Institute of Actuaries of India

ST1 – Health and Care Insurance

May 2013 Examinations

INDICATIVE SOLUTIONS

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.

Solution 1 :-

i)

Two principal methods on which dental insurance plans work are:
1. Capitation Basis
2. Indemnity Basis

1. **Capitation Basis**:
   The insurer and dentist agree a sum per annum per insured mouth.

   Under the capitation basis, the patient pays a regular fee to the insurer who deducts an amount for its expenses and passes the remainder on to the dentist. In return, the dentist provides treatment. Therefore, the dentist bears the risk that the cost of treatment required will be more that expected.

2. **Indemnity Basis:**
   The insurer covers the actual cost of treatment delivered.

   Under the indemnity basis, the insurer bears the experience risk. This can be on a full indemnity basis, but often limits, excesses or coinsurance will apply.

(2)

ii)

Earned premium is the proportion of premiums written and received that relates directly to the expired period of cover.

Earned premium for the Indian financial year 2012-13 relates to the earned premium from 1st April 2012 till 31st March 2013.

Rs. 800 is the annual premium received on 1st January 2013; the earned premium for the financial year would be for the 3 months from 1st January 2013 to 31st March 2013 only.

Hence it would be Rs. 200 (Rs. 800 * 3/12) for this policy.

(Other valid answer could be based on number of days. It would be Rs. 198.9 (Rs 800 * 91/366)

(2)

[Total 4 Marks]

Solution 2 :-

i)

Over-insurance refers to a higher than appropriate replacement ratio (ratio of post-claim income to pre-claim income, in both cases net of income taxes) which may lead to an inadequate incentive to return to work for a policyholder who has purchased income protection plan.

There are several ways in which over-insurance can arise:

- Over-insurance from outset.
- Subsequent over-insurance, through salary not keeping up with benefits.
  This might happen if a policy had benefits that increased automatically on each policy anniversary or if salary reduced (e.g. through part-time working), or a combination of these two.
- A reduction in the tax levied on IP claims, applying to existing policyholders.
- Multiple policies or receipt of other non-disclosed sources of income. These other sources refer to income while sick.

An insurer which currently only provides individual Income Protection (IP) plans is planning to launch a group version of Income Protection plan;

(2)

ii)

- In group products full details of individual lives may not be available at the inception of the contract. Pricing can be done for broader definitions of age, family size etc.
- The insurer, in such circumstances (i.e. when the full information is not available), could also make an estimate of the premium which could be adjusted up or down at the end of the period, if the details are known exactly.
- Different employers may demand different type of benefits, salary definitions, eligibilities and terms and conditions to suit their needs.
- Premiums for the group products may be different year on year as there could be significant changes in the lives covered. This could be due to change in employment or if lives opt out of the group scheme individually.

- From pricing viewpoint the actuary needs to keep in mind if the selection process of the group leads to anti selection in terms of cover chosen. Normally a statement of good health and active at work condition is asked for.

- The historical claim experience (over a specified time period) of the scheme itself would be analyzed. Equivalent risk premiums, based solely on the scheme's experience, would be calculated. Experience-rating methods could be used so that the premiums charged for a group scheme more closely reflect its own past claims experience.

- The size of the credibility factor will be a function of the size of group experience data. The factor will be larger, the larger the volume of data that is used. The "actual" risk premiums and the theoretical risk premiums would then be combined to produce the scheme risk premium rates, using credibility factor for the group scheme.

(5)

iii)

- Economies of scale – it will be much cheaper to sell and easier to administer one group policy than lots of individual policies. Underwriting tends to be less onerous on group policies. The premiums will reflect the reduced expenses.

- It will usually be easier to control and validate claims if dealing with a sole contract, i.e. the employer, rather than lots of separate individuals. This will reduce the cost of claims and claims administration.

- Group IP policies often have profit sharing arrangements, so employers will be interested in keeping claims costs low (as well as getting employees back to work). They could therefore initiate appropriate steps to control the cost of claims.

- Individual contracts have more scope moral hazard. For example, individuals who have taken out an IP policy themselves may behave slightly differently and may make fraud / false claims.
- Group covers may have tax advantages over individual insurances in some territories.

(3)

[Total 10 Marks]

Solution 3 :-

i) Product design factors:

- Target market
- Regulatory requirements
- Needs of distributors
- Company's own culture
- Availability of reinsurance arrangements
- System and other internal constraints
- Underwriting (both at inception and at claim stage) methodology
- Guaranteed or reviewable premiums
- Exclusions, waiting periods, deferred periods
- Benefits that are not offered by Government/State
- Type of benefits offered-Indemnity vs. fixed cash benefits
- Risk Characteristics
- Capital requirements
- Profit margins
- Return on capital employed
- Other considerations such as professional guidance notes, Actuarial Practice Standards (APS) issued by the governing actuarial institute.

(3)

ii)

- Independent intermediaries tend to reach a more financially sophisticated target market and hence more complex products can be designed.

- Also, independent intermediaries are more likely to have customers with high net worth, with consequent need for higher health insurance cover. So the product could have a high level of minimum cover for policies sold through intermediaries.

- Generally people purchasing the policy though this channel have better standard of living, better access to health care so they may have lighter claims experience.

- Similarly withdrawal experience of business secured could be better.

- The need for competitive terms varies by distribution channel, with the greatest competition being in business sold through independent intermediaries. So

premiums need to be competitive, as intermediaries have access to knowledge of the whole market.

- Independent intermediaries represent the interests of their clients and not a particular insurance company. The insurance company needs to be aware at the time of pricing the product that an intermediary might encourage anti-selection.

- The level of underwriting also needs to be stringent as intermediaries may encourage anti-selection.

- There may be competitive pressures not to make underwriting too stringent for business sold through intermediaries, for fear of discouraging business i.e. if too many applicants are refused at standard premium rates, the intermediary may stop recommending the insurer for most of his clients. These differences should be reflected in the product design.

(4)

iii) Advantages:

- It will help company to achieve good public relations opportunities as the scope of cover can be expanded for the same price. People would appreciate that their policy is updated as per the medical advancements.

- Claims assessment could be simpler as all the customers, of new or old CI products, will be on same CI conditions and the conditions will be as per the latest medical advancements.

Disadvantages:

- There is a risk that the option does not turn out to be in favor of policyholders. This can lead to criticism from intermediaries, regulator, media and customers.

- There may be large administrative burden of informing existing policyholders.

- A deep understanding of effect of new medical advancement is required to model the changes on expected claims for pricing of the option. Moreover, there may be difference of opinion within medical professionals/experts for categorizing critical illness conditions as ‘critical’.

- There may be significant costs involved in researching on the medical advancements that will arise after issuance e.g. employing efficient staff who understands the medical terminology

- There may be dissatisfaction from policyholders at the claim stage as they may not be able to claim for the conditions covered earlier in the original contract and are removed later.

(5)
[Total 12 Marks]

Solution 4 :-

i)

- Quota share is a form of treaty reinsurance whereby all the at-risk benefits for policies covered within the terms of the treaty are split between cedant and reinsurer in the same fixed proportion.

- In this arrangement, reinsurer covers an agreed proportion of each risk. This proportion may be constant for all risks covered.

- Under surplus the proportion of risk ceded will vary from risk to risk, depending on the size of the sum insured under the policy in relation to the retention agreed under the treaty.

- In this arrangement, reinsurer covers an agreed proportion of each risk which will relate the insurer's preferred monetary retention to the overall size of sum insured.

(2)

ii)

- The insurer can go for excess of loss reinsurance arrangement in which the reinsurer agrees to indemnify the cedant for the amount of any loss above a stated excess point.

- The insurer can go for aggregate excess of loss which is also called stop loss which protects insurer by covering total losses for the whole account above an agreed limit for a 12 months period.

- The insurer can also go for catastrophe excess of loss which covers amount of all claims arising from a single event and exceeds the pre-specified lower limit.

Benefits:

- Allows direct writer to take on risks that could lead large claims.
- Helps stabilize profits from year on year.
- Helps make more efficient use of the capital by reducing the variance of the claim payments.
- Lower capital requirements (some credit may be allowed for calculations of solvency capital post reinsurance arrangement as prescribed in the regulations) compared to capital requirements without any reinsurance arrangements.
- Other indirect benefits are from technical expertise of the reinsures and sharing of knowledge and underwriting support by reinsurer to the insurance company.

(3)

iii)

- Update assumptions for future experience:
  Reinsurer would like to monitor its claim frequency and claim severity experience over the time period before offering the risk rates to the direct insurer. This would allow them to monitor any trends in the experience and adjust the risk rates considering the expected future trends in the claim frequency and claim severity.
- If reinsurer has written business with the insurer in the past, it would consider the past experience of the insurer and accordingly propose the risk rates.
- Reinsurer will also factor the underwriting procedures, target market and internal risk management philosophy adopted by the insurer while arriving at the risk rates for the insurer.
- Medical experience may change rapidly and reinsurer can check the experience from other countries and adjust the same in the country where reinsurance business is written.

(3)

iv)

- Carry on regular monitoring of claims reported, paid and incurred
- Monitoring of withdrawal experience
- feedback into pricing and reserving assumptions
- Use third parties for their expertise by setting service level agreements to mitigate risks
- Regular Audit
- System checks
- Checks on policy and claims data
- Ensure proposal form and admin system have the same format
- Product designs should be assessed for its complexity and against the capacity of the staff to handle the operations for the design
- Ensure staff are trained
- Survey level of customer service satisfaction by making sure product meets the need of customer
- Underwriting
- Claims management control by ensuring claims are paid in line with policy conditions
- Fraud controls and take appropriate actions against any observed frauds
- Use pre-authorization procedures
- Control distribution processes
- Invest in sales training
- Monitor premium receipts

(4)

[Total 12 Marks]

Solution 5 :-

i) Company may set different assumptions for reserving than EV for following reasons:

The regulator has relaxed the norms the company may still consider to set basis for reserving in line with previous basis and only relax the margins marginally. Company may do this as there could be uncertainty on how the market will react to this change and how regulator will assess the new basis.

Company will set reserving basis to ensure that they meet policyholder's liabilities which is a different purpose than for EV. EV shows the value of future profits of the company with the value of any net assets attributable to shareholders.

Reserves are calculated to also put a value on the liabilities at a level satisfactory to the regulator whereas the EV are calculated for internal management who are interested in knowing the best estimate of company's profits.

(2)

ii)

Factors influencing size of margin held for reserves:

Availability of data, the size of the margin will depend upon the data available with the company. More credible and reliable the data, lower shall be the margin.

Nature, term and currency of the liability, if the liabilities are complex e.g. premium guarantee or options for policyholders, the company may keep higher margins owing to uncertainties associated with these features.

Regulatory restrictions, however the norms have been relaxed still regulator might expect companies to still maintain a minimum level of prudence over the best estimate basis.

Method of valuation, if company uses approximate methods because of practical limitations they may keep higher margins to allow for this.

If the markets are politically or economically unstable e.g. uncertainties around the future interest rates or inflation, the company may choose to keep higher margins to allow for this.

(2)

iii)

Outstanding claims reserves: Reserves in respect of claims notified to the insurer but not yet fully settled. The insurer is required to hold reserves against these claims, when assessing results or submitting accounts for a particular period.

Incurred But Not Reported (IBNR) – Reserve in respect of claims that have arisen but that have yet to be notified to the insurer.

Incurred But Not Enough Reported (IBNER) – as above but where it is felt that not all detail has yet been submitted and a provision needs to be established for the remainder.

Unearned Premium Reserves (UPR)-These reserves represent the balance of premiums received in respect of periods of insurance not yet expired.

Unexpired Risk Reserves (URR)- If company determines that the premiums that were charged to the policyholders are inadequate and does not fully represent the risks underlying, they should hold additional reserves for this inadequacy.

Companies may also hold catastrophe risk reserves in addition to above reserves. These reserves can be hold just in case a future catastrophe was to happen.

(6)

iv)

Case estimates:

An experienced claims manager inspects the claims papers and estimates the ultimate outgo for each case individually. The following factors will be taken into account:

- procedure type, this will indicate the cost of the procedure itself and the likely in-patient duration for accommodation costs
- hospital (medical centre) to be used
- name of surgeon, consultant or other medical principal
- policy coverage (full indemnity, excess, limits, recuperation benefit etc)
- age, gender and past claims history of claimant may have some bearing
- current levels of medical inflation.

Case estimates cannot be used to produce estimates for claims that have not been reported (whether incurred or not). For example, if case estimates are used for the reserving process then reserves for claims incurred but not yet reported must be estimated separately using other methods.

Statistical estimates:

Outstanding claims are assessed en masse in relatively homogeneous cohorts, based on historical trends and patterns, adjusting for known or anticipated future changes.

The portfolio might be split by contract type, by distribution type or by geographical region and a statistical distribution fitted to the past experience to estimate the claims incurred from the earned premium.

The above model can incorporate the provisions for IBNR, if this has been established appropriately.

(4)

v)

Situations where statistical estimates may give spurious results:

Simple models
If models used for statistical estimation are very simple then they might not produce reliable estimations. The benefits of using statistical models might be lost if the cases are not modeled appropriately.

Inhomogeneous risks
If the cases are inhomogeneous, using statistical estimation techniques may produce spurious results. Statistical estimation is appropriate for homogeneous claims.

Further, if the cases are divided into large number of groups for calculations than it might not produce credible results and instead case estimates could be a preferred method.

New company/incredible data
If the data do not belong to a number of past years use of statistical techniques may produce unreliable results. There could be external influences on the claims and hence claims reported year on year might have different patterns. **(2)**

[Total 16 Marks]

Solution 6 :-

i)

For the LTCI products there are generally two types of funds, one unit and the other non-unit funds.

The regulatory restrictions may be different for each fund as the investment risk on unit fund is born by the policyholders and for non-unit fund by the insurer.

Fund manager will have to consider following regulatory restrictions before investing in an asset;

- If the asset is restricted

- If the amount of investment in the asset is pre-specified for purpose of demonstrating solvency
- If there are limits on exposure to single counterparty/country
- If there are categories of assets in which the company has to necessarily invest e.g. government stocks.

There could be requirements for matching the nature/term and currency of liabilities. In practice matching long term care liabilities could be difficult given the longer term of these contracts. The fund manager may have to invest in foreign currency assets or suitable derivatives if the longer duration assets are not available in the country.

The restrictions may be applied on the company as a whole or at a fund level/product level. It could be more difficult for the fund manager to meet the regulatory requirements if the restrictions are applied on product level than on company level. **(4)**

ii)

Long term care plan:

- Company should increase the equity allocation in its investment strategy only if it maximizes the overall return on the assets
- For pre funded long term care plans, liabilities are of longer durations and increases with inflation. Increase in equity exposure limits may help insurers to match the liabilities and also earn better returns.

- For immediate needs long term care plan, the liabilities are immediate in the form of benefit payments and may also increase with inflation. Increasing exposure in equity may not help to match the immediate liabilities given the volatile nature of equity returns.

Unit linked critical illness plan:

- For unit linked critical illness plan assets are matched to the unit liabilities. If the equity exposure in the underlying fund increases then during the short term, the fund (asset) value will be volatile and hence the payout will also be volatile.
- However, during long term, the fund is expected to give better returns and hence the claim payout may be higher.
- Expenses incurred for running the businesses e.g. salaries and rents, increase with inflation hence increasing equity exposure may help the insurer match expenses outgoes.

Company wants to set appropriate target returns/benchmark for the fund manager after this change in the regulations. **(6)**

iii)

To analyze fund manager's performance in past the company can take following steps:

- Determine an appropriate time horizon, not too long and not too short, on which it wants to assess the performance
- Remove any particular years which can distort the results of the analysis and may be study them separately.
- Calculate returns achieved by the fund managers in past and compare with the target returns/benchmark given in the investment policy
- Allow for the restrictions/mandates given to the fund managers e.g. regulatory restrictions or requirements to meet liabilities
- Compare performances over different funds/fund managers/products
- Calculate the risks taken by the fund manger to achieve above returns
- Check if the fund managers have met the mandates and restrictions placed on them across all periods
- Investigate if this was not true and understand if such deviations were communicated to the board in advance **(4)**

[Total 14 Marks]

Solution 7 :-

i) List the assumptions that would be required to price the Hospital Cash plan.

- Claim incidence rates
- Increase in claims incidence rates
- Expenses
- Expense inflation
- Renewal rates

- Commission
- Investment returns
- Taxation
- Expected new business volumes
- Expected new business mix
- Profit margins
- Required return on capital
- Margins for reserving assumptions **(4)**

ii)

Claim incidence rates/increase in incidence rates:

Use Industry data, reinsurance data, overseas data or any other source for deriving base incidence rates.
Adjust for any known changes for the hospital cash product if the data does not fully reflect the characteristics of the product
Adjust incidence rates for any observed past trends in the data.
Calculate the increase in the claims incidence rates in past year on year and remove if any on-off events e.g. epidemic which can distort the results
Adjust for target market using any published statistics if available.
Keep margins, use actuarial judgment to determine the amount of margins.

Expenses:

Company may not have its own experience. It can use the industry experience and adjust it for expected new business volumes for the company.

Adjust for any known factors which might result in lower/higher costs than industry averages for example higher salaries, lower cost of building (cheaper location) etc.
Keep margins in best estimate assumptions for any contingencies.
Use actuarial judgment.
Put service level agreements with TPA, hospitals and incorporate such agreed cost figures in the expense assumptions as they could be more relevant for the company.
Outsource activities to other companies who provide policy issuance/servicing and agree costs/fees.

Expense inflation:

Rates of inflation will be partly related to prices and partly related to salary costs.

Recent expense inflation experience of the industry should be analyzed to determine the basis for future projection.

Thus the following may be considered when setting the value of this parameter:
- current rates of inflation, both for prices and earnings
- expected future rates of inflation

Commission:

These assumptions will be determined by the amounts that the insurer intends to pay the distribution system as commission. This may be influenced by current levels of sales remuneration in the market place and/or by any legislatively imposed rates of commission. The pricing actuary will need to include any special arrangements that have been agreed between salesmen and insurance company.

Investment returns:

In a "traditional" pricing basis, the assumed rate of future earned investment return will depend on the assets in which the reserves are invested, which in the case of health products tends to be fixed interest assets / bonds.

For Hospital cash, the investment return is expected to have minimal impact.

Assumption for investment return should be consistent with the basis chosen elsewhere for inflation.

Value assigned to this parameter will be affected by the intended investment mix for the contract and the current or expected future expected returns on these assets. These assumptions could be taken from published investment indices for the relevant asset classes.

Taxation:

The actuary will need to allow for the rates of tax applicable to the line of healthcare business in the territory where the business is being written.

If taxed on profits, none of the elements in the basis need to be altered, but the return afforded by premiums over claims and expenses may need to be adjusted to permit the appropriate net return.

If taxed on investment income or expenses the actuary includes investment income and expenses net of the relevant tax rate.

If taxed on premiums financially, the insurer remains neutral to this levy, although the insurer may collect it on behalf of the State.

An external consultant has suggested that the company should not charge the new customers for medical tests performed for the initial underwriting.

(13)

iii)

- This will increase the expenses incurred by the company as the expenses will be met in full by the company. The profitability of the product will also be impacted as the expenses incurred will be deducted from the profits.

  - Company can however increase the premiums to allow for this expense. This might result in expensive premiums than competition rates.

  - In long term per policy medical costs can come down if the company has big book of business.

  - If the customer does not buy the policy after undergoing the medical tests, the profitability of the product will further get impacted as higher proportion of the expenses will be charged from the sold policies.

  - This might boost sales, some customers will find this attractive as they do not have to pay any additional costs for buying the policy. **(3)**

[Total 20 Marks]

Solution 8 :-

i)

- Product should be affordable to this segment of the market.
- Product should offer various payment options e.g. easy installments or per day payment
- Product may provide withdrawal options and refunds of unearned premiums on withdrawal.
- Easy to read marketing material as the customers may not be well educated
- Distribution through worksite marketing or other efficient distribution channels
- Insurer may restrict claim payments only to a list of hospitals
- Small co-pays or deductibles could be used
- Insurer may consider providing family cover on a compulsory basis to ensure a minimum premium or to avoid anti-selection
- Insurer can offer some benefits as add-on which are available only on payment of additional premium for different levels of affordability of customers
- Insurer may provide cover for travelling expenses to hospitals if there are no good health infrastructures in nearby localities.

(3)

ii)

Risks:

- Suitable data may not be available to price this product hence the pricing may be wrong
- Lack of awareness of insurance may result in reputational risks as the customer may not understand if some claims are rejected
- Customers may not fill proposal forms or other forms appropriately which might further result in claim repudiation or higher claim expenses
- There could be anti-selection risks as the extensive underwriting may not be done to control premiums
- There could be higher frauds as the customers might fake claims
- There could be other operational risks as the insurer is marketing a product for the first time to this segment

Risk control measures:

- The insurer can align with the reinsurer to access the data used for the survey to form better understanding of the lives

- Insurer may hold some customer education programs through worksite channels. This may also benefit insurer in longer term.
- Easy proposal form designs, use of vernacular language
- Reinsurance cover can be used to share risk of higher than assumed claims
- Training of staff to deal with this section of market.
- Insurer may use some overseas experience of similar products
- Insurer may also control the volumes for first few years
- Regular monitoring of experience may help avoid some risks

(6)

iii)

- Profit margins for other similar products
- Profit margins on overseas similar products
- Underlying risks of the product
- Affordability of premiums
- Business volumes that the insurer expects to write in future
- Size of the target market
- Competition premiums
- Check if there are any regulatory incentives or statutory benefits of offering the product
- Any possible synergies with other lines of business

(3)

[Total 12 Marks]

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