Institute of Actuaries of India

Subject CP1A - Actuarial Practice

November 2023 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:

a) Group Term Insurance

Benefits provided:
The contract provides lump sum benefits on the death of the member of the group.

Customer needs:
The product could be used by an employer to provide stated benefits as a part of an employee benefit package.

[1.5]

b) Motor Third Party liability

Benefits provided:
The contract provides coverage in terms of damage or injury caused to a third party, cost of damage caused to the motor of third party.

Customer needs:
The product protects insured, the owner or driver of the motor against the financial losses caused by the insured in the event of an injury or even death of any third party arising out of motor accident.

[1.5]

c) Deferred Annuity

Benefits provided:
The contract may provide a part of the accumulated fund as lump sum benefit at the end of the deferment period and a stream of regular income thereafter over the lifetime of the insured.

Customer needs:
The product is a savings product to meet future retirement needs. It protects the insured from out living its savings insured.

[1]
[4 Marks]

Solution 2:

The downgrade in sovereign rating is usually on account of increase in the risk of default by the government on its borrowings from the market, particularly from the international market. As a result, the yields on the government bonds will rise leading to fall in the in the market value of sovereign bonds.

Corporate bonds: The yields are likely to go up.

Overall, there will be an increase the interest rates in the country.

Increase in the interest rate is likely to result in the fall in the value of Scheme's fixed interest assets. The value of equity investment may also fall as increased interest rate is likely to have a dampening effect on the corporate earnings.

Increase in the interest rates is likely to increase the valuation rate of interest and hence fall in the value of liabilities.

If the overall duration of a scheme's liabilities is longer than the overall duration of Scheme's assets, the fall in the value of the assets as a result of increase in the interest rates is likely to be lower than the fall in the value of liabilities and hence improving the asset liability position of the company.

Increase in inflation is likely to increase the value of liabilities.

Overall, impact on the asset liability position will depend on the

- Extent of matching/mismatching of its assets and liabilities in terms of duration, nature and currency.
- Types of investment held by the Scheme as downgrade impact would vary across asset types.
- Method of valuation of assets and liabilities

[5 Marks]

Solution 3:

i) Aggregate XL covers the aggregate of losses, above an excess point and subject to an upper limit, sustained from defined peril (or perils) over a defined period, usually one year.

[2]

ii)

a)

Under Risk XL Treaty

Claims amount	Recovery	Retained
8,00,000	5,00,000	3,00,000
5,50,000	2,50,000	3,00,000
1,50,000	0	1,50,000

Total retained by the insurance company after operation of this treaty is 7,50,000. So under aggregate XL treaty, the recovery will be on 50,000. (All figures are in INR)

[3]

b) Various methods:

1) Statistical analysis – if there are many claims, following a known patters
2) Case by case estimate – Individual assessment of claim records where there are few claims
3) Proportionate approach – based on amount of net premium yet to expire
4) Equalization reserves – may be set up to smooth results from year to year, where there are low probability risks with a high and volatile financial outcome

[4]

[9 Marks]

Solution 4:

i) Any risk of financial loss, disruption, or damage to the reputation of an organisation from some sort of failure of its information technology systems.

[2]

ii) Areas to be discussed:

The assessment of cyber risks broadly covers the following areas:

- Risk management - involves the identification, evaluation, assessment and mitigation of various technology risks

- Data classification - Classification relates to the categorization of datalike private, public, internal, confidential and what kind of controls the company has exercised in terms of access and periodic review of the controls to ensure that there have been no breaches
- General Access control - includes the creation, modification and deletion of accesses. Also involves controls around privileged access and segregation of duties
- Human Resource Security - Robust background verification before an employee enters the system, appropriate controls in terms of employment contracts and code of conduct during employment and return of assets & data post termination with appropriate time lines
- Information Systems: Building strong controls during acquisition, development and maintenance such as having appropriate fire walls, restricting access to internet sites -
- Mobile security - Controls around mobility devices (mobiles, tablets, BYOD devices)
- Change management - includes the lifecycle of change from change requisition, acceptance, development, UAT testing and then deployment of change in the ecosystem
- System Upgradation - Whenever updates to key network and infrastructure components care needs to be taken to ensure that there was no exposure to new risks
- Network security - Controls to safeguard various networking components (includes firewalls, switches, routers, etc.)
- Cryptographic controls - key management of various encryption techniques used for safely storing confidential data
- Business continuity and disaster recovery - activities to be carried out to ensure that the critical business functions can operate at minimum operating levels in case of a disaster
- Third party risk management - controls around third parties (during onboarding, whilst engaged with them and after termination)
- Physical and environmental security - controls around the physical assets (CCTV, Fire alarm, Access control/ biometric systems, physical barriers outside the perimeter)
- Cloud security - security configurations and controls to safeguard activities on the cloud
- Email security - Security controls to safeguard email gateways and to protect the organization from inflow of unscrupulous spam/viruses
- Data Privacy - controls to safeguard personal data (notice, consent, security)
- Appropriate cyber insurance covers to ensure that the company's losses are minimised due to any unforeseen attacks.
- It may require assessment of frequency of cyber attacks and the maximum loss due to these attacks
- Time period of cover
- Ease of renewal
- Assessment of insurance companies for their ability to provide technical advice as well as their claim settlement records

Define the scope of coverage, including what types of cyber risks are covered (e.g., data breaches, ransomware attacks, business interruption) and under what circumstances.

1. *Choice of insurers:*
   a. *Financial strength of the insurer*
   b. *Does the insurer has the expertise to assess the claims, if not then that will have an impact on their claim payment*
   c. *Industry reputation*
   d. *Claims settlement ratio*
   e. *Support in can provide in information security domain*
   f. *Address the potential for policy renewal, cancellation, or changes in coverage terms*

2. *Amount and premium to be taken will depend upon:*
   a. *Types of attacks to be covered*
   b. *Time period of the cover to be taken*
   c. *Specify the maximum amount the insurer will pay for a covered loss, often broken down into different categories of coverage (e.g., breach response costs, liability, business interruption)*

3. *Other key points:*
   a. *What will be insurer's obligations and the policyholder's responsibilities when responding to a cyber incident, such as reporting the incident promptly and cooperating with the insurer's investigation.*
   b. *Who will negotiate with the hacker in case of a ransomware attack*
   c. *If the ransomware is to be paid in assets like crypto which the company cannot deal in (regulatory constraints), then*
      (i) *who will make the payment*
      (ii) *how will the company reimbursement for the payment? What will be terms of such a settlement*
      (iii) *Whether the expense related to it are covered*
   d. *Specify how disputes between the insurer and policyholder will be resolved, whether through arbitration, mediation, or litigation.*
   e. *Allow for the inclusion of additional coverage options or modifications to the standard policy based on the policyholder's needs.*

[11]
[13 Marks]

Solution 5:

i) Industry Representation:

1. Calibration of standard formulae is based on an "average" company, the approximation it makes are not necessarily appropriate to all companies. Some aspect of standard formulae may not be applicable to certain companies whose business strategy could be different to companies in general. E.g. company writing only 1 or 2 lines of business compared to 4-5 lines that are generally written.
2. Internal models help differentiate the capital requirement between companies who have a robust risk management process compared to those who don't
3. It will give flexibility to the companies to use approaches that are more appropriate to their business, especially allowing for nature of assets that they have invested in
4. Will help in assessment of capital requirement and reduce the cost of capital for the company , thereby optimizing capital management for the company
5. Better capital management will help in business and profitability growth for the company and industry as a whole.

Regulatory considerations:

6. Since the implementation of Risk Based Capital is new, the Regulator may want to keep it simple for the time being. Phase wise implementation may be more feasible from implementation point, starting with standard model.
7. Internal models will be different for different companies, hence the regulator would have to review multiple models and approaches.
8. It may not be possible for the regulator to compare the risk capital among different companies if different assumptions and approaches are used.
9. It will increase the compliance cost for the companies as regulator would need more information on an ongoing basis to review the results.
10. It may pose difficulty in standardization of Regulator's approval process for different companies.
11. Internal models are more complex to set up and will change with change in business parameters. Regulator may have to review the models frequently.
12. Minimum Capital Requirement (MCR) and Solvency Capital (SCR) under Standard particularly would be attractive for smaller companies.
13. Cost of development of an internal model may be greater than any benefit that would be achieved by a lower SCR, which may not work for smaller companies especially.

[7]

ii)

1. Split between reversionary and terminal bonus, part of reversionary and terminal bonus can be backed with equity
2. Ability of the company to invest in equities
3. Risk appetite of company towards equity class
4. Regulatory constraints on investment in equities
5. Overall equity exposure that Par fund is allowed by WPC
6. The level of surplus/FFA is available in Par fund to absorb any losses from equities
7. Bonus philosophy of the company, especially the fall in bonus that is allowed as per the policy
8. Increase in capital requirement (economic capital) due to equities
9. SAA in equities in the past and its performance and impact on bonus rates
10. Impact of SAA in equities on the overall valuation rate of interest for Par fund and its impact on the reserves and capital assessment of the company
11. What is the equity universe in the country and are there enough opportunities to invest in equities with appropriate diversification
12. Investment performance of different asset class, are there any other asset classes (REITs, InVITs, Private placement) which provide better return for the same risk or lower risk
13. Current investment in equities at a company level, and limits at company level.
14. What is the proportion of investment that competition has done

[7]

[14 Marks]

<u>Solution 6:</u>

i) Scenarios where this will hold good:

1) When policy term is long, that is 30yr+, longer tenure increases the duration of the policy thereby making it more interest rate sensitive
2) When the rate of interest used for pricing is high which will make it interest rate sensitive
3) If the SA is increasing under the product thereby increasing the expected death benefit by the way of loyalty addition etc.
4) If the product design is not a vanilla term product but a term product combined with money back/survival benefit pay-out
5) If Surrender benefit is allowed under the term plan which is higher than that allowed for under ROP.
6) If the experience of the term portfolio is adverse, change in assumptions will impact the expected death cashflows, which may increase the interest rate sensitivity of the portfolio compared to ROP.

[5]

ii) **<u>Should the benefit be launched?</u>**

1) Companies expertise to manage morbidity risk
2) Whether allowed as per the regulations and labour laws
3) What impact will it have on employee attrition
4) Do we have to provide the said benefit since competition has been providing or if we are the first, do we have the first mover advantage in terms of attracting good talent from the market at optimal cost?
5) Which all grades should be given this benefit and should be a minimum tenor of service before the benefits start
    a. What proportion of work-force will be covered
6) Whether the cost of the benefit be deducted from employee or will it be borne by the company
7) Operational expertise of the company to manage this benefit

<u>Consideration for benefit:</u>

1) What would be the benefit aligned to?
    a. Should it be aligned to last drawn salary
    b. Should it allow for an inflationary increase or salary increase for a certain period
    c. What will be the tenor of the benefit? Will it be till retirement in case of permanent disability or tenor is till the employee has recovered and has the ability to work?
2) How the ALM for this benefit be managed?
    a. Will this be a funded benefited or un-funded?
        i. If funded then the following consideration to be assessed:
            1. Will it be part of overall company's fund or does this fund need to be managed separately
            2. What all asset classes that can be invested in? Risk appetite for the fund would depend on the level of benefits that are being provided as well as the level of funding
            3. Will the fund management be internal or external
            4. Compliance of the fund with any relevant regulations
            5. Valuation of the fund – internal or external
                a. How the valuation rate be computed? Do we have any similar product so that similar assumptions can be used?
                b. What standard morbidity rate table should be used and what proportion of the same should be used in pricing
                c. Should MAD be allowed for?
        ii. If un-funded, then ALM aspects will not be critical but the ability of the company to pay the benefits on "Pay As You Go" basis
    b. What will be the impact on capital and overall profits of the company
    c. Tax consideration of the benefit -- will company or employee get any tax benefit

[10]
[15 Marks]

Solution 7:

i) The solution will cover general environmental factors with specific explanation on life insurance through digital/online channel

1. *Digital Ecosystem in the country*
    - Level of digital penetration
    - Data Privacy and Cyber Security
    - Data Analytics & Artificial Intelligence application
    - Social Media

2. *Lifestyle Considerations:*
    - Level of benefits are likely to be higher than average if the general social and economic situation of the target market is likely to be affluent
    - Types of insurance products that can be offered e.g. Only protection and health products and /or savings -Endowment /unit-linked, Annuity
    - Population mix in terms of gender, age and occupation

3. *Competition & Commercial considerations:*
    - Level of competition would impact profitability of the life insurance business
    - Digital space tends to be very competitive with longer pay-back periods
    - Besides, the extent to which the accumulated losses during the bottom of cycle are outweighed by the expected profits during subsequent upswing in the market

- Extent of cross-subsidy of profitability across the portfolio of products
- Ease of Entry into the life insurance business and/or cost of withdrawing from the market
- State benefits but these may be offered at low level

4. *Legislation and Regulation*
   - Any specific regulations for digital business
   - sales process and the disclosure requirements
   - Capital needed (e.g. paid-up capital) and Solvency Requirement

5. *Product Considerations:*
   - the type of products that can be sold online
   - the design and pricing of products- preferably simple products
   - the type of products most suited to a consumer's need

6. *Tax:*
   - Can have impact on the needs of the individual e.g. proceeds from a life insurance policy can be received free of tax
   - Can influence the types and forms of life insurance products
   - Can influence the level of benefits offered e.g. benefits above certain level may attract tax

7. *Extent and types of Risk involved*
   - Cyber-crime and personal data breaches
   - Regulatory Risk - Uncertainty regarding evolving regulation
   - Underwriting risk – To the extent the company can underwrite (including claims underwriting) online
   - Potential concentration risk as the individual case size could be higher as the target market tend to be affluent

8. *Other Considerations:*
   - The state of financial markets and the ease with which the capital can be raised
   - The financial strength of the company to organize capital required

[10]

ii) The additional and specific challenges that the company may have to deal are as follows:

Given that the company plans to sell life insurance products through digital channel only, the company will have to set up an explicit digital ecosystem operation covering a full policy cycle- digital marketing, sales, issuance, servicing and distribution and claim settlement.

The local insurance regulations may not allow the company to write life insurance products within non-life fund. The company may have to seek a separate license to sell life insurance products.

The life insurance business is relatively more complicated than non-life insurance business as it is a long term business, and there are varieties of product features and the risks involved within a single product.

The Company would need a separate and explicit portfolio for life insurance products.

The designing of life insurance products would require specific market research on the level of competition, market trends, customer needs and profiling as these aspects related to non-life business may not be fully relevant.

For pricing life insurance products, the company would need data for which company would have to rely on external sources such as reinsurer or a publicly available data as the internal data related to non-life business may not be relevant.

The company would need a separate policy system or to upgrade its current system for non-life business as the existing system might not be robust enough to accommodate the complexities of a life product.

The life insurance business is likely to be mutually exclusive to the non-life business. Hence, additional capital may be required not only to write new business but will also be needed to maintain and support regulatory solvency requirement.

[4]

iii) The potential leverages that the company might have from its non-life business can be in two key ways:

- The company has already developed certain internal capabilities and experience over the years from its non-life business operations which could be useful for life business.
- Certain aspects of the insurance business operations could be shared by both life and non-life business.
- In certain cases, the company could upgrade or modify its processes/operations currently used by non-life business to meet the requirement of a life business.

However, any such leverage could be subject to any regulatory limitations. For example, company may have to demonstrate capital adequacy ratio separately for non-life and life business and could not use available capital in one business for other.

Product Pricing & designing: The non-life experience of certain short-term products such as critical illness and health products (with slight changes in benefits e.g. fixed benefits instead of indemnity) could be useful for pricing and designing of riders and health products for its life operations. In particular, the company could leverage on its morbidity experience to determine the pricing assumptions.

Reinsurance: The Company could use its existing reinsurance arrangements and/or relations for life operations in terms of getting support on data, technical assistance and underwriting. Certain reinsurance arrangements such as Catastrophe Reinsurance might need slight changes in the treaty to include its life insurance business under the cover. Similarly, the reinsurance administration process could be upgraded to include life business.

Target Market: There might be an overlap of the target market in terms of the need for non-life and life product. For example, a home insurance and credit life insurance for a customer buying house on loan.

Sales & Marketing: The Company could market bundled product consisting of both life and non-life product.

Underwriting Capability: The existing underwriting capability for non-life business could be useful for underwriting its life business both at the time sale and claims.

Investment Capability: The investment for non-life and life business could vary in terms of the duration whereas the type and currency of investments considered for both life and non-life business are likely to be similar.

Regulatory Compliance: If there is a single regulator for both non-life and life business, the regulatory compliance for both the businesses are likely to be similar.

Operational Risk Management: The nature of operational risk for both businesses is likely to be similar in nature.

Senior Management/HR: Given similar type of insurance business, a single set of corporate management team could manage both life and non-life businesses.

Expenses: To an extent the company could leverage its non-life business operations and processes for life business (as explained above) it may require lesser operational infrastructure which could lead to a significant saving of time and efforts for the company.

[6]

[20 Marks]

Solution 8:

i) Key reasons for fall in the new business:

- Management decision to reduce/ stop new business on account of
  - Reduced capacity to write new business on account of lack of available capital
  - Reducing sale of loss making business
  - Likely shift in the product portfolio as current portfolio may no longer be marketable of profitable leading to temporary reduction in the new business trends
  - Change in the target market/market segment leading to temporary reduction in the new business trends

- Increased competition due to
  - New launches by other insurance companies
  - New entrant in the market segment in which the company operates
  - Better returns (bonuses on with profits business) to policyholders by competitors
  - Higher commission and remuneration offered by the competitors resulting in higher agent attrition

- Damage to company's reputation on account of
  - Frauds within the company
  - Bad news in the news media and social media about the company and/or its group
  - Regulatory and Legal issues

- Restrictions imposed by the regulator on new business due to
  - Falling solvency ratio trend in the recent years
  - Operational Frauds e.g. siphoning, money laundering with consequences to serious implication on the interests of policyholders
  - Shareholders and management no more "Fit and proper" to manage insurance business and protect policyholders' interest
  - Consistent non-compliance
  - Operational systems and processes inadequate

Possible mitigation

Depending up on the reason for decline in new business, the company could take several steps including the following:

Capital Management:

- Company would need additional capital to increase new business. The company's existing shareholders could inject capital in the company.

- If the existing shareholders are not willing or not able to provide capital, the company could raise or borrow capital from the capital market e.g. through equity or debt.

- Alternatively, the company could consider freeing and/or generating capital within the company by:
  - Deferring dividend payment to the shareholders
  - Removing unnecessary prudence in the reserving
  - Increasing Reinsurance with limited impact on future profits
  - Considering Reinsurance Financing to capitalize future profits in the existing business
  - Shifting business to less capital intensive products
  - Reviewing Pricing: Writing higher profitable products which can generate higher profits in future
  - Reviewing current product portfolio with an aim to reduce new business strain
  - Restructuring of company's operations to optimize efficiency
  - Restructuring distribution channel e.g. Direct Marketing to save commission expenses
  - Outsourcing certain processes/operations to reduce expenses
  - Reviewing Expense control and management e.g. identifying essential and non-essential expenses
  - Improving process controls to reduce potential leakages and frauds
  - Strengthening risk management framework to reduce potential operational losses
  - Digitization & Innovation if it leads to efficient business operations

Operational:

- Introducing new products in line with competition
- Understanding where the company is faltering and identify various short-term and long-term solutions to improve the business
- Strengthening the internal controls and sending a positive message to the market that any kind of frauds will not be tolerated
- Reviewing the profitability of the product portfolio and rationalising the products
- Restructuring the management if required to inject new ideas
- Rebranding the company if required to send positive messages to the market
- Focussing on a few markets where the company has competitive advantage

[8]

ii) Broadly, company's liabilities will be a mix of Guaranteed Benefits and the Discretionary Benefits.

Guaranteed benefits:

In practice, any guaranteed liability is matched as closely as possible.

Given the availability of free assets, the company could deviate from the exact or close matching to guaranteed liabilities. The company could choose investments to improve the overall return on its assets.

Improved investment return could be used to enhance benefits to the with-profits policyholders and higher benefits and/or lower premium for without-profit business.

The extent of mismatching depends on:

The size of the free assets

The volatility of returns on the assets held in respect of the guaranteed benefits
The attitude to risk of the policyholders/shareholders

Discretionary benefits:

The matching of assets to liabilities for discretionary benefits is less since the company would want to invest in the assets with highest expected return in order to maximize the discretionary benefits.

The company could review its exiting level of mismatching.

Review of mismatching would consider:

- Extent of existing mismatching commensurate to the current and projected level of free assets Policyholders' reasonable expectations

- Extent of risk i.e. the probability of the discretionary benefits falling below a particular level

- Solvency position/SH investment performance/Generic points on matching asset liability

[6]

iii) The company is reviewing its pricing assumption.

General Factors:

- The pricing assumptions could be based on the best estimate average rates over the duration of the policy with or without margins for profit.
- Extent of financial significance of the of the assumptions
- Consistency with other assumptions
- Legislative and regulatory constraints

a) Mortality Assumption:

- The relevance and statistical credibility of the company's own past mortality experience to future experience.
- The sufficiency and statistical credibility of past industry data/standard mortality table.
- Appropriateness of the past industry data/standard mortality table to the company's future experience
- Adjustment to the past data to deal with
    - Abnormal fluctuations
    - Fluctuations and Changes in the experience with time due to factors such as medical advances, social and economic changes
    - One-off effects and random fluctuations e.g. due to pandemics/epidemics or otherwise
    - Potential errors in the data
    - Changes in the mix of homogeneous groups/target market within past data and homogeneous groups to which the assumptions apply
    - Product type- Term/Savings

[3]

b) Investment Assumption:

- Type of assets that will be used to back the liabilities under the product
- Past data such as
    - Data on dividend yields on equities
    - Data Yields on the bonds
    - Data on Index for index-linked assets

- Current economic data
- Forecasts- Fluctuations and changes over time which could depend on:
    - Changes in economic and fiscal policy as well as with general economic cycle
    - Economic and fiscal changes mean that most past data are irrelevant
    - So only data that relate to period after any recent significant change can be used
- Other economic adjustments such as changes in taxation on dividends
- Strategic Asset Allocation/Free assets to with stand fluctuations

[3]
[20 Marks]

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