Institute of Actuaries of India

Subject CA1-II – Actuarial Risk Management

December 2018 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.

Solution 1:

i)

Improvement in mortality experience

- It will help insurers to improve their overall mortality experience, by encouraging customers to lead a healthier life
- On the other side, if the life assured lifestyle is worsening his health parameters, will the insurer be allowed to increase the mortality charge (negative discount)
- Customer will feel good; will have the feeling that the insurance company cares for their customers
- Mortality/ morbidity charge may be a small component of a UL product cashflows; it may not have a major impact

Additional expenses

- the insurer will have to spend on technology that can track, store information from these wearable devices.
- More admin work for the insurer and more expenses
- , You have to collaborate with a company that makes these devices maybe even buy a stake in it.
- The device must be fool proof and adequate controls must be there to prevent mis-use of the devices to claim discounts
- Might have to run a campaigns to create awareness; which will cost money
- More regulatory reporting on how the discounts are given

Customer value

- On one side the customer may feel good that the insurer cares for his/her wellbeing.
- But as the mortality charge is a charge from the fund and not a premium, many customers may not even come to know of this and appreciate its importance
- There is no change in premium paid by the customer.
  More engagement points with customer creating more potential for upsell and cross sell;

[5]

ii) Challenges

It may be a good move for better customer engagement. There may be many challenges in implementing the same

- The companies could be already charging at very low mortality levels; there may not be any significant reduction in the charge, which the customer may appreciate
- Can the discounts be negative, i.e increase in the charge
- If health score deteriorates can the discount be reduced or made NIL;

- What about if the customer's health is deteriorating; can the insurer increase the charge from the original charge
- The insurer will have to prove to the regulator that the discount calculation is objective and not given on discretion of the insurer
- There may be customer complaints; if the device was mal-functioning; if it is been used properly
- Should the device be the one approved by insurer.Or
- How to manage if various devices that are available in the market, they may be using completely different technology. Should the insurer restrict the use of certain brands of devices only
- How to manage that the life assured is only using the device and is not manipulating to show better reading. (say tie it to your dog, which may show many steps walked per day)
- At what frequency will the discounts be reviewed, too frequent will not be a fair indicator to improved mortality
- Mortality rate is a fairly long term assumption and takes a lot of time for any material improvements to take effect
- Will need to keep encouraging customers keep working on their health; marketing campaigns to keep them motivated; this can be costly and difficult to measure the effectiveness of the campaign.
- More controls to avoid fraudulent usage of the devices. Companies will have to invest a lot more on technology

[5]

[10 Marks]

Solution 2:

- Commission is considered a compensation for the sales effort and clearly the sales effort is much more during the first year;
- So the sales force may not appreciate it and will not feel adequately compensated
- There will be a sudden dip in sales force compensation; may force many to look for alternate avenues as career option
- NB strain of the company will reduce substantially;
- Corresponding capital requirement will also reduce;
- The sales person will have to manage renewals also to ensure they continue to get compensated
- Insurer's renewal rate may improve; as
- it may put pressure on sales person to chase for renewal also and not just new premium and new business may be impacted
- There will be no arbitrage of selling long term or short term policies; if commission scales were not dependent on premium paying term.

- You may see lower persistency in policies sold in the previous regime as the renewal commission would be relatively lower to the new regime of higher renewal commissions.
- If the high first year commission spread over the policy term, with a certain lapse assumption, the premium to the customer may reduce marginally
- However, if the insurer sets the level commission at higher levels inorder that the sales person gets adequately compensated for the sale; then the overall premium will go up.
- This change in regulation should be for all channels; else there may be conflict of interest between channels and
- Customers may prefer certain channel over another
- Leading to competition within the insurer's sales channels
- If companies were driving varying the FY commission or sales incentives to drive sales in certain business mix; that may not be feasible in a flat commission structure
- The average premium per policy may go up, as sales people will try to compensate lowering of FY commission by increasing the average premium size.
- With overall persistency improving the company's profitability will improve
- However there may be more work on the renewal and policy servicing departments, as there will be more policies to manage
- Will have to see how competition is managing this change. Your company can't be different from the market
- Are they using some other incentives in the FY instead of paying as commission. Like contests, club membership, expenses reimbursement, etc.

[10 Marks]

Solution 3:

i) A general insurance company may use ART instead of traditional reinsurance for

- provision of cover that might otherwise be unavailable through traditional insurance or reinsurance e.g., cat risk cover,
- Even if traditional reinsurance might be available it might be expensive or premium rates may be very volatile
- Securitisation arranged through the capital markets, since insurance risk is uncorrelated with typical market-related risks, the capital markets may require a lower return on capital than reinsurers; so it is cheaper

  … it also helps in reducing the volatility of the results and hence stabilizing the results
- Using integrated risk covers, an insurer can help ensure that it is not over insured.

- Higher capacity- transfer of risk to higher capacity banking or capital market sector eg., there may not be a single reinsurer who has the capacity to meet the needs of an insurer, due to capacity issues
- greater security of payment and hence

… reduced risk of insolvency

… increased capacity to write larger risks

… access to the reinsurer's technical expertise – product design and pricing, contract wordings etc.

- as a source of capital

… Post-loss funding can be used as a source of capital – the terms for raising the capital are agreed prior to a specific loss event occurring.

… Securitisation is a source of capital, since the liability does not have to be accounted for in the statutory returns.

… Under securitisation, *eg*a catastrophe bond, the capital is provided to the insurer up-front.

- there is risk of insurer and reinsurer being exposed to similar risks while transferring risks to financial markets diversification of risks can be achieved ,
- tax advantages of alternate risk transfer

[6]

ii)

- Reinsurance can reduce a provider's capital requirements

… Since reinsurance reduces the uncertainty of the provider's outgo, the provider needs less capital to provide a cushion against adverse experience.

… this point is reflected in a number of supervisory solvency tests that allow the minimum level of free assets to be reduced to reflect the extent of reinsurance.

- Reinsurance can provide capital to meet initial expenses

… Reinsurance can be arranged that provide an upfront payment (.commission.)from the reinsurer to the provider. This reduces cash flow strain arising from writing new business.

… Effectively this is a loan from the reinsurer, repayable out of the provider's future profit stream, but only if a certain level of future profits is achieved.

[4]

iii) The main features of catastrophe reinsurance are:

- It is non-proportional reinsurance;
- it is usually negotiated on an annual basis
- The reinsuring company will agree to payout if a catastrophe occurs.
- There is no standard definition of a catastrophe. It is based on the reinsurance treaty agreed between the parties. There needs to be a minimum number of claims arising from a single incident occurring within a specified time of that incident for catastrophic reinsurance to take effect.

- The reinsurance treaty would cover all the terms and conditions
- The cover would usually exclude wars, terrorism, epidemics and nuclear risks.
- Catastrophe reinsurance would apply on the amount retained by the ceding company after applying all other original terms/ risk premium reinsurance
- The reinsurer will pay the total claim amount (net of amounts reinsured under other treaties) in excess of the catastrophe retention limit, as agreed in the treaty
- There would be a maximum amount specified in the treaty. For covering any amount in excess of this limit, the ceding company will have to take a next layer of cover.

[4]

[14 Marks]

Solution 4:

i)

a) **Specifying the problem**

- Need to know the aims and objectives of the insurance company for this product. Will need to know its success measure.
- including analysis of risks, including mitigations, and the problem seen from each stakeholder's perspective
- Analyse the market to ensure product viability is possible,
- understand the needs of consumers,
- understand who is the competition
- understand what if any unique competitive advantages the insurance company has that can beutilised for this product.

b) **Developing the solution**

- considering the models to be used
- assumptions that will need to be developed for the health insurance product
- Will need to collect and analyse data
- interpretation of results – i.e. is the proposition viable
- What level and form of benefit would be suitable
- are there any alternative solutions available
- Will need to construct the health insurance product to meet the needs of the client, ensuring that it also meets the profit criteria of the insurance company.

c) **Monitoring the experience**

- Ensure model is dynamic such that it can be changed if required and in particular to reflect any experience that it identifies.

- Company will need to review the sales of the health insurance product, with an understanding of the profits actually achieved. Will need to understand in depth the capital that it requires.
- Will need to show sufficient granular information on the demographics of the policyholders and understand where the sales and expenses are coming from.
- In all of this will need to feedback to management and refine the model adjusting for feedback received – that is a review of all elements of the cycle as required.
- It will be critical to review all assumptions and elements of the model on a regular basis.
- All stages of the cycle must be considered in the context of the relevant economic and commercial environment. In addition the requirements of professionalism must be recognised at all stages.

[8]

ii) Company can take the following steps to control fraud:

Strengthen the existing underwriting process

- Benchmark underwriting criterion with competition to check whether company is being too lenient; very lenient processes may attract the wrong risks to your company
- Check previous claims history of the policyholder at inception at the time of underwriting
- Check whether any new rating factors need to be introduced- geographical area (some places these practices may be more rampant)

Strengthen claim management process

- Get agreement with Hospitals and diagnostics for rate charts and
- Reward them for keeping the bills within the agree rates
- Encourage customers to use networked hospitals and/or diagnostic centers;
- if unapproved hospitals are used do not settle cashless; settle claims after suitable verification of bills by reimbursement
- Pre-authorize all claims;
- Strengthen claims admission process- large claims being assessed by senior officials.
- Conduct spot checks on claims of large sizes
- Increase / introduce excesses to discourage small trivial claims
- Use in-house / appointed TPAs only
- Ensure claims personnel are well trained and claims manual and process are well documented and followed to discourage subjective decisions
- Liaise with police and other authorities to catch fraudulent customers

Analyze existing experience

- Look for multiple claims from the same claimant. Assess reason for same

- Check accuracy of claims data- is it giving wrong information,
- Check whether more than usual claims is associated with a specific sales personnel/Channel / geography/ diagnostic center/ hospital
- Compare experience with other companies to check that worsening loss ratio is not a general trend

Strengthen internal control process

- Conduct internal audits to check effectiveness of internal control process
- Strengthen anti-fraud department by recruitments if necessary
- Share and spread information on fraud cases as a source of learning for sales staff, claims personal, operational risk team and senior management
- Strengthen policy wordings and increase penalties for fraud if required
- Can look at increasing the premiums generally or for certain targeted groups, that would not though stop the fraud but it would reduce its effect.
- Will have to reject very unprofitable business where there is a high incident of fraud (certain ages, locations, etc)

[8]

[16 Marks]

Solution 5:

i)

- Advantages and disadvantages to customers of choosing option A

  + Cost will be less as it is only a term assurance policy and as nothing is payable on maturity

  + provides protection to the family in case of death of the customer as the housing loan is repaid fully by the insurance company and the house is available to the family for use without any encumbrance

  - On maturity nothing is payable.
  - In case of illness/financial crisis/unemployment and the customer is unable to pay EMI, the loan outstanding will be more whereas the insurance cover will be for a reduced amount.
  - Even if the housing loan is repaid in full or partly the insurance cover may continue if there is no option to surrender the policy at that stage.

- Advantages and disadvantages to customers of choosing B

  + As it is a without profit endowment assurance policy, sum assured throughout the term will be equal to the initial sum assured. Hence in case of death, apart from repaying the full housing loan some money will be available for the family.

  + At maturity full sum assured will be available to the customer.

  + If the customer defaults in paying EMI and in case of death the loan amount can be repaid with the sum assured which will be higher than the loan amount.

- Cost will be higher than option A
- Is not a match for the liability profile of customers [6]

ii) The existing insurance cover does not provide for default in EMI due to illness, accident and unemployment. The customer has to take insurance to protect against these risks.

Income protection Insurance:

Provides regular income to the customer if he is unable to work due to accident or illness. Insured risk can also include unemployment. This income can be used to pay the EMI of the housing loans.

Critical Illness Insurance:

Provides lump sum if the customer suffers from any one of the predefined illness. This lump sum can be used to pay for the EMIs of housing loan or foreclose the loan completely.

Unemployment Insurance:

It provides income stream if the policyholder is unemployed. But the duration of income stream is generally only one year as its purpose is to provide additional funds to maintain the policyholder's life style and service its debts for a short period.

Property Insurance:

It provides protection to the customer against damage to the property due to fire and many other perils such as explosion, lightning, theft, storm and flood.

[4]

iii) Reconciliation:

- Number of policies last year + ON – OFF should be equal to number of policies current year.
- ON would be new policies plus new policies due to disbursements under existing loans.
- Closures would be pre-closures + closures due to ending of normal tenure + part repayments + principal portion of the EMI's.
- Movement data can be compared with the accounting data.

Individual checks for unusual values: For each individual policy to check the following

- Term beyond Minimum/ maximum term
- O/s duration should be less than term. O/s loan should not be more than loan disbursed.
- Interest rate, loan, term, EMI should be within the minimum/maximum range
- Check if date of birth < date of commencement of policy
- Check for zero/blank/abnormal values in age, term, sum assured etc.
- Sum assured, premium beyond the normal range.

Ratios:

To check the consistency with previous year:

- Average term, average O/s duration, average premium, average sum assured,
- Ratios may not change from year to year unless there has been abnormal year.

For eg.,

- Many big loan disbursements to high network individuals in the previous year or
- Many smaller loans to below poverty line customers in the previous year etc.
- Many loan repayments/disbursements in the previous year due to interest rate changes etc.

<u>Spot checks:</u>

On customer data. [6]

[16 Marks]

<u>Solution 6:</u>

i) Likely Reasons for losses:

Actual experience much higher than pricing due to

In appropriate pricing

<u>Mortality:</u>

- Higher mortality experience than expected due to
- Persons with very poor health buying the product than expected
- Poor underwriting standards
- Poor claims underwriting
- Claims management not sufficient.
- Catastrophic event, natural calamities, war and hence huge claims

<u>Expenses higher than expected due to</u>

- Higher commission/incentives to intermediaries paid than priced for.
- Sales was much less than expected and hence expense per policy was higher, development costs could not be recouped.
- Inflation in expenses was higher than expected.
- Due to heavy withdrawals the expense per policy on remaining policies was higher.

<u>Withdrawals:</u>

- Higher withdrawals in initial years and hence initial expenses could not be recouped.
- Higher withdrawals and hence profits expected in future did not emerge.

<u>Regulatory changes</u>

- Due to regulatory changes the product was withdrawn and hence expected business volume could not be achieved.
- Hence the development cost of the product could not be recouped.

Reinsurer:

- Due to reinsurer failure the claims had to be settled at the insurer level.
- Reinsurance cost was much higher than expected in pricing and hence losses.
- In appropriate/Inadequate Reinsurance. For example, Reinsurance treaty was surplus treaty with retention limit of Rs. 50000 whereas there were huge claims below rs. 50000 sum assured hence huge losses to insurer.

Competition:

- By nature, it has easily comparable benefits and hence highly Competitive product
- Competitors may have better value for money products or additional attractive features.
- It could lead to poor sales or high withdrawals and hence not able to recoup development costs and New business costs. [8]

ii)

- For each product the exposed to risk and the experience data needs to be classified by risk factors.
- The extent of the analysis will depend on the volume of business written. The aim will be to split the data into homogeneous groups while keeping the volume of data within each group credible.
- We need to calculate, for each risk factor, number of withdrawals divided by number exposed to risk of withdrawal.
- The results need to be compared with the assumptions adopted to determine whether there is a significant difference.
- Depending on availability of data the withdrawal experience may be analysed by:
  Age Band, Duration in force, By premium payment frequency, By sum assured band/ premium band (as they are low income groups there may not much range in this), By distribution channel, by geographical location.

[4]

iii) Likely reasons:

Basic characteristics

- For Customers with lower income levels meeting their day to day requirements of food and shelter is a major concern and hence they may not have enough disposable income for paying insurance premiums.
- They may not have enough financial sophistication to understand the necessity for insurance. Hence withdrawal experience from products sold to low income groups are likely to be worse than that for other target groups.

The reasons for endowment assurance withdrawal experience being better than term assurance could be:

- Commission structure of term assurance product could have been high initial commission and very low renewal commission. Intermediaries after selling the product may not have focused on following up for renewal premiums.
- Mis-selling of benefits for eg., this a pure protection product and customers may have bought it assuming some benefit on maturity. Have realized post sale that there is no such benefit.
- With profit policies have early penalty for early withdrawals which could act as a deterrent to withdrawals. Term policies there is no such deterrence as there is no maturity benefit to be lost.
- Increased competition and lower price of competitors may encourage people to surrender, less likely as customer base is less sophisticated. [4]

[16 Marks]

Solution 7:

i) A defined ambition scheme is a scheme where risks are shared between the different parties involved, for example scheme members, employers, insurers and investment businesses.

1. Examples of defined ambition schemes that are more defined benefit in nature include:
   - cash balance schemes, where a defined lump sum is provided at retirement as opposed to a defined pension through retirement
   - schemes where the retirement age is increased for future service in light of increasing longevity.
2. Examples of defined ambition schemes that are more defined contribution in nature include:
   - DC schemes that offer minimum investment guarantees or minimum retirement income guarantees.
   - Defined ambition schemes aim to offer the best of both worlds to members, although administration may be complex and members may not fully understand their operation.

[3]

ii)

a)

- To value the guarantee, the fund of each member is projected to retirement and compared with the guaranteed amount.
- A stochastic model of future investment terms will provide a range of outcomes, giving an understanding of the likelihood of the underpin biting and its associated cost.

Choose an investment model

- As the projections are sensitive to the investment return, a stochastic investment model needs to be adopted with investment return being projected stochastically.
- Need to assume the proportions invested in various asset classes such as equities, debts etc.
- If member has choice on investment any likely change needs to be allowed for

- Correlations between the investment return on various asset classes also needs to be allowed for.
- As contributions are salary dependent, salary growth is also assumed to determine future contributions.
- A stochastic investment model like Wilkie model is appropriate to use.

Other decrements

- As the guarantee is payable only on retirement, for arriving at the cost of guarantee model may not consider other forms of decrements such as deaths, withdrawals, ill health. Alternatively, the model may make some realistic assumptions for these decrements.
- Group data as it may reduce time for running for eg., members of similar residual service.
- Choose a time period for running - annual may be adequate
- Criteria for testing needs to be arrived at. For this the risk appetite of the employer needs to be considered. (probability of ruin of 1 in 100)
- The stochastic model will generate a number of random investment scenarios –eg., say a 1000.
- For each scenario and for each member (or groups of members) check the projected maturity value with the guarantee accumulated value. The cost for that particular scenario for that model point is determined.
- The projected costs are discounted to the present and summed across all members/model points.
- These are arranged in the ascending order of risk. Cost of guarantee could be decided as the average of the cost or top 90%/95%/99% of the cost. [7]

b) Reasons for the employer to provide this guarantee:

- The employer wants to provide benefits that are of value to the employees.
- If the accumulated value is very low due to poor investment returns, the pension at retirement will also be very less. Hence the guarantee due to paternalistic view of employer.
- If the investment choice is only with the employer then the employer does not want the employees to suffer due to his choices.
- Competitors may be providing such a scheme or a defined benefit scheme.
- There may be a regulatory/legislative requirement to provide such guarantees for DC schemes
- The employee’s union might be very strong and have forced the employer to provide this guarantee.

Risks:

- the employees may not understand and value/appreciate the benefits
- If the investment choice is with the employees, they may be reckless and choose risky investments as there is an inbuilt guarantee.

- Cost of this guarantee may be too high especially at times of low interest rates regimes.

[4]

c) Expenses:

Administration:

- Creation/Maintenance/up-dation of individual member wise accounts, nominee details
- Contributions deductions from salaries and maintaining
- Purchase of annuities from insurance companies due to ill health/retirement/withdrawal
- Maintenance of pensioners/nominee pensioners details
- Calculation of Transfer values on withdrawal if applicable.
- Payment of trustee's salaries/administrative staff/fund managers/ IT department salaries

Accounting:

- Accounting/ Taxation (if any)
- Publishing data in accounts
- Disclosure to members/to management/regulators/other stakeholders

Investment:

- May be handled by in house fund managers or outsourced.
- If outsourced then the returns could be net of these expenses.
- If in house, office space rentals, brokerage, consultants fees etc.
- Investment expenses etc.

IT Systems:

- IT systems for administration/accounting to be developed/maintained
- Integration with other systems such as salary module.

Legal fee:

- For updating/modifying trust deeds.
- Any litigation costs etc.

[4]

[18 Marks]

****