INSTITUTE OF ACTUARIES OF INDIA

Subject CP1 – Actuarial Practice (Paper A)

May 2024 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) Accounting Standards influence how a service provider provision for benefits in accounts and hence would
- Impact the type of benefits the providers would offer
- Impact the range of products marketed
- Impact profitability of the products

ii) Risk, Capital Adequacy and Solvency
- These are typically driven by the regulatory requirements.
- The firms may be required maintain minimum standards of the risk management framework including risk management roles (Chief Risk Officer).
- The firms may be required to maintain minimum capital requirement
- The solvency requirements are moving towards risk-based framework e.g. Solvency II for insurers and Basel norms for Banks.

iii) Corporate Governance
- Corporate Governance refers to the high-level framework within which company's managerial decisions are made.
- CG will influence on the way management takes care the interest of its stakeholders- Shareholders, employees, policyholders, pensioners, customers, suppliers, regulators etc.
- Ensures that remuneration incentivizes management to act in the interest of stakeholders e.g., through share options
- Non-executive directors are also often part of the overall corporate governance structure

[6]

Solution 2:

i) Information asymmetry is the situation where at least one party to a transaction has relevant information which the other party or the parties do not have.

(1)

ii) Steps that the Government/Regulators can take in dealing with information asymmetry

Disclosure and Education:
- Require a service provider to disclose full information about product features at point of sale e.g. Benefit Illustration
- Require a service provider to disclose full information about the company from time to time e.g. bonus notes, audited financial accounts, insider information
- Require an individual /prospective policyholder to divulge true information in the proposal form (non-disclosure to be considered as fraud)
- Take steps to minimize the impact of individual /policyholder behaving inappropriately or less carefully (moral hazard)
- Take steps to minimize the impact of individual /policyholder exercise the option and guarantees when they are more likely to gain from them (ant-selection)
- Educate customers- customer awareness programs and advertisements by the regulator and/ or service providers individually or through its associations

Conflicts of interest:

Knowledge held by service provider about third parties can be restricted to that which is publicly available by
- Insider trading regulations

- Chinese Walls
- Separation of functions

Negotiation:

The weakness of an individual in negotiating a deal with large institution may be addressed by:

- Price controls e.g. upper limit on management charges in insurance premium, setting maximum limits on commission
- Regulation of selling practices e.g. allowing free look period during which the customer can terminate the policy

Unfair features of insurance contracts

- Consumer Protection legislation
- Regulate and monitor designing of insurance contracts. Specifically,
    - Literature, e.g. requirement for plain, easy to understand language
    - Contract terms e.g. regulating changes in the contract terms without valid reason and sufficient prior notice to the customers and giving them opportunity to terminate the contract
    - Discontinuous benefits , i.e. the size and payment of Surrender Values

Treating the Customer Fairly

- Regulation to ensure that providers of financial products consider the interests of their customers and treat them fairly
- The interpretation of what TCF means can be subjective

(8)

[9 Marks]

Solution 3:

i) List of Stakeholders

- Citizens of the country
    - Active members
    - Deferred Members
    - Current Members
    - And their dependents
    - Other Citizens
- Central Government (Client)
- State Government (could be a Client with Central Government)
- Trustees
- Tax payers (both existing and future)
- Sponsors of Scheme, if other than the Government such as World Bank
- Government Departments – responsible for the efficient implementation of the scheme
- Banks- May be involved in the collections/payments
- Insurance Companies
- Tax Authorities
- Regulators
- Actuary
- Investment Fund Managers

(3)

ii) Factors to be considered in launching a SWS:

- Coverage and customer needs- whether scheme will be open to all or some target group basis – income, region, age or occupation.

- Underwriting required e.g. citizen of the country, level of income etc.

- The level of benefits under the Scheme- varying by say income/salary, fixed, maximum/ minimum level.
- The level contribution/premium to be paid in order to receive benefits
- Duration or term for which benefits are available.
- Any non-forfeiture benefits
- Cost of Benefits- will depend up on the level, coverage and duration of benefits
- Source of Funding- Premium/contribution from members or financing through its own resources/tax collection
- Whether the Scheme will operate as funded or non-funded Scheme, If Funded,
    - Level of funding to be maintained?
    - Pace of funding
- Is there any need for Legislation/Regulation- will depend on whether government wants benefits need to be guaranteed and continue for a longer period
- Monitoring: Whether the client (Government) wants to monitor the scheme through its own departments/ministry or wants a regulatory authority to regulate it.
- It may ask any existing regulator or set up a new regulator to monitor the Scheme who in turn may regulate the scheme as per the direction and needs of the government
- Will there be any role of financial product providers in providing the benefits under the scheme?
- Administration System: Whether exiting systems of providing social benefits are appropriate to operate and manage the benefits and premium/contribution collection under the new scheme?
    - The coverage of the scheme could to be wider in in terms of region or target groups than the existing schemes which can make:
        - Collection of premium/contribution through e.g. banks/agents difficult
        - Payment of benefits difficult e.g. Direct Benefits transfers may not be possible in certain regions without bank branches and/or beneficiary bank accounts
- Complexity of the scheme compared to exiting schemes may require appropriate training for the staff/agents operating and monitoring the scheme
- Complexity of the scheme/benefits in relation to the target group. Social welfare schemes are aimed to benefit weaker section of the society. Such schemes need to be simple and easy to understand for the people. It will help reduce the risk of :
    - Being less popular: lower take up rate and/or higher withdrawal
    - Frauds/ Corruption

- Profitability: Usually social schemes are not designed or marketed for making profits
- Need for Actuarial advice:
    - Advise the client in setting legislation particularly if scheme provides benefits on future events
    - Advise on monitoring compliance with the legislation
    - Setting up provision for benefits under the scheme
    - Monitoring experience
    - Monitoring asset liability position of the Scheme (if funded)

- Tax treatment of premium/contribution, if any paid and benefits received under the scheme

- Appropriate investment strategy/policy for investing premium/contribution received, if any under the scheme – usually less risky and/or risk-free investment strategy is appropriate for the social welfare schemes.

(5)
[8]

Solution 4:

i) *Risk Management Process :*

Risk Management can be described as the process of ensuring that the risk to which an organization is exposed are the risks to which it thinks it is exposed and to which it is prepared to be exposed.

The risk management process consists of risk:

- Identification: of risks that can threaten the income or assets of an organization, and of possible controls of these risks.
- Classification: into groups, including allocation of ownership
- Measurement: probability of severity , before and after any control
- Control: mitigation to reduce the probability /severity/consequences of losses
- Financing: determining the likely cost of each risk and the availability of capital to cover retained risk
- Monitoring: Regular review and re-assessment , including identifying new or omitted risks
- Risk appetite is an important input into this process.

(3)

ii) *The risks faced by the food tech company and the ways these risks can be managed are*

Business Risk:

The business volumes are higher than that can be handled by the company which might lead to poor customer servicing and brand damage.

This might be due to:

- Business expansion in Tier 3, 4 & 5 cities.
- Changing lifestyle and preferences – preferring ordering online instead of preferring dining out.
- Increased online orders during certain period e.g. during Tournaments such as World Cup and Premier Leagues

Competition Risk:

- The competition may result in lower income from restaurant advertising business and reduced margins on account of lower charges and /or higher discounts on food delivery.
- The increased competition may arise as a result of:
  - Threat of new entrants , given ease of entry in the online business
  - The existing and/or large players may compete on pricing and increase marketing spending to acquire market share.
  - Substitution Risk - Given all players operate primarily through mobile apps available on same platform (e.g. Android iOS),
    - The customers tend to enjoy bargaining power.
    - The non-food delivery companies can easily enter into food deliver business
- The Food Point may have to increase its expenses on marketing and customer servicing to retain and increase market share.
  - Higher Marketing Budget
  - Acquire smaller players to reduce competition

Technological Risk

Use of technology, fast changing technological changes and disruptive technologies (Chabot, AI, and ChatGPT) may affect company's business.

- Customer reviews (in particular false review) on Food and restaurant can be viewed by all other customers
- Use of AI based tools and lack of human touch could result in customer dis-satisfaction

Cyber Risk:
Hacking of customer's account could severely damage company's reputation to protect customer's personal data. Customer might become wary of doing business with the company.

Operational Risk
Operational risk arises from inadequate or failed internal processes, people and systems.

As an online company, the company relies significantly on website, application and telecom infrastructure. There is risk of losses on account of following:

- Given the traffic of orders and the 24x7 service availability, on-line systems of the company needs to be up and running all the time. Even short system downtimes can lead to significant financial losses, including reputational damage to the brand.
- Food Safety: Although a concern for the restaurant partners, the company delivering the food is directly dealing with the customers.
- Food Quality
- The food is usually delivered by the company's affiliated drivers/riders at customer's home or office which can give rise to additional risk.
  - Background check/Police verification not appropriately done
  - Delivery person engaged in criminal offence while on duty
  - Food tempering

Regulatory and Compliance risk:

There is risk that government regulations and legal cases may result in financial losses to the company.
In particular for new generation and technology companies, there is higher risk of uncertainty compared to traditional companies when it comes to interpretation of regulatory compliance.
The company will have to comply with the guidelines of Food Safety and Standards Authority of local government.
The company is also exposed to similar risks in each country in which it operates.

External Risk:
External risk arises from external events such as storm, fire, and flood or terror attack. In general, external risk is systematic risk.
Other financial risks:

Expense risk: Expenses higher than expected and/or allowed in the charges.
Market Risk: Risk of losses due to movement in the values of its assets
Credit Risk: Risk of loss when Counterparty risk fails to meet its obligations e.g. Insurance fails to pay insurance claims
Liquidity risk: Inability of the company to meet payment obligations in full and on time due to lack of sufficient cash.

(8)

iii) *Insurance products to manage the risk:*

The following insurance products might be appropriate in helping to manage the industrial company's risks:

Cyber insurance: Covers the losses arising from cybercrimes such as hacking, phishing, computer viruses

Business interruption: Covers losses on account of not being able to conduct business

Personal accident: provides fixed benefits on loss of limb or other specified injury from accident

Medical benefits: Provides benefits for medical treatment in hospitals

Group Term: Provides benefits on death of the employee.

Employers' Liability: Indemnifies the insured against legal liability to compensate an employee for accidental injury, disease or death suffered, owing to negligence of the employer or other employees

Public Liability: : Indemnifies the insured against legal liability to compensate a third party for accidental injury , disease or death suffered, owing to negligence of the employer or other employees

3rd Party liability: Indemnifies the insured against compensation payable to third parties for personal injury or damage to their property

Product Liability: Indemnifies the insured against legal liability for the death/sickness /injury to a customer (or third party), that result from product default.

Professional Indemnity: Indemnifies the insured against legal liability resulting from negligence in the provision of service by professional in the company.

Property Contents: Indemnifies value of loss or damage to the contents resulting from theft, fire, storm etc.

Commercial Buildings: Indemnifies value of loss or damage to the buildings resulting from theft, fire, storm etc.

Pecuniary loss: protects the insured against bad debts or failure of a third party

Fidelity Guarantee: Covers loss on account of frauds and embezzlement by employees

(5)

[16]

Solution 5:

i) *Capital needs of a Bank*

A Bank would need capital in the short-term to:

- Deal with financial consequences of adverse event/unexpected credit losses
- Provide a cushion against fluctuating trading volumes
- Finance Expansion
- Finance Stock and work in progress
- Obtain premises, hire staff, purchase equipment

Due to long-term nature (and associated uncertainty) of many of the benefits, Banks have additional needs of capital:

- Meet benefit payments before sufficient contributions are received
- Meet Development Expenses
- Hold cushion against unexpected events
- Meet solvency/Regulatory requirement- Basel Regulations which set out minimum capital requirement
- Invest more freely (Mismatch)
- Sell products with guarantee
- Demonstrate financial strength to attract business
- Smooth reported profits
- Achieve strategic aim

(4)

ii) Capital Management ensures that a provider has sufficient solvency and liquidity to enable both its existing liabilities and future growth aspirations to be met in all reasonably foreseeable circumstances.
It often involves maximizing profits of the provider.

(2)

iii) *Banks Capital Requirement Assessment:*

The bank may have to hold a minimum level of capital as required by the local regulator-Central Bank in this case.

Usually, the local regulatory capital needs would focus on the losses arising from credit risk.

Prescribed regulations such as Basel accord might set out minimum capital requirement covering key risks faced by the Banks. Basel regulations include capital requirement for credit, market and operational risk.

Over and above the minimum capital requirement, the bank may hold additional capital as per its internal risk assessment.
Internal or Required Economic Capital is assessed basis:

- Risk profile of the Bank's assets and liabilities
- Correlation among of the Bank's risks
- Risk appetite of the Bank/Target Solvency Ratio
- Business/ Strategic needs

Bank may use either internal models or standard prescribe (by the regulator/professional body) formula to assess the capital requirement.

(4)

iv) *Impact on Bank:*

The unsecured loans have higher credit risk compared to other secured loans e.g. home loan or commercial loans.

Hence, the capital required to write an unsecured loan is higher.

The company may have allowed for the cost of higher capital requirement in pricing the product (unsecured loan). In that case, the impact is likely no impact on the bank.

However, any additional capital requirement for systematic risk from the central bank may not have been allowed by the Bank.

If there has been an unexpected increase in the proportion of unsecured loans for the Bank, it may be required to increase the amount of provisions held by the bank.

Increase in provision is likely to depress the surplus arising during the year.

In the long-term, there is a cost of holding additional provisions. The cost would arise due to restrictions on investments and the opportunity costs. This is likely to reduce the profitability of the product, if the capital required is higher than allowed in pricing.

It may impact company's initial plans to expand business. The company might have raised capital to write new loan business or to strengthen its solvency position to attract investors/deposits. Higher capital requirements may limit such possibilities.

(4)

v) *The items that CRO could consider including in its re-assessment report to the Central Bank:*

- The segmentation of the loan profile to assess level of diversification by types of loan – the proportion of unsecured loan is likely to increase
- The segmentation of customer profile- To assess the diversification of the credit exposure
- The Segmentation of Bank's activities- To assess level of Diversification by businesses
- The segmentation of the markets in which the bank operates- to assess the level of diversification across region
- The segmentation of Assets held – To assess the level of diversification across Investments

- Asset Liability matching or mismatching position-whether there is significant deviation in the matching position
- Minimum capital requirement / EC Requirement- likely to increase
- Additional capital available in excess of the minimum capital requirement to take extra credit risk:
    - Capital Conservation Buffer- extra layer of usable capital
    - Countercyclical capital Buffer- for cyclical credit exposure
- Bank's risk appetite and its track report of risk management
- Internal and external Auditors
- Trends in its earnings in terms of quality, reliability and volatility
- Compliance to regulatory guidelines, taxation, accounting standards

(4)

[18]

Solution 6:

i) The main factors that will influence a long-term investment strategy are:

- The nature of the existing liabilities- whether they are fixed in monetary terms, real or varying win some other way
- The currency of the existing liabilities
- The term of the existing liabilities
- The level of uncertainty of the exiting liabilities- both in amount and timing
- Tax- both the tax treatment of different investments and the tax position of the investor need to be considered
- Statutory , legal or voluntary restrictions on how the fund may invest
- The size of the assets, both in relation to the liabilities and in absolute terms
- The expected long-term return from various asset classes
- Accounting rules
- Statutory valuation and solvency requirement
- Future accrual of liabilities
- The existing asset portfolio
- The strategy followed by other funds
- The institutions risk appetite
- The institution's objectives
- The need for diversification
- Environmental, social and governance (ESG) considerations
- Investment Expenses

(4)

ii) *Fund's portfolio:*

Investments in domestic currency form a good match by currency.

Domestic Equities:

- An appropriate match for active members' salary linked benefits in the long-term
- A good match for any discretionary pension increases as equities are likely to give high returns in the longer term

Domestic Government Index Bonds

- A good match for the nature of the deferred members' benefits

- Good match for fund's expenses
- Good match for current pensioners' benefits if inflation is greater than 5%

Domestic Government Conventional Bond

- A good match for current pensioners'' benefits if inflation is greater than 5%

Cash and Money Market Instruments

- A good match for short-term cash flow requirements e.g. immediate pension payments, expenses and transfer value payments
- The need for cash is less if there is stream of contributions, since contributions can be used to meet short-term outgo

Property:

- A real asset, so a broad match for real liabilities
- Rents can be used to pay benefit outgo (as long as there are other liquid assets too)
- Offer diversification from equities

Derivatives and Hedging:

- Derivatives may be used to aid matching of the pensions in payment if inflation is sometimes below 5% pa and sometimes below.

Overseas assets

- Can provide a reasonable match to long-term , real, domestic liabilities
- May provide diversification across country/level of economy/geographical reason

(8)

iii) Increasing cash and money-market allocation and reducing equity allocation

- The reduction in equity allocation and increasing allocation in cash and money market could be a temporary tactical allocation as CIO might be of the view that the rising interest rate will depress values of equities.
- Possibly start of a recession which is likely to adversely impact the equity prices and dividends
- CIO might want to realize capital gains now and wanted to maintain strong liquid base in order to take part in attractive investment opportunity that might arise a interest rates begin to fall.
- Weakness in the national currency , making cash investments in other currencies attractive

- This might also be in order to maintain liquidity to meet expected outgoings which it might not be able to cover through contributions or otherwise. Such occasions may arise due to:
    - Known short-term benefit or expenses outgo
    - Uncertain outgo

(4)
[16]

Solution 7:

Actuarial Control Cycle:

Specifying the problem

Primarily, the company will take over the morbidity risk from insured in return of the premium insured pays. The company will have other risk but these are likely to be not as material. These include expense risk, investment risk and counterparty risk (if business is reinsured).
The problem is to determine an appropriate premium rates that:

- Deliver an acceptable profit (in terms of IRR, NPV etc.) to the company
- are competitive in the market segment in which it wishes to do this business otherwise little business will be

The company is new in the market and hence likely to have little or no experience of the product Given that company is already writing health business, the experience of health business could be useful to an extent.

Developing the Solution:

The company will need a pricing and profit testing model.
The model should be capable of projecting all future cash flows arising under the product e.g. income, benefit outgo, provisioning
The model should be able to cover all plausible scenario of future development under the product including lapses, surrender, death/CI and maturity etc.
The company will need to decide the initial (pricing) assumptions about future experience, in particular the morbidity basis and expenses (fixed/marginal).
Morbidity basis shall have regards to the market segmentation and level and type of underwriting.
Judgment needs to be applied and regulatory requirements will need to be considered in setting reserving basis.

If the business will be re-insured, the company may consider taking help from reinsures on data, underwriting and profit testing.
Model may need to reflect reinsurance arrangements.
The model needs to be run several times to test the sensitivity of the profitability and premium rates to changes in assumptions. This will be an important input for the monitoring stage.

Monitoring the experience:

After the launch of CI product, experience will be monitored regularly to compare it with the pricing assumptions.
Need to wait for the morbidity experience to build up to a reasonable level of volume. As volumes build-up, it could consider the morbidity experience by homogeneous grouping e.g. by type of illness, geographical region etc. Other items of experiences may also be
If the experience differs materially from the pricing assumptions, the company may profit test the product on experienced rates and revise premium rates on new business. It may revise rates on existing business if the premium rates are reviewable during the term of the contract.
Any deviation in the actual experience of the company from pricing assumptions may require changes in the valuation basis.
The company will also monitor premium rates or changes in the premium rates offered by the competitors. This may also lead to change in premium rates.
In case the company cannot offer rates that are both competitive and profitable, it may withdraw product.

General Economic and commercial environment
The actuary will need to take account of the general economic and commercial environment when deciding the premium rates, for example by comparing the rates available elsewhere in the market.

Professionalism
The actuary should be mindful of compliance with relevant regulation and professional guidance when pricing the product.

[10]

Solution 8:

i) Analysis of profit from actuarial point of view:

1. Analysis of profit is a key aspect of monitoring experience under Actuarial Control Cycle.

2. Valuation actuaries are key stakeholders in setting assumptions for reserving basis.

   a. Analysis of profits shows financial effect of divergence between assumptions made in provisions and the actual experience of the company during the year (e.g. mortality rates, surrender rates)

   b. These divergences are likely to be in line with the experience studies carried out by the actuary.

   c. The analysis can therefore help re-inforce and indicate the need for strengthening/ weakening the reserving basis.

3. The divergence between valuation assumptions and the actual experience can be split further to compare the actual experience against best estimate assumptions which can be useful information for pricing and other best estimate valuations such as MCEV.

4. The analysis will also show which items of experience have most significant impact on profit/ provisioning.

   a. This information can be used by an actuary to advise the company on the strategy and the business decisions. It will also indicate which assumptions have greater /lesser impact on the provisioning.

5. The analysis can explain any changes in dividend from the previous year
6. It can highlight any non-recurring components of profit , thus helping the actuary in managing expectations of future dividends/bonuses
7. It can give information on future trends in the company's experience and surplus distribution
8. It can show financial effect of the new business written by the company during the period and hence indicating a comparison with the pricing assumptions/business mix

(7)

ii) *Reasons of loss:*

- Deterioration in claims experience of previous years' business (higher claim amounts and/or frequency. This is more likely to be the case for term business and lesser for endowment and linked business

- Lower than expected investment return- This is more likely to be the case for Endowment business and less likely the case for the term business. For linked business, the investment risk and return is born by the policyholders.

- Over-spending on expense budget/one-off expenses: The amount of loss on account of this item shall depend on the allowed expenses and actual expenses allocated to the business.

- Higher than expected Withdrawal rates: Term business is likely to have no surrender loss/profit. Endowment business is likely to have significant impact.

- Provisioning too cautious /increase of prudence in provisioning basis: The sensitivity of the provision to the changes in basis shall vary by type of business. Any changes in the mortality basis will have significant impact for term business compared to endowment business and very small for linked business.

- Higher than expected Bonus rates: Only With-profits business

- Higher than previous year's new business: The extent of loss due to this item will depend on the increase in the new business from previous year and the extent of new business strain arising.

- Reinsurer failure/ default: Possibly higher for term business

- Change in legislation tax: Possibly higher for Endowment business.

- Regulatory fines: Depending up on the nature and business covered under regulatory fine. In case the fine is not specific to any business line, the losses may be attributed basis volume of business.

(10)

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