Institute of Actuaries of India

Subject CP1 – Actuarial Practice (Paper A)

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) Some of the points that CRO can consider are the following:

1) Solvency position projections over the tenor of the plan. This is an important consideration as any growth must be balanced with solvency of the company.
2) Capital requirement if any
3) New business / renewal business growth that is being assumed
4) Any large capex that has been planned and shareholder returns that it is expected to provide
5) Growth in key headers of Operating Expenses
6) Profits
7) New business margin
8) Share price projection (if company is listed)
9) Concentration risk of distribution channel
10) Product mix that the company is assuming and whether it is the most optimized product mix.
11) Competition benchmarking to assess the market share that company is aiming at
12) Reserving assumptions used in the projection
13) Investment assumptions used in the projection of investment income

[Max 4]

ii) Few aspects that you can suggest to the HR Director.

1) Investment approach
    - Key long term gaol and liability profile that needs to be managed
        - Nature
        - Term
        - Currency
        - Uncertainty of liability
    - Risk appetite of the individual as it will drive the investments and assets he/she can invest in
2) Tax status of the individual or if the investment will be structured in some other way like HUF etc.
3) Other sources of income like pension or state benefit that will accrue in the future
4) Choice of Investment in different asset classes like:
    - Property
    - Bonds
    - Equity
    - Collective Investment Vehicles
5) Regulatory /legislative restrictions if any
6) Horizon over which the investment can be made as this will drive the assets that can be invested along with expected results.
7) Whether he/she would be doing active or passive management of investments
8) This will be driven by the expertise the person has of the investment and macro- economic factors that drive investment.

[Max 3]
[7 Marks]

Solution 2:

i) Possible reasons for the deterioration in experience:

1) Mis-selling by the company leading to poor experience
2) Closure of branches or reduction in agency force thus impacting persistency
3) Company had expanded in tier 2 and tier 3 cities and experience may be mainly deteriorating from those sales
4) Competition has come up with innovative products and that may lead to migration of customers
5) For protection business, company may have reduced the premium and hence customers would be lapsing and re-purchasing from the company (i.e., lapse & re-entry).

6) Company's investment performance may not have been great compared to peers leading to lapses in ULIP portfolio
7) Pandemic may have impacted the financial position of the customers leading to lapses
8) Bad press or an incident may have dented the reputation of the company leading to higher lapses.
9) Insurance industry may be witnessing higher lapses and hence this may not be specific to your company
10) There could be a change in the methodology in calculating persistency metrics which may be a reason for fall in persistency
11) Company may be encouraging lapses in its Savings portfolio as it may be finding it difficult to manage the guarantees built into such products.

[Max 5]

ii) Some of the key aspects which should have a mention in the report:

1) Drop in VIF and hence EV of the company
2) Drop in appraisal value of the company
3) Drop in renewal income leading to drop in profits
4) Reduction in investment income due to decreasing or static investment book
5) Company may not be able to follow an aggressive ALM strategy due to either fall in renewal premium or increase in surrenders that might necessitate sale of assets
6) Increase in per policy expenses due to reduction in in-force(IF) book.
   - Increase in per policy expenses will increase the reserves thereby impacting profits
   - It will also reduce the margins on new products as premiums will increase
   - For past products the expected margins will also be reduced due to variance between assumed and actual experience being adverse
7) Persistency assumptions for reserving and pricing may have to be revised leading to:
   - Higher reserves for the IF block
   - Higher prices due to company's requirement to recover at least acquisition expenses earlier than desired. Higher premium may make the product uncompetitive.
8) Higher lapses may in short term lead to higher profits if the products are lapse supportive
9) Higher lapses in savings business will reduce the interest rate risk and company may not be required to keep guaranteed risk reserve thus leading to release of some reserves which will help to increase the profits of the company
10) High lapses will reduce the opportunity of cross and up sell which are cost efficient sales compared to new business from traditional channels
11) Higher lapses will lead to company's inability to recover the initial expenses and/or to also able to manage renewal expenses, thereby increasing expense overruns.
12) There could be a capital requirement needed to sustain new business as IF business is not able to generate the required capital to support growth.

[Max 6]

[11 Marks]

Solution 3:

i) Sales growth can be achieved in two broad ways:

1) Organic Growth:
   a. Increasing branches across the company but this will require capital
   b. Setting up an Online distribution channel for wider reach across the country
   c. Partnering with existing web aggregators (if not done) to increase the presence across India
   d. Hire more agents in tier 2 and tier 3 cities
   e. Have a new product which caters to a wider audience

2) Inorganic Growth:
   a. Acquisition of another insurance company

   b. Merger
   c. Partnering with regional banks and other institutes to drive growth and presence
   d. Setting new segment like Health or General insurance to increase the market share of the overall group company

Other aspects to consider:

1) What would be the total operational expenses(Opex) for the expansion and how will that be funded?
   - Opex consideration:
     - Opening of offices
     - Agent training requirements
     - Types of training required
2) Local regulatory or local statutory requirements while opening offices?
3) Any other considerations to be taken while hiring the locals?
   - Sources of capital
4) Will the tax status change with change in sales or expansion?
5) How to manage cultural shift while merging or acquiring
6) Regulatory procedure and time it will take for completion of the process, say, for branch opening or mergers or acquisition
   - Are there any regulatory restrictions that need to be understood?
7) Business plan projections:
   - sales growth that company can see
   - operating expenses
   - projected P&L
   - expected growth in EV and VNB margins or other key metrics
   - If the company is listed, how will the expansion help in increasing the stock prices

[Max 7]

ii) Key risks in the proposal that should be discussed:

1) Counterparty risk:
   a. Risk that the borrower defaults on its commitment to return the stock
   b. Risk that Exchange is not able to provide the stock to the company
2) Recall risk - Company has to recall the stock earlier than 6 months and it is not able to do so
3) ALM risk - Risk of inability to recover the stock on time can have impact on the ALM position of the company
4) Performance risk – non-availability of the stock at the maturity date can have an impact on the overall performance of the fund as the stock would now be converted into cash.
5) Loss on Sale – If at the time of maturity , the borrower doesn't return the stock and Exchange returns the price of the stock but stock valuation is lower at that time. By getting the money and not the stock would force company to book a loss on the stock.
6) Regulatory risk – this may not be allowed by the regulator
7) Operational risk –
   a. due to operational error, company lends the wrong stock which it should not have or was not allowed to.
   b. Error while accounting for the whole process if it is being done manually.

[Max 4]

[11 Marks]

Solution 4:

i)

1) 50% pro-rata reinsurance cedes 50% of all claims, and will be the most expensive of the provided options. XYZ Life will still be exposed to 50% of catastrophic mortality claims. This option is not appropriate to address XYZ Life's concerns.

2) Per risk excess of loss covers losses in excess of a threshold for each policy/contract. Catastrophic mortality claims would be realized as a high frequency of claims, rather than a small number of high face amount claims. This option would not be appropriate to address XYZ Life's concerns.
3) Per occurrence excess of loss would cover claims in excess of a threshold arising from a single event, subject to the wording of the treaty. If, for example, the treaty defined a pandemic event as a single occurrence, then this option would be appropriate to address XYZ Life's concerns, and would come at a lower cost than alternative options.
4) Aggregate excess of loss covers all losses in excess of a threshold over a given timeframe. Although this option would likely be more expensive than the alternative XoL options, this option would address XYZ Life's concerns with catastrophic mortality claims.

[Max 6]

ii) Issuing a catastrophe bond sold through a dedicated Special Purpose Vehicle (SPV):

1) XYZ Life would sponsor an off-balance sheet SPV which would issue bonds to investors. If a catastrophic event e.g., Covid-19 occurs, XYZ Life would be able to use the invested capital to pay off claims, while investors receive coupons and the return of principal if no catastrophic event occurs.

2) This approach would be appropriate for XYZ Life. It provides funding when catastrophic mortality events occur and has low counterparty risk as funds are received initially. XYZ Life should consider the risks and regulatory scrutiny associated with SPVs.

Participating in a self-insurance pool:

3) XYZ Life would participate in a pool of catastrophic claims such as Covid-19 with other insurers and would share overall claims results.
4) This approach would not be very useful as Covid-19 or similar CAT mortality claims would likely to be experienced by all insurers in the group.

Setting up its own captive:

5) XYZ Life would set up a captive reinsurance company for risk financing purposes that can be based in a jurisdiction with favourable capital and/or tax treatment.
6) This would not be appropriate for mitigating catastrophic mortality claims. Captives are for risk financing, not risk transfer. If XYZ Life experiences catastrophic mortality claims, they are still responsible for the claims as a captive is not bankruptcy remote.

[6]

[12 Marks]

Solution 5:

i)

1) Term assurance products are relatively simple products and so the company believes this approach is suitable, as this may keep their sales growing as people avoid interacting with the agents/intermediaries during the pandemic times for obvious reasons.
2) The company may also be looking to reduce costs…
3) to increase profits or reduce premiums which could increase sales…
4) and an online application process with tele-underwriting could reduce administration process costs…
5) or could avoid the use of intermediaries and reduce commission payments
6) The company may be looking to increase sales…
7) by reaching a wider network of customers,
8) as online may appeal to a different target market.

9) Competitors may be using online forms already so there is a need to keep up with the market to remain competitive.
10) It is also possible external events (e.g. a pandemic) are moving the market towards an online approach.
11) It may also be quicker than the current method and so be more attractive to customers
12) Or it may allow the company to process high volumes of applications with the same resource compared to currently
13) Moving from manual paper-based process to online reduces scope for manual errors if proper system controls in place
14) There is also a social responsibility angle in reducing paper waste.
15) Automation may lead to a more accurate / valid / stable underwriting approach…
16) and could lead to improved reinsurance rates.

[Max 6]

ii)

1) There could be an unexpected change in the volume of business due to the introduction of the tele-underwriting
2) The target market may change when using online applications and tele-underwriting
3) and so demographic experience may be worse than expected…
4) hence changing mortality risk
5) Expenses may be higher (or lower) than expected…
6) and the company does not have experience of these yet…
7) and so increasing the potential variation in expenses against assumptions
8) There could be an increase in fraud risk with an online process…
9) if it is easier for policyholders to make incorrect or false statements via tele- underwriting
10) New operational risks may be introduced
    - e.g. website failure, data security breach (any suitable e.g.)
11) This could lead to reputational risk
12) In addition, there is a risk of damaging relationships with intermediaries due to discrimination in product pricing (e.g. nil commission for online products).

[Max 6]

iii)

1) A stochastic model could be used to determine the capital required.
2) Claim amounts or claim frequencies or both could be treated as random variables each with a probability distribution.
3) A desired probability level, *eg* 0.5% could be chosen so that the model can then be used to determine the capital necessary to avoid ruin at this level (a VaR approach).
4) Correlations between variables should be allowed for
5) ... for example between claim amounts and claims inflation, claims expenses and the economic situation.
6) Since stochastic models are complicated and time consuming to run, it may be necessary to simplify the model in terms of, for example the time period considered or the number of stochastic variables.
7) It is possible that the model be run stochastically to determine how bad the claims experience needs to be to survive 99.5% of the time, and then to run a deterministic projection using that risk event to determine the capital requirements.

[Max 6]
[18 Marks]

Solution 6:

i)

- Consideration would need to be given to the scale of the operations and the vehicle to be used.

- The company could attempt to cover the whole country from the start. Alternatively, they may decide to focus on certain areas of the country.
- Perhaps they would concentrate on large urban areas with higher disposable income and more inclination towards building a healthy life style or on areas of the country that are closer to developed countries culturally or economically.
- They may decide to develop a small number of high profile flagship sites rather than have a relatively large number of small sites.
- They may decide to develop new sites using their own resources, i.e. an independent venture established from scratch. Alternatively, they may try to purchase a domestic company (if one exists and if allowed by regulation) that operates in their market.
- In this case, they will need to decide whether to maintain any existing brand names or use their own. Ultimately the aim may be transforming such operations so that they resemble operations in other countries in terms of products and management techniques.
- If these options are not practical, they may decide to set-up joint ventures with local companies e.g. suppliers, retailers or property companies.
- This may mean that they are investing in a business rather than having total control over it.
- Giving Franchisee is also a good option having a good brand name however the franchise model needs to be decided upon e.g. to give brand name only and sharing of small profits or to have everything provided by the brand and sharing a high profit percentage.

[Max 4]

ii) The factors will depend on the nature of the operations set up, since the risks will vary under each alternative.

- However, at the heart of any option, the core issue will be to assess the factors that could have significant impact on profitability — level and volatility.
- This will primarily depend on the demand for the packages they intend to sell.
- Assuming that they intend to bring out similar products to those sold elsewhere (this is the business that they know) they need to study the suitability of those products both in terms of the price and area for this market and consider how they need to be adapted.
- The type packages and prices sold there may not be popular e.g. if large sections of the population are vegetarians or religion could be a factor if supplements from certain animals are forbidden. –
- There may not be similar culture of ladies going to gym that exists in developed countries, and traditional societies may have codes of behaviour that are incompatible with the company's normal business model.
- To this end, careful consideration will need to be given to the target market as it may not be the same as in other countries. Sections of the population with sufficient disposable income will need to be identified and targeted.
- Pricing will need to consider the level of affluence in the country and the price of alternatives.
- A broad decision will be needed as to whether to aim for a slightly upmarket image or to go for a cheaper mass-market policy.
- Consideration will need to be given to the availability and cost of gym equipment's and supplements. Do they exist in the country, or will they have to be imported? Can the Company use existing suppliers or will they need to establish new relationships? A careful analysis of other expected costs will be needed.
- The most significant considerations relate to labour and property (rent or construction). The availability of a labour force with the necessary skills will be an issue
- Will also need to know whether there is any competition.
- Taxation both in relation to the point of sale or on profits (especially on those taken out of the country) will be an issue.
- Compliance with local regulations and customs e.g. employment or planning and advertising could incur a cost or delays due to bureaucracy.
- Selling food supplements may imply that health and safety considerations come into play.
- The political situation will need to be analysed and the attitude to foreign companies and restrictions on their operations.

- A view will be needed on future political stability and whether changes in regime could cause a problem.
- Linked to this will be attitude of the population at large to "global" influences.
- Are such restaurants likely to be focal targets of popular disaffection?
- If the corporation is buying an existing company, in addition to the above, a full assessment of that company including management and financial structure will be needed in order to assess a fair price to pay.
- Likewise, the strength and reputation of any partners in joint ventures or franchisee partner must be analysed.
- Any contracts should be thoroughly checked in relation to the legal system of the country. It will also be necessary to consider currency risks.

[Max 10]

iii)

1. Avoid the risk — e.g. look at risky location profiles and avoid
2. Reduce the risk — e.g. lower the scale
3. Reduce uncertainty — e.g. thorough market research
4. Transfer risk — e.g. franchising
5. Insure the risk — e.g. against disruption to supplies
6. Sharing risk — e.g. joint venture

[Max 6]
[20 Marks]

Solution 7:

i) Few reasons why Product B would be preferred:

1) Company wants to sell this product (even at a loss) to capture the market share as there is a greater demand for savings cum protection products in the market
2) It is already a key selling product and has the potential of selling more as it is a customer friendly product and meets their needs
3) Product A and C are not selling, and company must increase the sale of product B to meet the targets
4) Interest rates are low and hence guaranteed rates are in demand, hence easier to sell
5) Competition can sell this product easily and hence company needs to match the competition
6) There could be a regulatory or a govt ask to push products with guarantees
7) It has higher allowance for sales expenses
8) It has higher VNB margins
9) It has lower reserves, hence will help reduce the reserving requirement
10) Past experience has shown that pricing of the product and emerging experience are aligned and hence company can expect the profit margin that it has priced for
11) Company knows that it can hedge or manage the guarantee risk and hence higher sales while increasing the margins will not be increasing the risk to the company

[Max 4]

ii) Key considerations while selecting a distribution channel to sell:

1) Cost to premium ratio of the channel
2) Sales target set for the given channel in the business plan and whether a particular channel needs push to achieve them
3) If agents are trained to sell this product or further training is required, thereby increasing sales
4) In an Open architecture, this product may be needed to increase market share of the company
5) If reserving assumptions are set at a channel level, then which channel helps optimize overall reserve
6) Ability of a channel to increase the sale of the product in a short time (3 months)

[Max 3]

iii) Floating Rate Agreement is an OTC (over the counter) agreement between two parties (one of which is mostly is bank) to agree today to buy a specific bond at a specific price at a defined future date. FRA is used to lock in today's prices especially if the company feels that the prices are expected to rise. Usually the contract is settled in cash on maturity.

[2]

iv) Key aspects to be considered

On FRA portfolio:

1) How notional will be calculated
2) What will be the reference bond underlying the FRA
3) Who will trade?
4) What will be the cost of trade?
5) How will the valuation of the FRA be done and who will do it?
6) How will the settlement will happen
7) What will be the consideration while selecting a counterparty?

ALM strategy to follow:

8) Which products will be hedged under derivative program
9) Cash flow projection for the FRA portfolio
10) How much of the portfolio or cash flow can be hedged?
11) Underlying assumptions especially persistency assumptions (1)
12) How the performance of the portfolio will be assessed?
13) How the unhedged proportion if any will be managed (1)
    - What is the residual guarantee risk that cannot be managed?
14) Implication on reserving assumptions?
    - Is there a requirement to keep or increase counterparty default risk reserve
    - Impact on any mismatch reserve that company was keeping

Other considerations:

15) Does the teams have the capability and understanding of various aspects of FRA
16) Who will calculate the notional values and report on the bond tenors to be hedged
17) What will be the nature of Reporting to senior management
18) What are regulatory reporting requirements
19) How to assess portfolio return
20) How to assess valuation rate of interest for valuing liability book
21) Legal documentation with banks and how will those be completed
22) Regulatory approvals needed
23) How much to trade with different counterparties should be done
24) System readiness for managing the derivative portfolio
25) Any tax impact due to derivatives
26) Board approval for the program will be needed

Risks:

27) Counterparty default risk
28) Default risk of the underlying bond
29) Liquidity risk from margin payment or notional payment at settlement
30) Solvency risk arising from valuation/MTM movement of the derivative portfolio
31) Operational issues resulting from either weaker processes or inexperienced staff
32) Significant losses resulting from adverse movement in derivative due to change in interest rate scenario
33) ALM mis-match risk resulting from incorrect matching
34) Unwind risk, risk that company may have to unwind the portfolio and losses arising from it
35) Regulatory risk that regulator doesn't allow certain hedging or assumptions while accounting of the derivative portfolio

Reporting:

36) Overall valuation and impact on Balance Sheet
37) Stress scenarios and impact on derivative book and on key metrics of business
38) Reporting at counterparty level to have a good understanding of company's exposure
39) Reporting dashboard should have the following metrics:
    - Valuation
    - P&L Impact
    - What is the overall locked in rates
    - Overall duration of reference bonds
    - What is the cost of trades already locked in
    - Counterparty concentration and rating
    - Margin payment at counterparty level
    - No of trades entered
40) Any specific risks that CRO wants to highlight
41) Key metrics like VaR to measure the volatility of the portfolio

[Max 12]

[21 Marks]

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