriting criteria will have to be tuned to the fact that there could more anti selection from individual contracts. Further any information about the individual has to be sought from the individual and hence it might be seen as being onerous.

(Total 12 Marks)

6 a) Explain the following concepts and discuss the key modeling and assumption issues in relation to pricing and reserving calculations, in the context of PMI business.

i) Distribution of indemnity claim payments

Solution:
PMI policies usually provide indemnity benefits i.e. payment of actual cost of treatment often without any ceiling.

For pricing, reserving etc. estimates will have to be made of expected size of claims

- and the variance of the claims to ascertain the appropriate margins for risk.

For this, assumptions will have to be made about the probability distribution of claim size.

Assumptions about claim amount distributions are not necessary for benefits which are fixed in amount, including index linked fixed amounts.

ii) Distribution of claim frequency

Solution:
The difficulty is in estimating the claim incidence rates i.e. the difficulty in deciding the distinction between one claim consisting of a number of separate payment but identified with one claim or a number of claims each consisting of one payment.

The important thing is to establish the definition of a claim, which will be used for estimating the claim frequency and the claim amounts arising there from.

Claim frequency is dependent upon a number of parameters such as age, sex, occupation, duration from policy inception, time of the year etc.

e.g. at longer durations, when preexisting conditions would be covered after the waiting period, people are more likely to claim than others or will have greater expectations of claiming in the future.

iii) Family covers where individuals on risk may not be known

Solution:
Family cover policies will provide medical treatment costs for all the members of a family unit.
The family unit may be charged a single family rate, which might involve a range of possible numbers of children.

The claim cost will vary according to the number of children covered.

Estimates will have to be made about the average number of children per family and the likely effect this will have on the claim costs.

- which can be problem if this is new line of business for the company, with no past experience

- even for a company with past experience of existing business, there can be a problem of changing family sizes over time.

iv) Group arrangements of employees of employers, where individual employees can only be estimated

Solution:

In employer employee groups, over time, some employees leave and new employees join.

Thus the persons on risk under a group policy will keep changing.

The premium will be calculated on a historical or assumed mix of employees thereby not exactly matching with the risks actually covered.

This can be overcome by adjusting retrospectively the premium for the actual composition, when information becomes known.

Where cover is provided for family members of employees, the family size problems would create issues.

General

Absence of substantial industry wide claims and other data will make it difficult to estimate future claims experience reliably.

- also it will be hard to establish industry- wide trends in experience

Companies will be less able to corroborate their own experience with the industry as a whole.

- therefore requiring more margins in pricing and other assumptions
- companies will find it harder to explain why their experience is different from competitors, leadng to risks of overcharging or undercharging

b) What does funding for care mean in a LTCI policy and how will it affect modeling and making assumptions about distribution of claim amounts?

Solution:

Funding for care means that under the policy benefit payments will be made to meet the actual costs incurred by the policyholder in obtaining the care they need.

- e.g. actual nursing home fees payable.

The policy therefore pays indemnity benefits

- subject to a maximum limit in order to control costs

Thus there is the need to estimate the expected size of claims

- and the variance in claim amounts to provide for margins for risk

This would mean estimating a probability distribution for the periodic, annual or monthly, claim payment

The probabilities of future transition in and out of different benefit states would be used to quantify the cost of the duration of claims paid at each level.

The maximum limit would make the claim amount per period easier to estimate.

(Total 14 marks)

7a) i) Explain the product specific risks for Critical Illness (CI) policies.

Solution:

The main risk is in respect of the rates of diagnosis of critical illnesses specified in the contract, both for stand alone and rider policies.

Limited information available in the market to assess the likely rates of diagnosis
- to the extent historical rates being unreliable or even non existent

Risks brought about by advances in medical science
- Improved screening for diseases, leading to risk of earlier diagnosis leading to higher claim incidence rates than provided in pricing
- Earlier diagnosis may prompt some claims which otherwise would not have been payable
- e.g. the policyholder might have died prior to diagnosis, lapsed the policy or the term of the policy might have expired
- earlier diagnosis may identify individual's susceptibility to the disease (e.g. heart attack) and thereby prevent or delay the onset of the disease, thereby improving claims experience
- increasing availability of many treatments which were formerly complex, leading to more of these treatments being claimed under the policy resulting in increase in claims
- the effect of these treatments in prolonging lives of the sufferers, who will be more likely to need treatment later in life following recovery

Anti-selection risk, high for individual policies and a reduced one for group policies
Risk from selective withdrawals, for individual standalone policies and also riders
Expense risk, for stand alone policies
Investment risk, to a lesser extent, as the reserves would be relatively small.
Financial risk from withdrawals where the asset share is negative
Capital requirements – for stand alone policies and riders, will be normally low

ii) List the product specific risks associated with Long Term Care Insurance Policies

Solution:
Claim inception probabilities
Transfer probabilities between claim states, if there are more than one
Shortage of reliable data on which to base the transfer probabilities
Data such as in the US, where the business is well established, would need significant adjustment before they could be used in other countries
Anti-selection risk
Risk of selective and normal withdrawals
Financial risk of withdrawal when asset share is negative
Investment risk as significant reserves may build up
Expense risk
Marketing risk
- as the policyholder may expect the benefits would be adequate to cover the costs of care

Capital requirements could be extensive
- and will also depend on the nature of contract and guarantees given

(b) You are a product associate actuary in a life office which is planning to launch its first health product (which would provide critical illness, hospital cash and surgical benefits).

The CEO of your company citing a recent press article which had elaborated on the large scale mis-selling in such living benefit products seeks a report from the chief product actuary on the sources of mis-selling and how the company could avoid this. You are entrusted with producing this report.

Identify two key sources of mis-selling which could arise from product design and contract terms. Also list the steps that need to be take to avoid mis-selling.

Solution:
Potential areas which could give rise to mis-selling – Product design

(Comment: there are several areas that could become a source of mis-selling some of which are listed below.

- Too many benefits bundled as one product
- Lack of focus on core benefits (too many bells and whistles)
- Complicated benefit structure
- Treatment of pre existing illness
- Complex (and too many) criteria for claim eligibility
- Too many limits on benefits
- Floaters vs. Individual limits

The candidate is expected to identify an issue, explain how and why it could be a source of mis-selling. Due credit will be given for any relevant issue. Three issues from the list mentioned above are explained below to indicate the level of detail expected from the candidates.)

1. Too many benefits - "Comprehensive health cover" – by inclusion of benefits on hospitalisation, surgery and critical illness, the product might give an impression that it is a comprehensive health product which caters to all health insurance needs of the individual.

But this might not be the case – for instance, a product that provides lump sum benefit might not meet the full health costs incurred and further over a period of high (medical) inflation, such lump sum benefits might be way off the actual medical costs.

Another example is to provide a long list of critical illness or a surgery list. When due to competitive pressures the list of covered conditions under critical illness or surgical cover is expanded, there is a possibility that it might be construed as a benefit that covers "all" major (and not necessarily critical) illnesses or surgeries.

2. Treatment of pre-existing illnesses- The most debated issue in medical insurance is the exclusion of pre existing illnesses. Treatment of pre-existing illnesses vary considerably between insurers and products and there doesn't yet seem to be a standard practice. Further, exclusion of such pre existing illnesses is not easily understood or appreciated by the buyers. In several instances this could cause a big gap in health insurance cover and might be a source of mis-selling.

3. Eligibility criteria for claims – the product might in general give an impression that benefits are payable on the happening of any of the insured events while there could be additional criteria that might need to be satisfied before a claim is paid. For instance, in a hospital cash benefit product, the cover might have a time excess in which case no benefits are paid for the initial period of hospitalisation; in a critical illness product, no payment of critical illness benefit

might be paid if death occurs during the survival period; in surgical benefits, the company might wish to make an independent check whether the surgery for which a claim has been made was medically necessary in the first instance.

Potential areas which could give rise to mis-selling – Contract terms

Definitions and exclusions – the definitions of critical illnesses, surgeries and terms used in hospital cash benefit might be different from the common understanding of the terms thus defined. Similarly, there might be exclusions at various levels (product level exclusions – "certain benefits not available for persons engaged in certain occupations", benefit level – "hospitalisations due to epidemics being excluded" and contract level which are set due to individual underwriting – "hospitalisations for lumbar back problems excluded") which might cause problems at the claims stage.

Contract contact and language – communication of contract terms is a crucial factor. The insurer's intention is to use legally sound terms in the contract in most instances results in a format and a language that is difficult for consumers to understand.

How to avoid mis-selling

1. Simple and easy to explain product design
2. A sign off from the product development project team that issues on mis-selling were indeed considered while developing the product and care has to be taken to avoid any possibility of mis-selling
3. Training to intermediaries and employees on product features and how to respond to questions from consumers
4. Sound sales process to make sure that the potential buyers are educated and are aware of the decisions that they are making while choosing a particular insurance contract
5. After sales follow up to make sure that the several steps in the sales process have indeed be followed
6. Standardisation of communication that are sent and making sure that the language is simple and understandable from the consumer's viewpoint.

(As could be seen, the above solution is too elaborative which is not expected from the candidate. The candidate is expected to exhibit that he/she has understood what mis-selling is, product design and contract terms and how these could be avoided. Due credit will be given if the candidate could explain with examples instead of providing a general answer.)

(Total 15 Marks)

Question 8:

a. Write down a simple formula for calculating incidence rate for a typical age x for a hospital cash product for a term of one year, providing a lump sum cash for each day of stay at a hospital.

Solution:

(Comment: Incidence rate = Claims / Exposure, which could either be measured in number of policies or by cover amounts. In products where we suspect the

claims experience to vary by cover amounts, it would be sensible to calculate incidence rate using claim amounts rather than number of lives exposed.

Hence the candidate is expected to provide a formula using claim amounts and not using lives exposure.)

Claim amount paid in an hospital cash product = No. of claim incidences * average number of claimable days of stay in hospital * per day hospital daily cash amount

Exposure would be calculated as number of lives exposed * per day hospital daily cash amount.

b. The following table is an extract of your hospital cash portfolio which pays a lump sum benefit for each day of hospitalisation. Calculate the incidence rate for a one-year contract from the data given below.

Age	35 years
Insured lives	1000

Hospital cash per day benefit	No. insured	Claims rate	Average days in hospital
500	100	10.00%	5.00
750	200	8.00%	5.00
1000	400	6.00%	5.00
1250	200	6.00%	5.00
1500	100	6.00%	5.00

Solution:

Hospital daily cash benefit (DCB)	No. insured	Claims rate	Average days in hospital	Claims outgo
(1)	(2)	(3)	(4)	(5) = (1)*(2)*(3)*(4)
500	100	10.00%	5	25,000
750	200	8.00%	5	60,000
1000	400	6.00%	5	120,000
1250	200	6.00%	5	75,000
1500	100	6.00%	5	45,000
Totals	1000			325,000

Claims out go = 325,000
Amounts exposed = 1,000,000

Incidence rate = 0.325

[Note to the marker: The calculation of per day incidence rate should be given equal credit]

c. Given that a reinsurer loads the incidence rate in such a way to get 10% of the gross reinsurance premium as a charge for expenses and cost of capital, using

the incidence rate calculated above, calculate the reinsurance premium for Rs 100 per day hospital cash benefit for age 35 years. Ignore timing of claims arising, interest and the effect of reserving and solvency margins in your calculation.

Solution:

Incidence rate = 0.325

Reinsurer's load = 10% of gross reinsurance rate

Reinsurance premium = 0.325 / (0.9) * 100 = Rs 36.11 per Rs 100 daily cash benefit

d. Given that an insurer loads the reinsurance rate in such a way to get 30% of the gross premiums as a charge for expenses and cost of capital, using the reinsurance rate calculated above, calculate the gross insurance premium for Rs 100 per day hospital cash benefit for age 35 years. Ignore timing of claims arising, interest and the effect of reserving and solvency margins in your calculation.

Solution:

Reinsurance premium = Rs 36.11 per Rs 100 daily cash benefit

Insurer's load = 30% of gross premium

Gross premium = 36.11 / (0.7) = Rs 51.59 per Rs 100 daily cash benefit

e. Assuming a risk premium quota share arrangement wherein 50% of the hospital cash risk is shared between the insurer and the reinsurer, and assuming that the experience from the portfolio for which you have priced matches the claim experience given in question (b) above, using the reinsurance and the gross insurance premiums calculated above, calculate the following:

- Benefits retained and benefits reinsured
- Premiums earned by the insurer and reinsurance premiums ceded
- Claims retained and reinsurance claims
- Technical profits for the insurer and the reinsurer (technical profits defined as earned premiums less claims)

Solution:

Reinsurance arrangement	
Quota share	50%

No. insured	HCB -total	HCB - Retained	HCB – Reinsured
100	500	250	250
200	750	375	375
400	1000	500	500
200	1250	625	625
100	1500	750	750
	Exposed amount	Retained exposure	Reinsured risk
	1,000,000	500,000	500,000

Alternate solution: Without splitting each HCB benefit amount, it could be stated that 50% of the total exposed amount is ceded and the remaining retained.
(1 for correct numerical answer)

Total premiums received = Gross premium per Rs. 100 daily cash benefit
* Total amounts exposed /100

Thus, total premiums received = 51.59 * 1,000,000 / 100
= 515,900

Reinsurance premiums = Reinsurance premiums per Rs 100 DCB * Total reinsured amount / 100

= 36.11 * 500,000 / 100
= 180,550

Retained premiums = Total premiums – Reinsurance premiums
= 515,900 – 180,550
= 335,350

Claims outgo:

Total claims outgo = 325,000

Since it is a quota share arrangement from first rupee, the claims will be equally shared between the insurer and the reinsurer.

Hence,
share of claims for the reinsurer = 162,500
claims retained by the insurer =162,500

Technical profits for the insurer and the reinsurer

For the insurer, technical profit = Gross retained premiums less retained claims
= 335,350 – 162,500
= 172,850 (which is 33.5% of the gross premiums)

For the reinsurer, technical profit = Reinsurance premiums less reinsured claims
= 180,550 – 162,500
= 18,050 (which is ≈10% of reinsurance premiums)

(2 marks : 1 each for correct numerical answer)

f) One of your senior actuarial colleagues looks at the experience and the reinsurance arrangement and comments as follows: “This portfolio seems to be providing us better than expected results – our expected load for expenses and costs of capital was 30% of gross premiums whereas we get 3.5% more than our targeted load as the technical profit. It seems that we could therefore retain more risk from this portfolio. Given our focus on low income individuals who typically opt for the minimum hospital daily benefit (which is Rs 500), having a surplus

arrangement with a retention of Rs 500 will help us retain more and hence improve our overall profitability."

Comment on the profitability of the portfolio under the current arrangement, the expected profitability under the proposed arrangement and briefly suggest an approach to maintain or enhance profitability under the proposed arrangement. No detailed calculation of the exact share of risk, premiums, claims and hence the technical profits under the proposed arrangement is required.

Solution:

Comment on profitability under the current arrangement

- Current experience shows that the portfolio is producing a profit which is higher than expected.
- Note that we have assumed that the experience from the portfolio will be same as the pricing assumptions while calculating technical profits.
- In the absence of reinsurance, if the actual experience turns out to be the same as the pricing basis, then the technical profit will be the same as assumed in our pricing calculation. Similar results will be achieved if we had assumed effect of reinsurance in our pricing basis and priced accordingly.
- The excess profit margin is not due to the actual experience but due to the approach adopted in pricing and reinsurance. Further note that while calculating gross premiums we have loaded the reinsurance rates for expenses and cost of capital instead of loading the actual incidence rate.
- Thus the excess profit margin is an effect of gearing due to reinsurance.

Comment on the proposed arrangement

- A quick calculation of risk retained would show that under an surplus arrangement with a retention of Rs 500 the total risk retained will be same as risk reinsured.
- But given that the experience in the lower daily cash amounts are worse as compared to higher daily cash amounts, the proposed surplus arrangement and unchanged price would be expected to produce a profit lower than that under the current arrangement.

Comment on retaining or enhancing profitability

- If the company wishes to sell more contracts at the lower end of hospital daily cash scale, to retain its profitability it may have to adopt differential pricing (which would mean higher incidence rates for lower daily cash benefit amounts) or adopt a "portfolio pricing" approach and end up with a higher premium for all daily cash benefit amounts wherein the higher risk at the lower end is distributed across the benefit amount scale.

(Total 18 Marks)
(Total 100 Marks)

*********END********