

Actuarial Practice 1 – Assignment Questions and Solutions

1. IAI November 2024 Part A Q.2

A life insurance company LifeInvest Ltd. is considering expanding into the general insurance industry by establishing a new company General Co Ltd.

a) Briefly mention how the following aspects of general insurance differ from that of a life insurance:

- Nature of risks
- Policy duration
- Frequency of claims
- Reserve requirements

b) How does the investment strategy and asset portfolio of a general insurance company differ from that of a life insurance company in view of the differences mentioned in part (a)?

c) Gold prices in the last 1 year have increased by 40%. General Co. wants to invest 75% of its liquid assets in physical gold instead of money markets. You have been hired as an actuarial consultant to advise on this strategy. Outline the points you would highlight regarding this strategy in your report to the board of directors.

Solution:

a) The key liability profiles of a general insurance company differ from that of a life insurance company in several ways:

1. **Nature of Risks:** General insurance companies primarily deal with short-term risks such as property damage and accidents. In contrast, life insurance companies deal with long-term risks related to mortality, longevity, and morbidity.
2. **Policy Duration:** General insurance policies are typically short-term, lasting for a year or less, whereas life insurance policies are long-term, often lasting for several years or even decades.
3. **Frequency of Claims:** General insurance policies often have a higher frequency of claims due to the nature of the risks they cover, such as accidents and property damage. Life insurance policies, especially pure life policies, may have lower claim frequencies but higher claim amounts.
4. **Reserving Requirements:** General insurance companies need to set aside reserves to cover future claims, but these reserves are generally shorter-term (except for third-party liability claims) compared to life insurance policies.

b) As a result of these differences, the investment strategy and portfolio of a general insurance company differ from that of a life insurance company in the following ways:

1. **Liquidity Needs:** General insurance companies may need to maintain more liquid investment portfolios to meet short-term claim obligations. In contrast, life insurance companies may have more flexibility to invest in less liquid assets due to the longer-term nature of their liabilities.
2. **Risk Profile:** General insurance companies may focus more on generating stable and predictable returns to meet short-term obligations and manage underwriting risks. Life insurance companies may have a longer investment horizon, allowing them to take on more risk to achieve higher long-term returns.
3. **Asset Allocation:** General insurance companies may allocate a larger portion of their portfolios to fixed-income securities and cash equivalents to ensure liquidity. Life insurance companies may afford higher allocation to equities and alternative investments, some of which may be less liquid, to enhance returns over the long term.
4. **Duration Matching:** General insurance companies may not need to match the duration of their assets with the duration of their liabilities as closely as life insurance companies, which often use duration matching strategies to manage interest rate risk.

c) Points to highlight regarding investing cash assets in gold:

- The factors that contributed to the rise in gold prices, such as:
 - Inflation concerns,
 - Geopolitical tensions, and
 - Currency fluctuations may not continue in the future, which can lead to lower-than-average or even negative returns.
- Gold prices can be more volatile than money markets, which can lead to losses at the time of sale.
- Gold is generally priced in US dollars. Any fluctuations in the currency could also make the prices more volatile.
- **Opportunity cost:** Past performance of the asset need not replicate in the future. There could be other asset classes, e.g., equity, that could yield better returns. The company may miss out on this if it solely invested based on the last 1 year's performance of gold.
- Physical gold may not be as liquid, and there could be storage risks, insurance, and transaction costs of dealing in physical gold.
- Investing 75% of the cash assets in physical gold may also hinder the company's ability to meet its liabilities, especially if it plans to write short-tailed lines of general insurance business such as personal accident, motor own damage, and household contents insurance.
- Alternatives such as ETFs or gold bonds can be considered, which are more easily tradable and do not involve overheads.
- **Diversification:** If the company plans to have enough other investments in short-term liquid assets, then the remaining cash assets could be invested in gold.
- Thresholds and investment strategies can be defined, which could allocate assets to or away from gold instead of just investing the current 75% of cash in gold.

- Gold is viewed as a hedge against inflation. If the company also plans to underwrite long-tailed liability lines of business, then some funds could be allocated to gold.
- **Current economic environment:** Interest rates and gold prices are negatively correlated with each other. If the company expects interest rates to fall in the future, then some funds could be allocated to gold.
- Need to analyse correlation with returns of the equity market and other broader macroeconomic factors before investing a large sum in gold.

2. IAI November 2024 Part B Q.1

A multinational Life Insurance Company, Galaxy Insurance, is a Joint Venture partner in a Life Insurance Company ABC Life Insurance Company Ltd. (ABC), in a country with one of the fastest growing economies.

ABC has not been performing well for the past few years with increasing claims, higher expenses along with lower renewals and new business volumes. The local partner is planning to exit from the company. However, Galaxy Insurance is bullish on the domestic market and is confident of acquiring a good market share.

Galaxy Insurance is presented with an offer to increase the stakes in the Joint Venture leading to a majority shareholding.

a) Briefly discuss the possible reasons for Galaxy Insurance's interest in increasing the shareholding in ABC.

b) Describe the key business aspects Galaxy Insurance should analyze to arrive at a fair valuation of ABC.

The Chief Actuary of Galaxy Insurance is not comfortable with the valuation being offered and wants to perform due diligence on the assumptions and the company's investment strategy.

c) Discuss the factors the Chief Actuary will need to consider for reviewing assumptions used for the company's valuation.

d) Define Investment strategy. Highlight and discuss the areas to be evaluated to examine the company's investment strategy.

After months of negotiations and deliberations, the deal finally went through. Galaxy Insurance is now the majority shareholder in ABC Life Insurance Company Pvt. Ltd. Galaxy Insurance aims to have a majority market share and has entrusted the Chief Actuary to introduce for the first time, a new guaranteed endowment assurance without-profit product which will be very competitive compared to its competitors.

e) Discuss the potential risks and mitigation strategies the Actuary would need to consider when designing the product.

The company realized that in the current market, with-profits product is a good proposition with value generation for both the policyholder and the insurer. The regulator has keen interest in the with-profits product management of insurers and hence many functions are regulated.

f) State the reasons why with-profit products might be in demand in the market. Why could it be believed to be a valuable proposition for both the insurer and the policyholder?

g) Define the Actuarial Control Cycle and how it can be used for better ongoing financial management of the company

Solution:

a)

1. Market potential –
 - The domestic market may be under-penetrated, despite being a rapidly developing economy, with ample scope for growth in the financial services industry, especially the life insurance market.
2. Capital Availability -
 - Galaxy Insurance may have surplus capital to invest and Super Galaxy may deem fit for a high return on capital, considering the scope for growth.
3. Desire to expand into emerging markets
 - Galaxy Insurance may desire to enter the emerging market for higher profitability or diversification.
4. Marketing and Distribution Strategies
 - Galaxy Insurance may want to implement certain marketing, sales, and distribution strategies in the local market but hasn't been able to do so due to minority shareholding.
5. New partner
 - Since the local partner is on the lookout for a buyer, Galaxy Insurance may not be confident and contented in continuing the joint venture with a new leadership.
6. Valuation
 - Galaxy Insurance may be getting a good valuation due to the urgency of the local partner to exit.
7. Better Governance
 - Galaxy Insurance may practice high standards of good governance including superior internal controls and practices.
 - The joint venture may have poor standards at the current state leading to lower growth.

b)

1. Market Potential and Competition:
 - How big is the market? Growth potential
 - Competition in terms of number of players, distribution spread
 - Any competitive advantages the company has vis-à-vis the competition
2. Economic Scenario and government policies
 - What are the current interest rate levels in the economy?
 - Government economic policies? Do they encourage growth and more international investments or very inward-looking policies?
 - Is the capital market well developed with appropriate regulatory mechanism
 - How are the investor sentiments currently in the economy?
3. Solvency Ratio
 - How solvent is the company? Is it operating at a healthy solvency ratio?
 - Will the company need any capital injection soon?
4. Expenses
 - Current levels of expense ratios
 - Expense ratio trends of the company in recent years
 - Levels of variable/fixed expenses
5. Market share
 - Market share growth/degrowth tendency

6. Brand Value
 - How valuable is the brand in the market
 - Is there a need for re-branding? Is any significant investment required for marketing?
7. Productivity
 - What are the productivity levels of sales staff?
 - Is the company burning more money for additional sales?
8. Distribution
 - Direct sales level
 - Banca partners
 - Diversification of distribution partners
 - Digitization
9. Persistency
 - What is the persistency experience of the company?
 - Is there any improvement in the persistency trend? If not, has it been taken into account for future profitability projections?
10. Mortality/Longevity
 - How is the mortality experience of the company? Have significant death claims been paid out in the recent past?
 - What have been the longevity levels in the demography? Is it improving over the years due to medical advancements and/or improved lifestyle?
11. Underwriting
 - How strict/lenient is the underwriting process of the company? Are there any gaps in underwriting leading to fraudulent claims being honored and/or higher risk being unidentified?
 - Is the underwriting process advanced enough to identify and categorize risky profiles?
 - How does the company's standards compare with those of the competition
12. Regulatory Controls
 - What are the levels of Regulatory Controls on the company?
 - Are the regulations encouraging industry development?
 - Are they prescriptive or principle-based
13. Reinsurance
 - Does the company have acceptable levels of Reinsurance arrangements?
 - Are the reinsurance prices higher for the company? If yes why?
 - Does the company have Stop Loss/Catastrophe reinsurance arrangements in place?
 - Level of technical support reinsurers provide
14. Product Mix
 - What kind of product mix the company is selling? Is there a healthy mix of all segments of products?
 - Does the product mix have a higher proportion of lower profitability products?
15. Profitability
 - What are the profitability levels of the company?
 - What have been the profitability trends in the past few years?
 - What are the projected levels of profitability of the company?
16. Geographical Concentration
 - Is the customer base concentrated in a few states in the country?

- Are the major sales proportions being contributed from specific locations? This makes the company vulnerable to concentration risk due to any catastrophe, competition, etc.
- 17. Peer Comparison
 - How are peers valued compared to the company?
 - If there has been an acquisition in the recent past, Galaxy Insurance can refer to the deal to compare the valuation levels
- 18. Historical and projected sales
 - Past trend of sales growth
 - Expected future sales volume
 - Market potential
- 19. Assets – Liquidity, Credit Risk, Asset Mix
 - What kind of assets the company is currently invested in? Do they carry significant risks?
 - Has the company accounted for Liquidity and credit risk in the asset portfolio?
 - What are the levels of equity in the portfolio?
 - Are the liabilities and assets of the companies matched by duration and cash flow?
- 20. Customer complaints, litigations, legal risk
 - How are the grievance rates/customer complaints levels?
 - Are there any litigations on the company?
 - Does the company carry any legal risk for the products sold in the past?
- 21. Checks and controls/ Audit Reports
 - Checks and controls in the different functions of the company
 - Any system/compliance certifications received
 - Past and current audit report findings

c)

1. Mortality/Longevity
 - Past mortality trends of the company.
 - Average age group at different lines of business.
 - Any demographic characteristic exhibiting higher experience levels.
 - Smoker V/s Non-smoker, Gender, Ticket size mix, etc. Are there significant differences in the experience levels under these cohorts?
 - What are the levels of reinsurance rates? Is the company retaining acceptable levels of mortality risk?
 - Does the company's liability reflect the actual mortality experience at different levels? Are there sufficient levels of prudence considered while determining the policyholder's liabilities?
 - Does the mortality assumption used in valuation reflect the above considerations?
2. Persistency
 - Historical persistency trends of the company
 - Are the persistency levels low for specific products/segments or the overall portfolio?
 - Are the persistency levels skewed? Is it very low for some specific channels and higher for the rest?
 - What is the experience in early surrender/lapses? If there are a higher number of early lapses, it indicates mis-selling and hence impacts the long-term persistency of the

portfolio.

- Does the company's liability reflect the actual mortality experience at different levels?
 - Does the company's liability reflect the actual persistency experience at different levels?
- Are there sufficient levels of prudence considered while determining the policyholder's liabilities?
- Does the persistency assumption used in valuation reflect the above considerations?

3. Expenses

- What are the levels of initial and renewal expenses of the company?
 - Are the expenses categorized and allocated in line with their type and nature? – Fixed Vs Variable, Direct Vs Indirect
 - Are the future expenses inflated in line with the past trend and future expected inflation levels?
 - Does the company's liability reflect the actual expense experience at different levels?
- Are there sufficient levels of prudence considered while determining the policyholder's liabilities?
- Does the expense assumption used in valuation reflect the above considerations?

4. Interest rates and risk discount rates

- What are the future levels of interest rates assumed? Are these in line with the peers and market expectations?
- Do the interest rates reflect the portfolio's different asset classes?
- Are the liabilities valued at rates consistent with the asset classes it is invested in?
- How sensitive are the liabilities to the interest rate movements?
- Are there sufficient levels of prudence considered while determining the policyholder's liabilities?
- Do the risk discount rates reflect the shareholder's required risk premiums?

d)

It is a strategy with the primary objective of matching the liabilities by duration, term, and value and maximizes the investment return subject to an acceptable risk level as approved by the Board. It is a set of rules, behaviors, or procedures, designed to guide an investor's selection of an investment portfolio. Don't we need to say that?

1. Cashflow matching: Are the asset cash flows closely matched with liability cashflows? If not, what is the level of gap between the two? How has the company planned to manage the mismatch?
2. Credit Risk: What is the credit rating of the assets on the portfolio? If the assets are very risky, it can lead to defaults and hence impact the company's ability to pay claims. Does the company have an investment policy concerning the mix of different asset classes?
3. Duration: Duration of the assets and liabilities need to be closely matched to avoid the disproportionate impact of market movements on asset-liability position.
4. Regulatory and Solvency requirements: Does the investment strategy allow for regulatory and solvency restrictions on asset classes to be invested in?
5. Diversification: Is the portfolio well diversified? What is the proportion of debt and equity in the portfolio? Is the equity investment well diversified across different sectors of the economy?

6. Currency: Does the investment strategy allow for currency risk if any? Are the liabilities and assets matched in the same currency? If not, how has the company managed the currency fluctuation risk?
7. Liquidity: Does the investment strategy manage the liquidity risk of the company? What is the liquidity level the company maintains? What is the proportion of investments in liquid assets such as cash and money market?

e)

1. Solvency II
 - The Solvency II Directive aims to standardize the solvency regulations for insurance companies across Europe. Solvency II requires insurance companies to hold enough capital to cover their liabilities, with an additional solvency margin for protection against unforeseen events. The Directive sets a risk-based approach to solvency, with three pillars:
2. Pillar 1: Quantitative Requirements (capital and risk)
3. Pillar 2: Governance and Risk Management
4. Pillar 3: Reporting and Disclosure
 - It introduces a risk-based capital regime that takes into account the insurance company's risk profile.
 - Solvency II aligns the risk and capital requirements with the overall market and regulatory framework.
 - Solvency II also mandates that insurers have an internal control system in place to evaluate and monitor their own risks.
 - Solvency II ensures that the capital requirements for insurance companies are commensurate with their actual risk exposures.
 - The standardization allows a better comparison of insurers' risk profiles across the European Union.
 - Solvency II's focus is on policyholder protection, ensuring insurers are adequately capitalized to meet their obligations.
5. Capital Requirements
 - Solvency II requires insurance companies to hold enough capital to cover their liabilities, with a further solvency margin.
 - This capital must be sufficient to allow an insurance company to withstand significant stresses and risks.
 - The capital required by Solvency II is determined by the insurer's risk profile, which is calculated through the company's own internal models.
 - Insurance companies must also hold capital to account for a range of risks, including underwriting risk, market risk, credit risk, operational risk, and liquidity risk.
 - The capital requirement is calculated using the Solvency Capital Requirement (SCR) standard formula or an approved internal model.
 - Solvency II also sets out the Minimum Capital Requirement (MCR), which is the lower threshold of capital needed to operate in the insurance market.
6. IFRS 17
 - IFRS 17 is a new accounting standard that is set to replace IFRS 4 for insurance contracts. It aims to increase transparency and comparability in the financial reporting of

insurance companies.

- IFRS 17 will require insurers to report their insurance contract liabilities and performance more accurately.
- The key changes include a new approach to the measurement of insurance contracts, the presentation of the income statement, and the reporting of the liability for incurred claims.
- It aligns the treatment of insurance contracts with the reality of the business and allows a better understanding of the economic performance of the company.
- Insurers must report changes in the liability arising from insurance contracts and use a more consistent approach for assessing the profitability of their contracts.
- IFRS 17 will also enhance the disclosure requirements, making it easier for investors and other stakeholders to assess the financial health and performance of insurance companies.

3. IAI May 2024 Part A Q.7

You are working in actuarial department of Company A which is a small health Insurance company selling health insurance covers. You have recently attended a seminar on “Actuary-Well known for their Professional Advice”. One of the sessions in the seminar covered Actuarial Control Cycle employed by the actuaries in advising their client. Yesterday, your manager received a proposal from CEO wherein the company is planning to launch a critical illness product. CEO has asked your manager to provide his views on the actuarial aspects related to the new launch. You are assisting your manager in preparing a response to CEO. Describe how you would use actuarial control cycle and various aspects considered under in it in preparing your response to CEO.

Solution

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 risks 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 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 attracted.

The company is new in the market and hence likely to have little or no experience of the product. Given that the 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 scenarios 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 the reserving basis.

If the business will be re-insured, the company may consider taking help from reinsurers on data, underwriting, and profit testing.

The 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 the 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 experience may also be monitored.

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 the 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.

4. IAI November 2023 Part A Q.2

A defined benefit scheme (“The Scheme”) offers pension benefits linked to the final salary. Pension in payment is guaranteed to increase in line with a market index. The Scheme invests a significant proportion of its funds in a variety of investment instruments of Country A. A rating agency has recently downgraded the sovereign rating of Country A from AA+ to AA. The country has witnessed a significant increase in the price inflation in recent times due to which the central bank has indicated an increase in the repo rate during coming months and such increases in the rates are expected to continue if the inflation continues to increase or remain at higher than the desired level.

Describe the likely impact on the asset and liability position of the scheme because of increase in the interest rates in Country A and its Sovereign downgrade.

Solution

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 market value of sovereign bonds. Corporate bonds: The yields are likely to go up. Overall, there will be an increase in 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. IAI November 2023 Part A Q.8

Hyperbola Life Insurance Company has been writing non-linked With-Profits life business, non-linked non-participating life business, term business and unit linked business. Company's new business has been declining in recent years. The Board of Directors has sought a report from the company's management on the declining new business. The CEO of the Company has asked you to draft a note highlighting the key reasons for the decline and possible mitigation mechanisms that company can implement to improve the new business. The report has been submitted to the Board elaborating the various steps that the company would need to take to improve the new business.

i) What could be the key reasons for decline in new business and suggest possible steps that the company could take to improve new business?

One of the reasons for declining business as suggested by the report related to the lower investment return on its savings products compared to other savings instruments available in the market. You have been asked to review the current Asset Liability Management (ALM) position of the company.

ii) Describe how company's free assets & ALM can be used to improve the company's investment performance.

iii) Describe the key factors that would be considered in reviewing the following assumptions used in its product pricing.

a) Mortality assumption

b) Investment Return assumption

Solution

i) Key reasons for fall in the new business:

- Management decision to reduce/ stop new business on account of
 - o Reduced capacity to write new business on account of lack of available capital
 - o Reducing sale of loss making business
 - o Likely shift in the product portfolio as current portfolio may no longer be marketable or profitable leading to temporary reduction in the new business trends
 - o Change in the target market/market segment leading to temporary reduction in the new business trends
- Increased competition due to
 - o New launches by other insurance companies
 - o New entrant in the market segment in which the company operates
 - o Better returns (bonuses on with profits business) to policyholders by competitors
 - o Higher commission and remuneration offered by the competitors resulting in higher agent attrition
- Damage to company's reputation on account of
 - o Frauds within the company
 - o Bad news in the news media and social media about the company and/or its group
 - o Regulatory and Legal issues
- Restrictions imposed by the regulator on new business due to
 - o Falling solvency ratio trend in the recent years
 - o Operational Frauds e.g. siphoning, money laundering with consequences to serious implication on the interests of policyholders
 - o Shareholders and management no more "Fit and proper" to manage insurance business and protect policyholders' interest
 - o Consistent non-compliance
 - o 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:

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

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 existing level of mismatching. Review of mismatching would consider:

- o Extent of existing mismatching commensurate to the current and projected level of free assets

Policyholders' reasonable expectations

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

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

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 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 o Abnormal fluctuations o Fluctuations and Changes in the experience with time due to factors such as medical advances, social and economic changes o One-off effects and random fluctuations e.g. due to pandemics/epidemics or otherwise o Potential errors in the data o Changes in the mix of homogeneous groups/target market within past data and homogeneous groups to which the assumptions apply o Product type- Term/Savings

b) Investment Assumption:

- Type of assets that will be used to back the liabilities under the product
- Past data such as
 - o Data on dividend yields on equities
 - o Data Yields on the bonds
 - o Data on Index for index-linked assets
- Current economic data
- Forecasts- Fluctuations and changes over time which could depend on:
 - o Changes in economic and fiscal policy as well as with general economic cycle
 - o Economic and fiscal changes mean that most past data are irrelevant
 - o 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 withstand fluctuations

6. IAI May 2023 Part A Q.6

Long term care insurance is a segment that your company is targeting to enter to expand the company's footprint in the country.

- i) Define Long term care and what needs of a customer does it meet?
- ii) You are the Pricing Actuary tasked with doing the initial pricing of the product. You are asked to present the pricing results to the Product Management Council. Discuss the aspects you will consider while deciding on the assumptions and other factors that will have to be taken into consideration while pricing the Long Term Care product?
- iii) Longevity risk is one of the key risks in this product. Discuss the scenario(s) when the company should consider it as a systematic or a diversifiable risk?

Solution

- i) A claim is payable on this contract when the policyholder is deemed to have reached a specified level of disability, for example the policyholder may be unable to perform a specified number of 'activities of daily living' (ADLs).

The different levels of care will differ between one contract and another, but typically may include the following (in increasing order of cost):

- a. cost of care in own home
- b. cost of being cared for in a residential (but non-nursing) home
- c. cost of being cared for in a residential nursing home.

The contract can be paid for by single or regular premiums, and all types of benefit structures (without-profit, with-profit, unit-linked and investment linked) are possible. Any regular premiums would cease from the point at which claims begin to be paid (if not at some earlier date).

The contract can be used to help provide financial security against the risk of needing either home or nursing-home care as an elderly person, ie post-retirement. The contract could pay for all the IAI CP1A-0523 Page 7 of 11 costs of care throughout the remainder of life (an indemnity contract), or could provide a cash lump sum, or an annuity, to contribute towards the costs of care.

ii)

- 1. Key aspects affecting setting the assumptions are:
 - a. The use to which the model will be put
 - b. The financial significance of the assumptions
 - c. Consistency between the assumptions – compared to current product or other similar products
 - d. Legislative and regulatory requirements – tax, regulations
 - e. The need of the stakeholders
- 2. How to gather the data:
 - a. Does the company in the past or currently writing any long term care product? If yes, then assumptions underlying the product can be used.
 - b. If no, then alternative source of data is required like:
 - i. Reinsurance, Will the reinsurer participate in this product and what will be the

reinsurance cost that needs to be allowed for?

ii. Standard table:

3. important to understand if the standard tables are aligned to the target customer demographics
4. To assess what % age of such standard table will be more suitable for the company to reflect its expected experience
5. These assumptions need to be reviewed considering the business strategy that the company has for growth of this segment.
 - a. Factors to be considered?
 - i. Is company planning to use any new distribution?
 - ii. Is company planning to sell into different geographies than it is currently selling?
 - iii. Is the expectation of margin still the same?
 - iv. Is any change in UW expected, as this will impact the mortality and longevity assumptions
 - v. Incentive like customer discount, higher commissions, lower acquisition cost, higher expense towards marketing etc. needs to be allowed for, especially if company want to capture the market in a short span of time
6. Can company tie up with diagnostic centres and for initial or regular check-ups of its customers?
 - a. This will ensure that the data used for UW is credible and cost of acquisition and regular check-up happens at a reasonable rates.
 - b. Whether company can have these tie ups will impact the acquisition and maintenance expense assumptions
7. Sensitivity testing and scenario analysis, especially to assess the impact of longevity risk and what loading is needed to maintain target profit margins
8. ALM consideration and how will it impact the interest rate assumptions
9. Capital requirements and cost of capital assumptions
10. Assumptions and MAD that is needed while reserving as that will have an impact on NB strain and margins of the product]

iii)

1. If the company writes only/predominantly annuity business, then longevity risk is fundamentally a systematic risk. If the mortality rates are falling for the population as a whole, this risk cannot be diversified away.
2. If the longevity rates vary for certain subsets of the population (certain socio economic profiles) then the company may be able to diversify its exposure by either avoiding such socio economic profiles or by targeting a wider range of population with varying socio economic profile
3. It can reduce volatility and hence diversify the risk by selling large number of policies, thereby benefitting from law of large numbers
4. The company can diversify the risk by writing term or whole life products as improving mortality will have a beneficial impact of such products which will negate the impact of longevity risk on long term care product
5. Company can also diversify longevity risk against other risks like market, operational risk, thereby reducing the overall capital requirement of the company.

7. IAI June 2019 Part A Q.2

Outline how the following technologies can be used in pricing. i) Telematics in Motor insurance. (2) ii) Wearables in Health insurance.

Solution

i) Motor insurance – the analysis of data obtained from using telematics (i.e. monitoring driver behaviour through a device installed in the insured vehicle).

- Duration of trips in pricing a product i.e. the more the trips, the higher the premium
- Cars connected with GPS can be used in finding the exact location of claims
- Braking and acceleration used by the drivers can decide the premium

ii) Health insurance – the analysis of exercise regime (e.g. from wearable fitness monitors).

- Wearables like fitness watches can be used in tracking the activities by the policyholders eg. no of steps, heart rate, BP, other forms of activity etc
- Points for doing exercise and reduce future premiums

8. IAI June 2019 Part A Q.4

List the insurance needs of a large oil drilling company.

Solution

Protection of employees-

- Life Insurance cover for workers in case of any accidental death at the plant/site
- Health Insurance cover for workers in case of any accident at the plant for treatment in a hospital

Property Damage Insurance:

- This is insurance to indemnify against loss of or damage to vehicles, machinery and equipment etc used at oil drilling site, due explosion or other reasons
- Business interruption cover- Collapse of operations due to NAT CAT events

Liability Insurance:

- Third party public liability (environmental pollution caused),
- Professional indemnity-errors and omission for employees and directors

Marine insurance:

- Large individual claims – for example, the loss of a large ship at sea
- Accumulations – for example, a storm hits a harbour and equipment and machinery for transport are damaged.

Financial Loss insurance: The benefit provided by financial loss insurance is indemnity against financial losses arising from a peril covered by the policy.

It includes:

- Pecuniary loss – perils include bad debts or failure of third parties, includes mortgage indemnity guarantee insurance
- Fidelity guarantee – To cover against dishonest actions by employees, such as fraud and embezzlement
- Business interruption e.g. political reasons

9. IAI June 2019 Part A Q.7

A Senior Actuary has asked his student to examine the regulatory returns of other insurers and provide a comparative analysis of supervisory reserves it has set for its Health Indemnity business to other insurers' reserves.

- i) While providing response to the Senior Actuary, comment on the care the Student needs to take when using external data for comparative purposes.
- ii) In order to strengthen the process of setting up supervisory reserves, the Student has also been asked to prepare a process document covering the entire work.
- ii) Describe the major areas that the Student needs to cover in the process document.

Solution

- i) When using competitor data for comparison, the company should consider differences in:
 - The scope of the cover provided, ie types and levels of benefits i.e. he needs to consider the indemnity Vs Fixed Health Benefits products as both offer different kinds of types and level of benefits e.g. indemnity provides the cost associated with the Hospitalisation while the fixed benefit provides the fixed cost irrespective of the event
 - The target market (expected claims experience may vary significantly by the types of policyholder targeted) of the company and its competitors
 - Business management actions taken such as underwriting levels and
 - Use of reinsurance, the approach taken to valuation by the different companies
 - Level of differences due to choice in how prudent the basis is
 - The quantity of the data (ie number of policies) and hence how credible it is which would indicate reliance based on own experience
 - The company should also consider how reliable the source of data has proved to be in the past, and when the results were compiled (they may be out-of-date)
- ii) The major areas shall be:

Data used for valuation

1. First section shall be on the data used for statutory valuation and the data validation process to validate that the data is accurate and complete.
2. Discuss Data extraction from the core system and adjustments if any
3. List all the checks that have been performed on the data e.g.
 - o Number of records comparisons with last month data
 - o Amount of new business recorded by internal MIS team versus new business premium in the data received
 - o Date formats must be in order like Date of birth
 - o Comparison of sum insured with last month's data etc
4. Ratio/trend Analysis done on the data is also important e.g. average sum insured, average premium, Premium / 1000 sum insured etc.
5. Process for documentation of data errors and action to be taken shall be recorded.

Methodology

6. This section shall cover all types of reserves that the company is holding:

- Unexpired Risk
- IBNR Reserves
- Asset liability mismatching reserve
- Catastrophe reserves

7. The methodology used to determine these reserves shall be written clearly.

8. All relevant regulations/professional guidelines shall be referred in this section.

9. Treatment of reinsurance should be documented

Experience Investigation for eg;

10. Should discuss internal/external analysis to be conducted before setting parameter values 11. This includes analysis of claims data, expense data, asset data etc. To set incidence rates, expense assumption, and discount rate for valuation purpose. 12. The granular level to which Claims data may need to be analysed - at product, sales channel, duration of entry, smoker/non-smoker status, age and gender level to determine incidence rates, should be documented. 13. Process for doing trend analysis for eg., Are arrived incidence rates better/worse compared to last year claims analysis and reasons for significant deviation? 14. Then arrive at incidence rates to be used for valuation purpose (after allowing for margin of adverse deviation) 15. Process for performance of expense investigation must be documented -- expenses will need to be analysed to determine expense loadings for provisions. Try to do initial and renewal expense allocation and arrive at per policy unit cost. 16. Documentation on process to be adopted for inflating expenses for the future should be discussed 17. What are the relevant regulatory guidelines and practice standards that need to be considered for setting assumptions for statutory valuation?

Result analysis

18. This section includes major checks which shall be done on final reserve numbers. E.g.

- What is the reason for changes in average trends in reserves, seasonality impact etc.
- Product level reserves shall be compared with last year/month reserve figures

10. IAI November 2020 Part A Q.3 (Part)

Due to the increase in hospitalizations from a vector borne disease during monsoon season, CEO of a small health insurer company has asked you, the Product Actuary, whether the company could come up with a simple health product covering risks arising from this disease.

- i) Propose a suitable product design.

Solution

Features & Benefits

- Only cover that specific infectious disease and exclude any other treatment to manage costs
- Offer short term policies like 3 months, covering only the monsoon period
- Reasonable Sum Insured based on observed trends of costs for managing the disease— one single SI or few levels of SI could also be offered
- Comprehensive in-patient hospitalisation cover / or
- home nursing for treatment taken at home, if hospital beds are not available
- Coverage for consultations, diagnostic tests, pharmacy and
- Coverage even for non-medical expenses incurred during hospitalisation for example medical consumables, customised diets etc.
- First 15 days waiting period from date of inception of policy to avoid anti-selection.
- No other waiting periods
- No other exclusions
- Post hospitalization cover for follow up after discharge
- Simple Options for sub limit on room rent to limit costs
- Simple extra loading structure for customers suffering from co-morbidities