Institute of Actuaries of India

Subject SP2 – Life Insurance

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:

i) Reasons behind the Business Strategy Director's Proposal are as follows:

- Entry in overseas market will increase new business volume and profitability.
- The Director might have an objective to improve share price and brand image of ABC Life
- It may be a strategic direction given by Parent Company for overseas presence.
- This will increase diversification of business across geographical region, risk exposure and capital requirement.
- May be capital and regulatory arbitrage.
- Term product sales may be declining in the domestic market in recent times and hence ABC Life may be struggling to maintain existing profit levels.
- The market may be saturated due to a lot of insurers competing in the Term product (bottom of underwriting cycle)
- Market research / Customer survey may have indicated strong demand for individual term products in overseas market as:
    - There is no provider of individual term product overseas.
    - Government might have made term product mandatory to against mortgage.
    - Increase in demand due to tax incentives.
- Overseas government might have given incentives to ABC Life to enter the market.
- ABC Life might have excess capital.
- There may be synergies of selling term product in two different jurisdictions:
    - The spreading of (fixed) overhead costs over a larger number of policies. (Economies of scale)
    - The potential to use the same admin system for the two different jurisdictions.
    - The potential to utilise inhouse expertise more fully for servicing and other functions.
- ABC Life's competitor's may have started to provide Term product overseas and the Director does not want ABC Life to fall behind competitions.

[Max 6]

ii) Mortality Data:

- The main risk relates to the setting of mortality rates for pricing of term product in the overseas market.
- The company may have various sources of data, but they have weaknesses.
- For example, the overseas mortality data may not be relevant to set mortality assumption because overseas data may have different:
    - General health of population
    - Underwriting levels and approach
    - Target market
    - Different provisions from state
    - Lifestyles and different attitudes to risky activities
    - Selling group business and not individual policies
- The company might use overseas industry data or reinsurer's data.
- This data may also not be relevant because:

  - The data might be very heterogeneous, reflecting a range of different policy conditions, underwriting practices, target markets.
  - The different contract design (individual versus group) may attract a different target market.

- Overseas market may be using national mortality statistics.
- ABC Life needs to use this data with caution as a guide to mortality of an insured population because of different classes of lives involved.
- Data may be of poor quality due to data errors or missing data.
- Else data may not be sufficient or reliable.
- Some data may be out of date.
- As ABC Life is a dominant player in the domestic market, it may have good quality of data which can be used with adjustment.

Overall:

- It may be difficult to price term policy for overseas market for ABC Life with confidence.
- Hence, may need to price with significant margins, or incorporate a reviewable premium facility to take corrective action if experience will not be favourable.

[Max 9]

iii) The risks highlighted by the CRO for the company in selling the term insurance product through the new distribution channel in overseas market are as follows:

1. Data risk-
   a. As the overseas market and distribution channel is new, ABC Life may have a lack of adequate, accurate and relevant data for pricing the term product appropriately.
   b. Social media as a distribution channel may create data privacy issues.
2. Mortality risk-
   a. For term insurance product, mortality risk is a key risk. As per product is to be sold by direct marketing underwriting is more simplified which may lead to higher mortality experience.
   b. The target market may be younger customers with different lifestyle. Due to new market and new distribution channel predicting mortality correctly will be a challenge.
   c. Anti-selection may be an issue.
3. Expense risk-
   a. Expenses of setting up the platform may be higher than expected.
   b. Expenses of maintaining the website may be higher than expected.
   c. Higher initial expenses to register the company in overseas market.
   d. Higher checks and controls in the system to avoid data breaches and for protecting personal data.
4. Persistency risk-
   a. Lapses may be higher than expected using the new platform.
   b. There is a risk of lapse from existing policyholders if overseas rates are lower than those already issued via intermediaries.
5. New business volume and mix of business-
   a. The volume of new business from the website may be higher than expected, leading to new business strain and higher capital requirements.

   b. If the volume of business lower than expected, it would be difficult to meet overhead expenses.
   c. The mix of business may be different than assumed, meaning assumptions around mortality/persistency etc. are not as expected.

6. Counterparty risk-
   a. The maintenance of website may be outsourced.
   b. Reinsurers and other external vendors may meet their part of obligation.
7. Operational risk-
   a. Data security issues while using online platform and social media.
   b. Errors in new administration system, processes like selling of products and underwriting.
8. Reputational and regulatory risk-
   a. Policyholders may not understand the product if purchasing without advice, leading to risk of mis-selling though term insurance is a simple product.
   b. There may be regulatory restrictions on the features of products that may be sold directly.
9. Legal risk-
   a. It may arise due to data privacy issues and data breaches
   b. or policyholders' complaints.
10. Competition-
    a. As the product is simple and available online, it will be easier for competitors to compare prices, features etc.
    b. Easier for customers to compare prices independently which may lead to very competitive pricing.
11. Overseas market- The overseas market faces the following risks.
    a. Increased expertise needed to assess the market.
    b. There may be restrictions on the product features, investment of product and ownership of certain shares.
    c. Risk of adverse political developments
    d. Different accounting practices, lower liquidity of assets.
    e. Language problems

[Max 9]
[24 Marks]

Solution 2:

i) The following products are suitable for the given target market-

a. Term insurance- provides a benefit on the death of the life assured provided it occurs within the term selected at outset.
b. Endowment insurance- provides a benefit on the death of the life assured provided it occurs within the term selected at outset or on maturity of the policy.
c. Critical Illness contracts: The contract provides a cash sum on the diagnosis of a 'critical' illness, which will be explicitly listed in the policy documentation.
d. Personal accident- provides a benefit on accidental injury as defined in policy document of the life assured provided it occurs within the term selected at outset.

e. Health insurance- provides sum of money as defined in policy document for medical treatment.

f. Crop/Livestock damage insurance - The contract covers damage to crops or livestock due to adverse weather or disease.

[Max 3]

ii)

a. The insurance company may face higher claims in micro insurance term product than standard term product because:

   i. The product has less stringent underwriting due to lower premium rates

   ii. The more manual nature of the policyholder's normal occupation

   iii. Differing climate and sanitation arrangements

b. Claim rates may be higher due to higher levels of fraud.

c. Large volumes of small policies make fraud more difficult to spot and the cost of procedures to identify fraud may outweigh savings.

d. The local culture may make checking up difficult e.g. reluctance to talk to investigators.

e. Poorly translated policy documentation in local language may lead to a higher level of disagreements.

f. There may be potential for bad publicity due to refused claims.

g. There is a greater potential for anti-selection and moral hazard. There may be more non-disclosure e.g. due to lack of understanding of the importance of full disclosure.

h. Withdrawal rates will probably be different. They may be higher due to pressures on income which may be very variable, e.g. weather dependant, drought etc

i. Initial expenses will be higher due to the need to recover the costs of developing a new product as premium is low.

j. Higher initial expenses to develop and train specialised distribution network.

k. Higher initial expenses to develop robust IT system to handle higher number of transactions due to higher frequency of premium.

l. Per policy expenses will be higher as individual premiums will be small.

m. Premium payment frequency may be weekly not monthly or annually and payments may be in cash. There may be record keeping issues due to the large numbers of transactions.

n. Volumes of business may be higher depending on the potential size of the target market which may lead to higher capital needs and higher administration expenses.

o. There will be less diversification of business by target market, as this is mainly the low-income group, or by geographic location.

p. Collectors may not pass on premiums, or they may be stolen in transit. This may lead to counterparty risk.

q. Higher investment cost as potentially suitable matching assets are unlikely to be available.

r. There may be regulatory or government pressure to settle the claims and to keep premium competitive which may lead to losses to the company under this product.

[Max 9]

iii) The insurer may take following actions improve adverse experience of the product:

1. Underwriting of product at new business stage:

   a. Using simple and clear proposal form covering all questions to assess mortality risk under the product

   b. Automated underwriting to reduce underwriting expenses

   c. To make sure that the risk classification is appropriate to reduce the risk of anti-selection.

2. Underwriting of claims-
   a. Pay claims as per terms and conditions of policy
3. Reduce fraud under the policy-
   a. Could aim to work closely with the government on educational initiatives like healthy lifestyle, insurance awareness.
   b. Use of tightly and clearly worded terms and conditions, e.g. to reduce potential for non-disclosure.
   c. Reduce fraud by educating policyholders about the effects of fraud on the availability and cost of insurance.
   d. Data keeping and proper documentation to avoid potential frauds and reduce operational failures.
4. Invest in good IT infrastructure for efficient payment and record keeping.
5. Reduce poor withdrawal experience:
   a. By offering renewal discounts and proactive premium collection and monitoring/reminders.
   b. Have appropriate commission structure depending on distribution channel.
6. Reduce higher expenses by outsourcing some functions:
   a. e.g. distribution
   b. policy administration,
   c. claim handling.
   d. negotiate fixed per policy servicing cost.
   e. train more (cheaper) local staff.
7. Appropriate premium rates to the risk concerned.
8. Experience monitoring to ensure that claims experience does not depart too far from that assumed in pricing of the product
9. Accounting and auditing- This is to enable proper provisions to be established, regular premiums to be collected.
10. Enter reinsurance arrangement with reinsurance company.
11. Investment performance can be increased by reducing investment cost using investment expertise.
12. Diversification of insurance selling of microinsurance policies across various geographical areas, different groups of policyholders, etc. This will reduce claims cost further.

[Max 8]
[20 Marks]

<u>Solution 3:</u>

i) Risk factors that the company may use when setting the model points are as follows:

- Age
- Sex / gender
- Sum assured.
- Smoker status
- Premium frequency
- Term of policy
- Distribution channel
- Post code

- Occupation
- Lifestyle factor / hobbies
- Any disability
- Medical history

[Max 3]

ii) Use of sensitivity analysis:

1. Results from the models will need to be looked at in conjunction with sensitivity tests to show vulnerability of results to unexpected future experience.
2. Outcomes will be analysed for sensitivity to variations in:
    a. Model point assumptions
    b. Parameter values
3. The effect of mis-estimation of parameter values can be investigated by carrying of sensitivity analysis.
4. Sensitivity testing, on a deterministic basis can be used to help determine the margins that may be necessary in a basis.
5. Such margins in each parameter assumption can be a way of allowing for risk in a pricing model, as an alternative to risks margins in risk discount rate.
6. Sensitivity analysis can be used to determine the variance of profit, or of the return on capital, for any business being modelled.

[Max 3]
[6 Marks]

Solution 4:

i) Surrender values should

Take into account policyholders' reasonable expectations

Treat surrendering and continuing policyholders equitably

At early durations should take into account premiums paid and at later durations be consistent with maturity values

Not exceed earned asset shares in aggregate over a reasonable period of time

Take into account surrender values offered by competitors

Not subject to frequent change unless dictated by financial conditions

Not be subject to discontinuities by duration

Be capable of being administered easily

Should avoid selection against the insurer

[Max 4]

ii) Concerns with increase in surrenders
The Company may suffer a loss if the surrenders are higher than assumed at the time of pricing

Lower the number of policies less will be the recovery towards overheads of the Company

Surrendering policyholders may be healthier which makes the balance portfolio have a higher death outgo resulting in lower profits

Lapse and re-entry may be a problem as customers may see more value in buying a new product which may offer higher benefits consistent with the higher interest rates being seen in the economy

The Company may have to liquidate assets whose value may be depressed and suffer a loss if the surrenders are more than expected

Surrendering policyholders may create a reputation risk for the Company

[Max 3]

iii) Course of action

The Company needs to review its surrender values.

It should check whether the surrender values are consistent with the higher interest rates

If it is deemed to not violate PRE the Company can reduce surrender values

The decision to reduce and the extent of reduction would depend on the investment strategy of the Company on whether the Company is following a matching strategy and whether the Company has sufficient cash holdings to pay surrender values

If the Company needs to sell assets the Company may revise surrender values downwards to prevent any loss that could arise from having to sell bonds

It may take a view that the increase in interest rates is a temporary phenomenon and may be willing to absorb any losses

The Company can discourage lapse and re-entry either through pricing actions on its new products, however this may have an impact on new business volumes

It may decide not to incentivise intermediaries for such kind of sales

[Max 3]
[10 Marks]

Solution 5:

i) Reasons for reinsurance

The primary consideration for the Company would be to reduce claim payout fluctuations.

The minimum sum assured can vary from INR 1,000,000 to a maximum of INR 50,000,000. There is a large variation is sums assured. By retaining INR 100,000 it can be more certain of the claim payouts and not be affected by any claim on larger sums assured.

This is a relatively newer product and the mortality experience may be different than assumed in pricing. By reinsuring the Company is reducing the effect of misestimating the mortality parameter.

The Company may need the technical assistance on underwriting.

It can benefit from lower capital requirements.

The Company may need reinsurance to stay within the insurance risk appetite

Reinsurance costs may be lower as the reinsurer may assess the risk differently which would increase profitability.

[Max 3]

ii) Factors on level of reinsurance

The reinsurance terms offered may be higher than the current reinsurance costs. The underwriting requirements set out by the reinsurer may be stricter than envisaged

It is possible that with the reinsurance arrangement being offered the Company's profitability targets may not be met or the product may not be successful due to lower volumes.

Normally, the Company would decide on the level of retention based on the costs of reinsurance.

If the costs are relatively high the Company may not want to cede more as its profits will be lower. The reinsurance terms themselves may vary based on the retention level.

While the product is new the Company may have credible experience for the business it intends to write and therefore may be comfortable with retaining more.

The current solvency position of the Company would also decide the level of retention.

If the current solvency is comfortable, it may have an ability to retain more as it can forgo any benefits of lower capital requirement associated with reinsurance. Additionally, it may be able to absorb any impact arising from claim volatility,

The Company could decide on setting up a mortality fluctuation reserve and assess whether the cost of financing this reserve would be lower than protection by reinsurance at higher retention.

Approach

It would set the retention limit in such a way that the impact from claim volatility on profits and solvency does not exceed a certain level.

The aim would be to keep the probability of insolvency low or the probability of impact on profits not exceeding a certain percentage of annual profits.

It could run a stochastic model for expected claim rates and determine a retention level such that the Company stays solvent or meets the profits criterion at the desired probability level. It would need to run the model with differing retention limits and decide on the level at which this probability is met.

Alternatively, it could carry out a sensitivity analysis varying the mortality distribution and assess the impact on profits and solvency and decide on the level of retention.

[Max 10]

iii) Embedded Value

The Embedded value before reinsurance is equal to the sum of Present Value of Profits and free assets.

100* 5.65+ 1000= 1,565

With Financial reinsurance the free assets of the Company will increase by INR 300 million which is the loan provided by the reinsurance Company. There is no corresponding increase in the liability since the loan is a contingent loan and has to paid only if the Company makes profits.

The future profits will reduce by the loan installments and will be equal to (100-55.3)= 44.7. The Present Value of future profits will be 44.7*5.65=252.56.

The new Embedded value is 252.65+1300= 1552.64

If the balance sheet were on a realistic basis the Company would probably have taken credit of future profits in computing available capital and or there may be a need to recognize the liability in respect of loan repayments. Therefore, the loan may not increase the free assets.

[5]

[18 Marks]

Solution 6:

i) Investment strategy

The Company would want to invest in such a way that the returns are at least as that assumed at the time of pricing.

The intention would be to maximize returns.

However, subject to the risk being at acceptable levels given its free assets and appetite for risk.

Given annuity amounts are guaranteed the Company would want to invest such that it will be able to meet the guarantees.

It would want to invest such that the asset proceeds match the annuity payments.

However absolute matching may not be possible because of lack of suitable assets.

It could choose to invest in fixed instruments like Government bonds and corporate bonds as the asset proceeds are predictable provided there are no defaults.

It could follow an immunization strategy so that any movement in interest rates have an effect on the assets as well as the liability.

However, it is possible that the assets of required duration may not exist and the Company could still be subject to some reinvestment risk

Depending on the risk appetite and the solvency position, the Company can choose to be mismatched so that it has the opportunity to benefit from higher returns in the future.

If it does not follow a matching strategy, it could invest more in corporate bonds which would have high expected returns but would have lower terms as compared to the liabilities.

It could invest a part of the assets in riskier assets like equity if there are sufficient free aseets to absorb the volatality.

The investment strategy would take into account Regulations of permitted investments.

The investment strategy would take into account the impact of any change in the market value of the asset on it's solvency.

[Max 7]

ii) Regular premium deferred annuity

With a regular premium deferred annuity, the Company will be exposed to reinvestment risk much more than it would be in the single premium immediate annuity.

Till the annuity payments start the cashflows will be positive both from assets and from liabilities with small outgoes towards expenses and surrender values if any.

This results in a large part of the cashflows being subject to the risk of being invested at lower returns than are currently available.

The Company could allow for lower return while pricing the annuity. However, this may not be perceived as fair by customers.

It could make the product very unattractive for the customer.

It is possible that interest rates could become even lower than that assumed in pricing and the Company may make losses.

In case interest rates do not fall significantly, persistency could be lower than that assumed in pricing as customers may see better value in surrendering and buying newer policies.

The future investment return assumption corresponds to the yield implied in a call option on the bond. The Company could enter into derivatives so as to buy bonds to ensure the return assumed in pricing.

The guarantee can also be managed by entering into swaptions where the Company pays the floating rate in return for the fixed return.

However, the necessary derivatives may not be available.

The administration of derivatives may be complex.

The Company loses the opportunity to benefit from higher investment returns.

The liability cashflows are estimated based on longevity assumptions and certain persistency assumptions.

The actual cashflows may be different than assumed.

This results in uncertainty of the term of the liability and asset cashflows may not support the outgoes resulting in reinvestment risk or having to redeem assets prematurely.

[Max 7]

iii) In a market consistent valuation, the discount rate would usually be the risk free rate obtainable from government bonds. The choice of assets will not have a bearing on the discount rate.

However, it is usual to include an illiquidity premium in the discount rate to take credit of the illiquidity premium in the yield on the assets held.

Capital requirement will arise if there is a change in the value of the assets which is not offset by a corresponding change in the value of the liabilities or vice versa.

The amount of capital will depend on the type of investments held and whether a matching strategy is followed.

The least amount of capital would be required if the assets and liabilities are completely matched and the asset comprises of Government bonds. However, this strategy limits any potential upsides and may not be in line with expectations of shareholders.

Capital requirement would be higher in the following scenarios.

If the investment strategy is not be matched, a change in interest rate will result in asset values changing differently as compared to liabilities.

In case of deferred annuity the capital requirements may be higher as the discounted value of the future premiums may cushion the movement in liabilities due to interest rate change.

However, if the Company has entered into derivatives, and is in a relatively better matched position, the capital requirement may come down.

Similarly if the assets comprise significant amounts of corporate bonds, there would be a change in the value of assets with change in widening of default spreads. There will be no change in the value of the liabilities due to widening of credit spreads which could result in higher capital requirement.

Similarly change in equity values will result in capital requirement.

[Max 8]
[22 Marks]

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