Institute of Actuaries of India

Subject CP1 – Actuarial Practice (Paper B)

March 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 main purposes include:

- Reviewing the premium rates
- Setting the best estimate assumptions for reserving
- Management information
- Analyzing sources of surplus
- Monitoring adequacy and use of reinsurance
- Assessing the profitability of different segments
- Assess the improvements in claims and underwriting practices
- Budgeting and planning exercise
- Estimating the IBNR provisions
- Charge to the asset shares for par policies

[Max 4]

ii) The following are the key risks which will be faced by the insurer

Liquidity Risk

- The company may not have sufficient financial resources to pay the claims as they fall due
- The need to sell the investments at a time when the price is depressed

Solvency Risk

- The high claims will lead to losses for the insurer leading to direct impact on the solvency
- The impact will depend on the amount of mortality risk hedged using reinsurance
- There may be need to keep additional mortality reserve which will further depress the solvency
- Reduced ability to pay dividend in the year
- It may face difficulty in raising the capital in short period of time if solvency is near the minimum threshold
- Reduced ability of the insurer to write new business or take risks
- There could be increase in scrutiny by the regulator which may impact the way business is managed

Operation risks

- The insurer may find difficult to process the claims due to increase in volume
- It may find difficult to recruit extra resources as it may be an industry phenomenon leading to higher demand of claim personnel
- Higher costs as more number claims are required to be investigated and settled
- They may not be able to perform the claim underwriting due to sheer volume leading to payment of fraudulent claims
- Increase in turnaround time for claim settlement for the insurers

Reputational risk

- Increased reputational risk for the insurer due to complaints from claimants on time taken for decision
- Distributors may face difficulty in managing the customer relationship due to delay in claims decision
- Penalty or discomfort by the regulator for delays
- Higher number of cases going to ombudsman because of which it might not see company in good light
- Bad publicity in media which could hamper the sales

Conflict with reinsurer

- High number of claims could lead to insolvency of the reinsurer leading to further financial impact on the insurer
- Increase level of scrutiny and documentation required by the reinsurer to approve the claims
  - This could further lead to delay in settlement of claims
  - Hassle for the claimant in terms of increased level of documentation required for claims
- The deficiency in underwriting or reinsurance administration might get exposed due to excessive scrutiny by the reinsurer
- Increase chances of conflict between reinsurer and insurer with respect to approval or settlement of claims
- Insurers may be forced to pay the claim where the reinsurer refuses to participate

[Max 11]

iii)

a) Subordinated debt

- Subordinated debt is any type of loan that's paid after all other corporate debts and loans are repaid, in the case of borrower default
- Subordinated debt is likely to be less expensive than alternatives such as equity particularly in the low interest rate environment
- It enhances return on equity and avoids dilution
- Tax benefits for the insurer as interest payment may be tax deductible
- Enables access to new investor classes previously inaccessible to the insurers
- May be able to raise capital for long term

[Max 3]

b) Financial Reinsurance

- Insurer can increase assets through reinsurance advance
- Loan servicing contingent on surplus arising and hence no need to provide for this liability in the statutory returns
- There could be release of the capital requirement to write the plans if risk transfer is also involved
- The lower capital requirement will enhance the return on the capital employed
- The cost of Fin Re is likely to be lower than the cost of raising equity
- Improves ties with the reinsurer
- Tailor-made Fin Re contracts can offer more flexibility

[Max 3]

iv)

- Pandemic risk is driven by the combined effects of spark risk (where a pandemic is likely to arise) and spread risk (how likely it is to diffuse broadly through human populations).
- Some geographic regions with high spark risk lag in pandemic preparedness
- Increase in the frequency of the global travel and interconnected ness
- The increase in the air travel may lead spread of pathogens rapidly
- The increase in the urbanization with high population density
- Struggling infrastructure in many of the cities and countries which includes lack of
  - Sanitation
  - Health care facilities
  - Housing

- This means an increasing number of people living in overcrowded and unhygienic environments in which infectious diseases can thrive, without adequate health amenities
- Shortage of medical staff nurses and other key workers, health systems may lead to the increased threat of disease outbreaks.
- Some pandemic mitigation measures can cause significant social and economic disruption.
- In countries with weak institutions and political instability, pandemics can increase political stresses and tensions and hence lead to difficultly in applying mitigation measure to restrict the outbreak.
- People may venture new territory in search of wild food or encroachment, they may enter animal habitats that have never had human contact before. This might be due to

    - Climate change also impact where people live, with climate shock events resulting in significant human displacement.
    - Increase in the human population
    - War and conflicts

- The national and international trade in wildlife also puts people in contact with animal infections that can then spread from person to person and potentially become a pandemic.
- Reduced biodiversity while some species are going extinct, those that tend to survive and thrive
- Example: rats and bats, for instance — are more likely to host potentially dangerous pathogens that can make the jump to humans.
- An increasing risk of flooding, which can be brought about by more frequent extreme weather events, also means that outbreaks of waterborne diseases
- Climate change can also affect the spread of disease in several ways, such as by altering the natural range of disease carrying insects like mosquitos
- Weakened immunity of human population due to lifestyle changes and environmental degradation

[Max 9]

v)

- The annuity are long term liabilities so it may be appropriate to back it using long term investment like equities
- The other asset classes may not have sufficient supply like long tenure corporate or infrastructure bonds
- Further, rising longevity has increased pressure on annuity/pension funds to invest in long-term assets.
- The low yield on the fixed income instruments which are presently the predominant asset class for backing annuity business may force the insurer to invest in equities having high expected yield
- It may be a strategy followed by the competitors to enhance the return on the assets and to price the annuity plans competitively
- Or it could enhance the shareholder returns
- The equities are more risky than fixed interest rate securities and can have significant short-term volatility
- The insurer must ensure that investment in equities is aligned with its risk appetite policy
- Otherwise, it could lead to higher probability of insolvency given the insurer is already looking to raise capital and may be not financially strong
- The insurer needs to perform the cash flow matching exercise to establish the proportion of equity investment in the fund,
- The cash flow matching is important as the dividend yield is likely to be lower as compared to the annual annuity payments to annuitants.
- Also, the cashflows of annuity are relatively stable as usually there is no provision for surrender, therefore it reduces the risk of selling equities at time when market value is low
- Investing in equity may have favorable impact on solvency position for the insurer subject to the benefit it can take for higher expected yield on equities in determining the regulatory capital.

- May lead to diversification in the investments
- The change in market value equity may not impact the revenue account as unrealized loss/gain change will sit in balance sheet
- Since it is a pension fund therefore investing in equities may not have any implication from tax perspective
- Equities may provide real rate of return therefore are suitable to back the certain component of annuity liability like maintenance expenses which are expected to increase with inflation
- The suitability also depends on whether the insurer has enough expertise to invest in equities
- The cost of equity investment is higher than debt may not be a significant factor in overall decision

[Max 8]

vi)

- One of the biggest benefits which aggregators provide is convenience.
- Customers can purchase the policy from anywhere and at any time.
- While buying insurance online, one can choose to compare the prices from insurers, thus making things much easier for them
- Contact less particularly in time of pandemic
- It helps in saving time from the grueling task of researching providers individually.
- The purchase of the policy may be faster as compared to the tradition methods
- As it is managed electronically, the premium of policies is submitted immediately
- The premium goes directly to the insurance company, safety is maintained since this rule out the chances of an agent not depositing any premium you may have paid in cash.
- The process is paper free being on digital platform
- Can talk to their customer relationship executives telephonically regarding any query, which can be resolved over phone
- Or there is chat service and chatbots available to service the prospective policyholder
- The prices of buying the policy online on account of:
    - The commission may be saved
    - Those buying online are expected to exhibit better mortality
    - Cost savings due to digitation of processes

[Max 6]

vii)

- Web aggregators promote or push a particular product of a particular company through its web-site
- The aggregator itself is not a big name in the market with limited volume
- The aggregator may itself be new in the market
- The aggregator may not have proper lead capturing and follow up process
- The aggregator may itself not spend on marketing and branding
- The quality of the customer experience provided at sales may be lagging
- The insurer may not be a popular brand in the market
- There are already established brands selling through the web aggregator
- It is a late entrant in the market and therefore may take some time to establish in the online space
- The products displayed or sold through the aggregator are not innovative
- The price is not competitive
- The claim settlement advertised is one of the lowest in the industry
- The underwriting conditions for the protection plans may be restrictive as compared to competition
- There may be increased competition from some of the new age digital insurance players
- The change in regulation can impact sales though the web aggregators like change in reward structures or minimum servicing standards requirements
- The insurer is not constantly reviewing the features or price to keep with competition

[Max 6]

[50 Marks]

Solution 2:

i) Key Implications of Climate change for the Insurance Industry:

I. Changing weather patterns and a changing climate will impact property and agriculture-related losses

II. through changes in frequency and severity of flood, wind, drought, hail and other climate-related events.

III. These changes will need to be modelled and allowed for in all aspects of the business i.e. pricing, reserving and capital modelling

IV. Model Risk: There is a risk that the different models used to calculate premiums, reserves and capital do not adequately represent the reality of a world impacted by climate change (and if they do now, they may not in the future).

V. Some types of insurance may become less affordable: the uncertainty around climate risks could lead to prices that few customers or businesses could afford and lower rates of insurance penetration.

VI. It could also widen the protection gap i.e. between those who can afford protection and those who cannot.

VII. Diminishing markets -- Exposed coastal properties and coal-related activities are examples of risks that might soon become uninsurable.

VIII. There is a risk of a shrinking market for certain products like underwriting coal projects as consumption of coal is considered as one of the reason for climate change.

IX. Greater accumulation of risks: The risk of over-exposure to a single (climate-related) event may increase as significant climate events become more common and/or more severe, e.g. increased frequency of tropical cyclones, tornado, hail, drought, flood, famine, etc.

X. Increased correlation of events: Events that are usually uncorrelated may become more correlated because of climate change, e.g. correlation of political risk with droughts or floods.

XI. These correlated risks are difficult to quantify and manage and contribute to a greater accumulation of risks.

XII. Latent claims: At some point in the future, liability claims relating to climate change could emerge with some latency. Lawsuits where the negative impact of carbon emissions is central to the claim may increase.

XIII. Adverse selection against insurers: Those insurers who do not adequately account for climate risks in their pricing models may be more susceptible to adverse selection by policyholders, e.g. because they unwittingly offer cheaper premiums to customers than competitors who have adequately accounted for climate risks.

XIV. Changing morbidity risks: A changing climate may alter the distribution or prevalence of both infectious and non-infectious diseases like malaria, and asthma in insured populations.

XV. Changing mortality risks: A changing climate could increase the number of deaths linked to extreme weather conditions.

XVI. Changes in population: Climate change could lead to rapid changes in the population of different geographic areas, e.g. due to mass migration because of water shortages or floods.

XVII. Populations that have either shrunk or increased dramatically because of migration could have very different risk profiles than before, e.g. different demographic profile, socio-economic status, education, etc.

XVIII. Greater capital requirements: Climate change could lead to greater capital requirements for insurance companies because of the increased frequency and severity of extreme events combined with the risk climate change poses to assets

[Max 9]

ii) Key implications of climate change for capital markets:

I. Stranded assets: Reducing global carbon emissions requires keeping significant fossil fuel reserves in the ground – or at the very least they cannot be burned without carbon capture and storage.

II. This will impact the cash flows, future values and share prices of companies whose businesses rely on the extraction and consumption of fossil fuels. These fossil fuel assets may effectively become "stranded".

III. Business model redundancy: Demand for, and cost of, production of most goods and services could be significantly altered as a result of either climate change or efforts to transition to a lower carbon economy. For example, energy, water and food might comprise a higher proportion of most consumers' spending. Many business models may be rendered obsolete or non-viable as a consequence, with resultant collapses in share prices and debt defaults becoming more frequent events.

IV. On the other hand, new business models and opportunities may emerge, leading to improved prospects for some subsectors of the economy.

V. Market volatility: In addition to the above, future uncertainty around climate change and the implications for society are likely to increase market volatility, for example, through political instability as a result of water or food shortages.

VI. Economic shocks: In the near future, shifts in market sentiment caused by (currently unrealised) awareness of the future impact of climate change could lead to economic "shocks" and substantial losses. Triggers for these shocks could include new scientific evidence, policy change or legal developments.

VII. Changes in saving patterns Higher energy, water and food costs may reduce savings by families and investment by businesses, lowering the level of capital formation and deployment in the global economy at a time when new infrastructure investment is critical to meet the challenges posed by climate change.

VIII. Intergenerational issues: Another consequence is intergenerational transfer of risk, from current to future generations who will be more directly impacted by climate change

[Max 4]

iii) Steps involved in including the climate change related risks in company's risk management process:

List of teps involved:

- Risk identification
- Risk classification
- Risk measurement
- Risk control
- Risk financing
- Risk monitoring

Risk identification:

- The risk arising from climate may not be immediately obvious as it is an emerging risk
- Everyone in the organisation need to be involved in risk identification including at Board level
- Identify the climate risks across all lines of business and operations

Risk classification:

- The identified risks need to be classified into various risk categories like market risk, insurance risk etc.
- For example, the volatility in the markets because of disasters can be included in market risk.
- Similarly, the increased frequency of floods may be included in insurance risk

Risk measurement:

- This is very important activity as this risk is not obvious and immediate
- Evaluate internal and external risk environment
- Develop mathematical models like catastrophe model
- Conduct various stress tests and scenario analysis
- Assess the correlations with other risks. For ex: the flood risk, the fire risk
- Reporting of the risk through techniques like risk matrices, risk registers

Risk control:

- Use the techniques like risk transfer, ART
- For example catastrophe bonds
- Use other techniques like diversification, enhanced underwriting etc.
- For ex: Diversifying across various geographies to diversify the risk
- Management control systems

Risk monitoring:

- To consider a range of quantitative and qualitative tools and metrics to monitor their exposure to financial risks from climate change.
- For example, these could be used to monitor exposures to climate-related risk factors which could result from changes to the potential impact of physical risk factors on outsourcing arrangements and supply chains.
- These metrics and tools will evolve and mature over time as the experience is gained.
- The metrics should be updated regularly to support decision making by the firm's board and/or relevant sub-committees.
- Should set out circumstances which would trigger a review of its strategy for addressing the financial risks from climate change.

[Max 7]

iv) Operational issues that may arise while developing model used for carrying out scenario analysis:

I. Model should be adequately documented

II. The workings of model should be easy to appreciate and communicate

III. The outputs from the model shall be capable of independent verification for reasonableness

IV. The model shall not be overly complex so that either the results become difficult to interpret or model becomes too long or expensive to run

V. The model should be capable of development and refinement

VI. A range of methods of implementation should be available to facilitate testing, parameterisation and focus of results

[Max 3]

v) Securitisation:

I. This is the transfer of insurance risk to the banking and capital markets
I. Among other things it is used for managing risks associated with catastrophes as the financial markets are large

II. It also involves converting an illiquid asset into tradeable assets.

III. Examples of illiquid assets are future profits, mortgages

[2]

vi)

I. An investor purchases a bond from the insurance company and therefore provides a sum of money to insurer.
II. The repayment of capital and interest if any is contingent on a specified event (catastrophe—ex: earthquake) not happening within a particular period of time.

III. If the event happens, the insurer use the sum of money provided by investor to cover the cost of claims.

IV. If the event doesn't happen, the investor gets their interest and capital back in the normal way

[2]

vii) The risk characteristics of a Catastrophe bonds are:

I. Security: Less secure than government securities.

II. The level of security depends on the financial institute issuing these bonds

III. Marketability: Marketability is less compared to government bonds and corporate bonds.

IV. This is primarily because of smaller size of issue.

V. Liquidity: The value of these bonds tends to be more volatile and less predictable than government bonds or corporate bonds

VI. The yields on such bonds are higher considering lesser marketability, liquidity and perceived additional default risk

VII. The returns on catastrophe bonds are largely uncorrelated with macroeconomic factors i.e., a rare thing in the investment world.

VIII. The risk of losing some or all of the capital in the event of catastrophe does occur, their risk exposure can be reduced by diversifying among many different catastrophe bonds

IX. It is difficult to price the bond

X. Because of difficulties in modelling the bond

[5]

viii) The natural perils for a crop insurance:

I. Destructive weather (hail, frost, damaging wind).
II. Disease.
III. Drought.
IV. Fire.
V. Flooding.
VI. Insect damage.

[3]

ix) Factors to be considered while designing Crop Insurance product:

I. Customer needs and interests:

   i. Need to examine whether the policyholder needs cover against multi-peril or single peril.

   ii. Whether government is providing any monetary support for crop losses

   iii. Whether cover is required for both agricultural seasons like Kharif and Rabi

   iv. Whether cover needs to be different for commercial crops and other crops

   v. Risk appetite of customers in terms of their willingness to transfer risk or retain the risk

II. Characteristics of other stakeholders:

   i. The government, the lenders typically banks are the major stakeholders in crop yield.

   ii. Need to check whether these stakeholders make this insurance as a mandatory requirement.

   iii. The terms of premium financing i.e., whether government share certain amount of premium

   iv. Whether the stakeholders share the loss

III. The regulatory environment:

   i. Whether the regulator or government has proposed any ceiling on the pricing

   ii. Any restrictions on the method of assessment of loss i.e., based on rainfall or crop yield in a certain segment or area

   iii. Any specific capital requirements for a crop insurance

   iv. Any tax benefits or any specific terms for this type of business like “Cooling-off” period.

   v. The regulatory provisions on reinsurance and co-insurance under this line of business

IV. Profitability, Marketability and Competitive pressure

   i. Need to balance the above three items

   ii. Whether this business can be offered across the country or area specific

   iii. Whether government allows all players across the country or specify each area

V. Market for the product

   i. As the product is targeted at agriculture farmers, the terms and conditions of the product shall be simple to understand

   ii. The loss assessment shall be on simple basis

VI. Capital requirements:

   i. Capital is influenced by level of benefits and uncertainty around assumptions

   ii. As climate-change becoming more unpredictable, the capital requirements may be more considering the uncertainty

   iii. If the government and other stakeholders share the loss to certain extent, the capital requirement may be lower

iv. In order to encourage the crop insurance, whether any lower capital requirements are being proposed by regulator or the government.

v. Whether any reinsurance support will be available

vi. If available at what cost the reinsurance will be available

vii. Whether any other insurers are ready to share the risk in the form of co-insurance.

VII. Administrative issues:

i. Need to check whether any separate administrative systems or other systems to be developed

ii. Whether any expertise is required for loss assessment for such business

iii. If any government subsidy is there, whether it will be realised at regular intervals of time.

VIII. Premium affordability:

i. Whether the customers are able to afford the premium.

[15]
[50 Marks]

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