

Institute of Actuaries of India

Subject CP1 – Actuarial Practice (Paper B)

December 2022 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)

- The traditional approach to pricing in insurance involves the use of pricing bands; consumers will be allocated to various bands depending upon a few simple metrics.
- The risk pooling, where risks are shared between policyholders with broadly similar risk characteristics is a long-established feature of insurance.
- Data analytics will have an impact on the related concept of the degree of pooling of risk.
- The rise of data analytics steadily reduces the size of each pool, and hence lower existing levels of cross-subsidy between different policyholders leading to bespoke pricing
- Certain policyholder may not be able to afford insurance.
- In some cases, insurance may not be offered at all
- The people who are likely to be left out will be most vulnerable section of the society
- Example those with different cultural backgrounds as well as specific challenges faced by women in low-income households
- Society may also desire a degree of cross-subsidy by retaining pooling of risk where this is deemed to be 'fair'
- Personalisation of insurance prices increases the risk of indirect discrimination at the hands of pricing algorithms
- Example higher pricing for policyholder who have particular names, caste etc.
- There is also a risk of overreliance on analytical model outputs: replacing human knowledge and judgement entirely which may lead to poor outcomes for certain set of policyholders
- The data collected from the third parties may not be accurate again leading to poor outcomes for certain set of policyholders.
- There may not be consistency in application of the data across different products lines (life and health protection) leading to unfair treatment of policyholders
- There will be increased risk around breach of data or poor data security exposing personal details of policyholders leading to reputation risks for insurer
- Some policyholders may see using personal data as a credible threat to their privacy which can lead to bad publicity
- There is a potential lack of transparency around Data Science and associated analytics and understanding and explaining what is behind the analytical 'black box' can be challenging to the insurer.
- If non-risk factors are used to optimise the final price for policyholders, it may be difficult to justify the same from fairness perspective
- Information asymmetries between insurers and consumers could widen with greater use of Data Science
- This could lead to erosion of trust in the insurer industry
- Any data or model enhancement or self-learning by the analytics tool might lead to different pricing for same cohort in short span of time which is difficult to justify and can lead to reputation risk for insurer
- It could also lead to trouble with the regulator including regulatory fines

[1/2 mark each, Max 10]

ii)

- Regulation and legality around use of third-party data
- Any limitations posed by professional actuarial body around use of third-party data
- The data may be outdated
- The cost of acquiring the data may be significant

- Any bias present in the data
 - The quality and accuracy of the data
 - The adequacy and consistency of the data
 - Integration of the third-party data with the pricing tools particularly if the data is unstructured
- [1/2 mark each, Max 3]

iii) The surplus under economic balance sheet is defined as Market value of asset (MVA) minus the market value of liabilities (MVL).

- The market value of assets is instantly available from the financial market.
 - In case for certain assets where the MVA is not available alternate valuation method can be used
 - The MVL is determined as the present value of the liability cashflow on best estimate basis using the appropriate discount curve.
 - A risk margin needs to be added to the PV of liability along with explicit allowance for TVOG.
 - Risk margin can be calculated using various methods like Cost of capital approach etc
- [1/2 mark each, Max 3]

iv)

- The capital can be used to write new business if it is expecting significant increase in volume in future
- The growth in the past has led to need for injection of capital
- The claim ratios have led to deterioration in the solvency of the company
- This could be account of pandemic or poor risk management standard
- Poor investment performance in the recent past
- Default on credit bonds like IFLS etc
- Expecting adverse experience in near future so want to increase capital
- Change in the regulatory capital requirement or regime
- Excess dividend paid in previous year(s)
- Unable to get reinsurance coverage for NB due to poor claim experience or pandemic thereby increase strain
- This will impact the optimization of the capital
- Recapture of treaty by the reinsurer, leading to increase in capital requirement as any credit for reinsurance cannot be taken for reserving/solvency
- Any major investment like changing the core system or investment in technology
- Expansion of the distribution channels requiring capital
- Or help in increasing the financial strength and rating
- This will help to attract new business and retain existing business
- Help in mergers and acquisitions

[1/2 mark each, Max 7]

v)

- The company may have started writing more long tail business in the non-linked fund
- Therefore, investing in longer dated asset will help in meeting the liability profile more closely
- There may be changes in the investment regulation by the regulator which may have not allowed equity investment in the non-linked earlier
- Or the capital charge for investing in equities have been reduced
- Or there could be change in the internal investment policy
- The economic scenario may mean that it may be more feasible to invest in equities

- For example, if the yield on the fixed interest securities have come down substantially
- Or it expects significant return on equities for foreseeable future
- There has been increase in the risk appetite of the company which means that it could take on more investment risk to generate higher returns
- This could be on account of excess capital in the company
- Or the company may have optimized the risk more effectively like purchasing reinsurance
- The competitors may be investing in the equities in the non-linked fund
- The fund may have gained in size thereby making it more feasible to invest some portion of assets in equities
- The investment income may be the key source of profit for the insurer and therefore excess return help in improving the expected profitability
- To price the products more competitively

[1/2 mark each, Max 6]

vi)

- Since the expectation was to beat the benchmark therefore tracking the index/benchmark will not work
- Hence the fund manager will have to adopt active approach in managing the equity investment
- Therefore, more the risk fund manager takes by deviating from the benchmark, the higher the risk of variation with the benchmark
- For example, it may be holding significant amount of cash if the manager believes that the equities will fall in near future, instead equities have risen
- The sector selection may not be appropriate
- The stock selection in sectors may not be appropriate
- Or the sector/stock selection might be in view of generating long term returns on portfolio
- The investment team may not have enough expertise of investing in equities
- It may not be also possible to recruit good investment managers/analyst in short period of time
- There might be constraints on the investment manager which would have impacted the returns
- Like regulatory restriction to invest in parent company stocks
- Or limits on the maximum investment in particular the sector or stocks as risk management strategy
- The equity market has been volatile for the comparison period, and therefore it was difficult to outperform index
- The peers in the industry have also performed poorly
- The time frame of comparison is also important as it may not be possible to outperform benchmark at every comparison milestone
- Since the company have recently launched the fund, the timelines of comparison may not be appropriate
- It may be more reasonable to compare returns for at least 1-3 year period
- There could be discrepancy in comparing the actual returns and the benchmark
- Example: in-consistency in the treatment of the investment income
- Or treatment of the fund management expenses/tax when comparing the returns
- The benchmark may not be appropriate
- Operational challenges, not been able to execute key deals at appropriate time due to internal systems issues

[1/2 mark each, Max 10]

- vii) The investment manager will have to consider the following
- How to define the ethical fund investment philosophy
 - Ethical does not have a universal definition and therefore the fund manager will need to define what is meant by ethical.
 - The definition will have to include industries in which investments are not going to be made
 - Does the ethical need to actively support certain industries such as green energy?
 - It will be difficult to assess whether large conglomerates are ethical as per the defined philosophy
 - Will any third-party support be required to help manager to determine whether the company it wants to invest in meets ESG credentials
 - The manager needs to establish rules regarding the action to be taken if a company becomes 'unethical'
 - And what happens if the fund invests in an unethical stock
 - Will annual audit be required to assess whether the fund meets its stated objectives
 - They may not have expertise in running the fund
 - Does it need to train the existing staff
 - Or should it outsource the fund management subject to regulatory constraints
 - Is there any ESG index against which the performance can be benchmarked
 - It may be difficult to compare the return with other competitor funds due to different investment philosophies
 - Regulatory restrictions on investment and sectorial limits which could interfere with application of the investment philosophy
 - Do ethical investments produce the same level of income
 - Will ethical investment result in lower returns
 - In such a case it will lead to dissatisfaction of the policyholder
 - Leading to complaints or surrender
 - Will the fund garner enough volume
 - If not, then it will be difficult to manage the fund
 - The likely fund management expense on the fund and whether it will differ from other funds
 - Tax treatment of the fund, is it different than other funds

[1/2 mark each, Max 11]

[50 Marks]

Solution 2:

- i) The types of insurance cover provided by general insurance products can be classified as
- Liability
 - Property damage
 - Financial loss
 - Fixed benefits

[1/2 mark each, Max 2]

- ii) The need for regulation of insurance products is greater than that for other markets due to
- Confidence in the product especially because insurance is a contract where premium is paid upfront.
 - The information asymmetry that exists between the insurer and the policyholder.

Pros of the proposed regime

- Faster turnaround time for the products resulting in a greater number of products introduced in the market.
- Insurers will be able to respond fast to the needs of the market without much bureaucratic hassles.
- Lower cost of development thereby lower expenses and lower premium.
- Increased product innovation.
- Increased competition among insurers
- Any other valid point

Cons of the proposed regime

- Lack of regulatory oversight may result in sub-standard products being introduced in the market.
- Lower public confidence in the products.
- Increased litigations and subsequent action by the regulator resulting in reputation risk for the insurer.
- Inadequate premiums may result in higher claims and resultant impact on solvency.
- Reinsurance rates may harden, or reinsurers may be unwilling to provide support.
- Any other valid point

[1/2 mark each, Max 5]

iii)

- a) Reserves or provisions are calculated amounts that are set aside to meet future liabilities.
- Reserves are classified as retrospective for contingencies that have already incurred and prospective for those that are expected in the future.
 - An insurer may use different methods to allow for risk in the reserves. Best estimate reserve with or without risk margin, setting the reserves at a higher percentile say 75th percentile, loading for contingency, projecting the cashflows are usually the different methods used.
 - The best estimate reserve has an equal probability of over / under reserving, a prudent or cautious basis will result in stronger balance sheet and lower profits. On the contrary, optimistic reserves result in lower value of liabilities and pre-mature distribution of profits.
 - Some of the reserves above may not be recognised by certain regulatory regimes.
 - Similarly, there may be disputes with tax authorities as certain reserves are seen as a way to defer profits and hence evade tax.
 - An insurer will calculate provisions for the following reasons.
 - To determine the liabilities to be shown in the published accounts and reports.
 - To separate accounts prepared for the purpose of supervision of solvency, to determine the liabilities to be shown in those accounts or internal management accounts.
 - To value the provider for merger and acquisition
 - To determine the excess of assets over liabilities and whether any discretionary benefits can be provided.
 - To calculate discontinuance / surrender benefits
 - To influence investment strategy
 - To provide disclosure information for beneficiaries.
 - In addition, a provider exposed to a range of financial and non-financial risks may set aside 'global' provisions.
 - Any other valid point

[1/2 mark each, Max 6]

- b)** The reserves in an insurer's balance sheet could be broadly classified into Premium reserves, Claim reserves and other reserves.
- For a general insurer, premium reserves or reserves for unexpired duration of the cover would represent the proportion of premium that falls beyond the accounting period in consideration.
 - The part of premium accounted for the period is known as earned premium and the amount set aside for the future is called unearned premium reserve.
 - Claim reserves denote the ultimate claim amount payable for the portfolio of business less whatever is already paid. They are broadly divided into case estimates and statistical reserves.
 - Case estimates or outstanding claim reserves are set aside based on the incidents notified to the insurer. These reserves are usually set by an experienced claims manager who may avail the services of qualified claims surveyor to assess the situation on ground.
 - The statistical reserves may be set with reference to historical claims, premiums, expected ultimate claim ratios or a blend of these parameters.
 - For large volumes of typical claims, like retail motor portfolio, the reserves may also be automatically set based on history of past claims events.
 - In addition to case estimates, the insurer also set statistical reserves based on past trend of claims. These include the Incurred But Not Reported claims and Incurred But Not Enough Reported claims.
 - Unexpired risk reserve or Premium deficiency reserve is set if the unearned premium reserve is expected to be lower than the claims that may arise from that part of premium in the future.
 - If the claims reserve above does not include provision for claims management expenses, then separate reserves for expenses related to future claims is set.
 - For long tail classes of business with low frequency and high severity, the insurer may establish claims equalisation reserve to smoothen the results when claims occur.
 - Separate Catastrophic claims reserve is set for classes of business prone to large and Cat events.
 - The regulator may require the insurer to demonstrate the adequacy of reserves held in the balance sheet.
 - In addition to the above, the insurer will also establish other reserves related to
 - Retirement benefits like pensions
 - Any receivables like premiums or reinsurance recoveries that are overdue
 - Provisions related to impaired assets or other reserves related to investments
 - Any tax or other future liabilities
 - Any other valid point

[1/2 mark each, Max 6]

- iv)** Approach to assessment of Capital requirements for the General Insurer under the proposed Risk Based Capital regime.
- Risk based Capital may be defined as the minimum amount of capital required to be held by an insurer that is calculated based on the assessment of risks to protect its customers against adverse developments.
 - Regulatory capital requirement is the additional capital held in excess of the provisions determined on regulatory valuation basis.
 - It is not prudent for an insurer to run its business solely based on the regulatory capital requirements.
 - Economic capital requirements could be a starting point for the assessment of Risk Based Capital.
 - Economic Capital is the amount of capital that a provider determines is appropriate to hold given its assets, liabilities and business objectives.

- Economic Capital is typically determined based on the risk profile of the individual assets and liabilities in its portfolio and the correlation of risks
- A risk measure like Value at Risk (VaR) or Tail Value at Risk (TVar) with certain level of confidence (say 99.5%) may be used to determine the economic capital requirement.
- The insurer needs to identify all the risks relating to both its assets and liabilities that will need to be modelled.
- Premium and reserve risk and catastrophic risk are the typical risks modelled for the business underwritten.
- The insurer will need to make assumptions about the correlation between the different classes of business underwritten. E.g., Health, Motor, Property etc.
- The other risks usually modelled are market risk, credit risk, liquidity risk, operational risk and currency risk if the insurer has overseas transactions.
- Under the current circumstances, risk of a Pandemic could also be included in the model.
- The insurer may use internal model with parameters specific to the business underwritten or standard model with parameters specified by the regulator.
- The model could be deterministic or stochastic, but the scenarios need to be internally consistent.
- An advantage of stochastic model is that it can automatically allow for correlations between different risks.
- The assets and liabilities are valued at market value or fair value.
- Alternate methods of valuation will be needed for non- tradable assets and liabilities for which market value is not readily available.
- Large and Catastrophe claims may need to be modelled using other proprietary models to arrive at an estimate of losses.
- It is likely that there may be difference between modelled Economic capital requirements and the factor based regulatory capital requirements.
- The calculated Economic capital requirements may be lower than regulatory capital due to diversification benefits.
- The specified regulatory capital may be more prudent and higher than the economic capital requirements to ensure protection of policyholders.
- The Economic capital requirements are held in excess of the market-consistent value of liabilities.
- A risk averse insurer may set a higher economic capital requirement for prudence or obtain a better credit rating.
- The parameter and assumptions would need to be reviewed and revised in the light of changing economic and business circumstances.
- Any other valid point

[1/2 mark each, Max 12]

v) Expenses associated with the product

- Commissions, underwriting costs, product design costs.
- Management expenses, salaries legal and other expenses
- Claims management expenses.
- Cost of setup of IT systems for data collection, analysis and monitoring.
- Cost of initial medical screening prior to policy inception.
- Per policy expenses like stamp duty postage etc.
- Cost of development of specific software, mobile App and other wearable device if any
- Cost of data collection, per insured cost payable to external service provider if any.
- Per claim expenses payable to external service provider if any.

- Disbursement of wellness benefits in the form of medical, nutritional consultation, health check-up or fitness programs may require tie-up with multiple agencies resulting in higher expenses.
- As the target population is senior citizens where claim costs are high, there may be a pressure to keep expenses low to reduce the premium
- Online sales may not be the preferred method of distribution for senior citizens. Employing agents for distribution may increase the costs.
- Persistency of the product may be low and hence the insurer may not be able to spread the cost over future years.
- Lower than expected sales may result in lack of spread of higher initial / fixed costs
- Higher advertisement and marketing costs for the target market may make the product unviable.
- Any other valid point

[1/2 mark each, Max 5]

vi) Risks specific to the said wellness-based health insurance product

- Being an innovative product, the risk factors and parameters used for rating may be inappropriate resulting in higher claims.
- Suitable data may not be available for rating or underwriting decisions.
- For example, the number of steps walked per day may not be an appropriate measure of morbidity of the insured. This is particularly true when the target group are senior citizens.
- Quantification of wellness benefits disbursed in the form of medical, nutritional consultation, health check-up or fitness programs may impact the reserves and /or premium rates
- While the ‘good risks’ get the fitness benefits or premium discounts, there is no method of penalising the ‘bad risks’ This may result in higher average claim costs.
- Availability of reinsurance at a suitable cost may particularly be a problem as the product is new and lack regulatory oversight due to the liberalised regulatory regime.
- Senior citizens being the target market, the product may be subject to the risk of lower volumes, low persistency and higher claim frequency
- Claim cost for senior citizens being already higher, there is likely to be pressure to prune expenses to set an ‘affordable’ premium.
- Higher premium rates may impact sales as the senior citizens major source of income may be pensions.
- Senior citizens being less tech savvy, may also impact the sales.
- Higher chances of disputes and complaints due to lack of awareness
- Being a health insurance product, a likely pandemic will result in higher claim costs.
- In a liberalised regulatory environment, the product is likely to face higher competition.
- Regulatory risks higher for self-Approved product in case of any mis-selling or adverse experience.
- Solvency risk especially if the product constitutes major share of total business.
- The cyber risk and the risk of loss of health data of policyholders may be significant.
- The data collection through mobile App or wearable device many be outsourced. The risk of outsourced agency not performing as expected
- Any other valid point

Mitigation of risks specific to the product

- a)** Consider other standard parameters for rating a health insurance portfolio.
- b)** Consider medical history of the insured during underwriting.
- c)** Establish correlation between steps walked and general health of individual.
- d)** Obtain Self-declaration by insurer about his/her current state of health.

- e) Consider underwriting of each proposal based on standard medical tests.
- f) Hold higher reserves to compensate for possibly inadequate pricing
- g) Hold higher reserves to compensate for unpredictability of morbidity experience using the wellness metric.
- h) Diversify the portfolio using other standard health products to spread risk.
- i) Being a new product, consider quota share reinsurance and excess of loss reinsurance on the retained share.
- j) Suitable cyber security and insurance.
- k) Consider alternate methods of risk transfer.
- l) Create awareness about the product among the target population to minimise any disputes.
- m) Stringent conditions for outsourcing. Ease of switching to alternate service provider.
- n) Explore other target population. e.g. Tech Savvy younger generation to spread the risk.
- o) Any other valid point

(1/2 mark per point. Max 8 marks for risks specific to the product and Max 6 marks for mitigation)

[Max 14]

[50 Marks]
