

Institute of Actuaries of India

Subject SP8 – General Insurance: Pricing

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) Loss Portfolio Transfer (LPT) refers to the strategic transfer of a block of insurance policies
...along with their corresponding liabilities
...from one insurance entity to another.

[Max 1]

- ii) Insurance companies engage in LPT transactions to achieve key objectives, such as
...mitigating specific risk exposures
...optimizing capital allocation
...enhancing their overall risk profile
...change in business strategy
...any other relevant objective

To illustrate, consider an insurance company specializing in medical malpractice coverage. Due to a surge in large and unpredictable claims, the company decides to transfer a portfolio of medical malpractice policies to another insurer. By doing so, they offload the associated claims liabilities, thereby reducing their exposure to potential adverse developments and freeing up capital for other strategic initiatives.

[Max 4]

- iii) When assessing the suitability of a Loss Portfolio Transfer, actuaries need to analyse various factors, including
- the historical claims experience of the portfolio,
 - the stability of the incurred but not reported (IBNR) estimates,
 - the claims handling practices of the acquiring company, and
 - the financial strength of the acquiring entity.
 - In long-tail insurance lines like asbestos liability coverage, actuaries must consider extended claims development periods and the potential for adverse loss emergence.
 - In contrast, for short-tail lines like property insurance, claims development tends to be more immediate and predictable, requiring a different approach to assessing risk and transfer viability.

[Max 3]

- iv) Loss Portfolio Transfer, reinsurance, and securitization are distinct risk transfer methods.

While reinsurance involves sharing risk with other insurers, securitization entails converting insurance risks into tradable securities.

In comparison, Loss Portfolio Transfer involves the outright transfer of policies and liabilities.

[Max 3]

- v) An insurance company might choose Loss Portfolio Transfer over reinsurance when seeking to divest entirely from specific risks without ongoing shared obligations.

LPT may be favoured over securitization when the company desires a straightforward and direct transfer of liabilities without the complexity of structuring and marketing securities to investors.

[Max 2]

- vi) The pricing and negotiation of a Loss Portfolio Transfer can present intricate challenges.
...One notable complexity is accurately valuing the portfolio's future claims liabilities
...as differences in claims handling practices
...and reserving methodologies between the ceding and acquiring companies
...can lead to contrasting loss development patterns.
...assumptions around the future claims inflation

...risk margin etc.

These variations may impact the pricing structure, with disagreements arising over the assessment of risk exposure and the assignment of a fair premium.

Achieving a consensus on these matters requires thorough due diligence, transparent communication, and a shared understanding of the underlying data and assumptions shaping the pricing negotiations.

[Max 4]

[17 Marks]

Solution 2:

- i) Pricing categories:
- a. Tariff
 - i. Where the regulator has significant influence over the rates
 - b. Cost Plus
 - i. Where we set the price based on a statistically driven analysis, using the expected cost of claims, appropriately loaded for expenses, profit, and so on
 - c. Qualitative
 - i. Where we cannot determine the 'correct' price purely by numerical analysis and so we must take account of subjective factors
 - d. Distribution
 - i. Where we set the price allowing for non-cost elements such as the customer's propensity to shop around. This occurs in markets where we manage the pricing strategy across multiple distribution channels.
 - e. Economies of Scale / Industrial
 - i. Where we focus on operational efficiency and economies of scale. Currently this is done only by very larger personal lines insurers who are operating multiple brands across multiple channels, and possibly many countries.

[4]

ii)

Gross LR	Net LR	Gross UE	Net UE
30%	33%	3%	3%
30%	32%	3%	3%
30%	32%	3%	3%
50%	40%	5%	4%
30%	30%	3%	3%
30%	33%	3%	3%
40%	40%	4%	4%
50%	56%	5%	5%
40%	44%	4%	4%
120%	70%	12%	6%
50%	55%	5%	5%
40%	44%	4%	4%

[4]

iii)

- There has been an evident deterioration in the Loss Ratio over last few years.
- This could be driven by adverse climate related factors.
- It could also be driven by inflation.
- It is also possible that the company has been writing poor risks (/ deterioration in underwriting standards).

- Or driven by changes in business mix
- 10 years is a long period to have not revised the pricing rates.
- Ideally, Target Loss ratio depends on various factors including Target COR, expected profits.
- Based on the previous rating exercise, it seems that the company was targeting Claims as % of Exposure to be around 3% (or 30% Gross LR or 33% Net LR).
- However, the more recent years, exhibit a trend inching towards 5%.
- Indeed, the average of Net UE column for the latest 5 years is a 4.9%...
- ... which maybe rounded off to 5% for the recent pricing exercise.

[6]

iv) (formula) $NP = GP - RP = \text{Claim} + \text{CHE} + \text{Expense} + \text{Comm} + \text{Profit}$

- Claim = $0.05 * \text{Exposure}$ (from above part*)
- Claim Handling = $10\% * \text{Claim} = 0.005 * \text{Exposure}$
- Comm = 0.3 GP
- Expense = Comm = 0.15 GP
- RP = 0.1 GP
NP = GP - RP = 0.9 GP
- Profit = $0.1 \text{ NP} = 0.1 * 0.9 \text{ GP}$
- Calculations:
 $0.9 \text{ GP} = 0.055 \text{ Exposure} + 0.45 \text{ GP} + (0.1 * 0.9) \text{ GP}$
 $0.9 \text{ GP} = 0.055 \text{ Exposure} + 0.54 \text{ GP}$
 $0.36 \text{ GP} = 0.055 \text{ Exposure}$
 $\text{GP} = 0.055 / 0.36 \text{ Exposure}$
 $\text{GP} = 0.1527 \text{ Exposure}$
- Answers:
 - 15.3% premium rate
 - Therefore, to achieve 10% profit margin, Gross Premium should be charged at 15.3% premium rate (as a % of Exposure)
 - Target Loss Ratio, therefore = 33% (Gross basis) and 36% (Net basis)

[Max 10]

v) Pricing insurance products in the face of climate-related risks demands a comprehensive understanding of potential perils and their impacts. Gathering and analysing relevant data are critical to ensuring accurate risk assessment and setting adequate premium rates.

Here are the Key data requirements:

1. **Climate and Weather Data:** Detailed historical climate data, including temperature patterns, precipitation levels, wind speed, and frequency of extreme weather events. This data helps assess the likelihood of climate perils such as hurricanes, floods, and wildfires.
2. **Geospatial Information:** Precise geographic and topographic data, including elevation, proximity to water bodies, flood zones, and coastal areas. These factors significantly influence vulnerability to climate hazards.
3. **Property and Infrastructure Data:** Information about the properties insured, including construction type, age, valuation, and existing risk mitigation measures. This data aids in estimating potential damage and loss from climate events.

4. **Loss Data Analysis:** Analysing historical loss data related to climate perils, both within the insurer's portfolio and in the industry. Identifying patterns and trends helps refine pricing models.
5. **Climate Change Models:** Utilizing climate change models to project future climate conditions and potential shifts in risk exposure. These models assist in long-term risk assessment and pricing strategies.
6. **Socioeconomic Factors:** Data on local demographics, economic activity, population density, and land use. Socioeconomic factors affect the potential impact of climate events on communities and infrastructure.

[6]

vi) **Challenges:**

- **Data Quality and Availability:** Accessing accurate and comprehensive climate and property data can be challenging, especially in regions with limited data infrastructure.
- **Model Uncertainty:** Climate change models carry inherent uncertainties that can affect the accuracy of risk projections.
- **Long-Term Predictions:** Forecasting the long-term impacts of climate change requires careful consideration of evolving conditions.

Solutions:

- **Collaborative Data Partnerships:** Establish collaborations with climate research institutions and data providers to access reliable and up-to-date climate data.
- **Advanced Modelling Techniques:** Implement advanced modelling techniques that account for uncertainties in climate change projections.
- **Risk Communication and Education:** Educate stakeholders about the limitations of long-term predictions while emphasizing the importance of proactive risk management.

[3]

vii) Allow for climate-related risks:

- a. Based on historical data provided, it seems that the book was adversely affected by Catastrophe event only in 1 out of 10 years.
- b. However, there were no major catastrophe event from 2011-2019 which would have adversely affected the book
- c. It is possible that this catastrophe event was related to climate change (wildfire, floods, etc)...
- d. ... although it is also possible that this event was non-climate related (earthquake for instance)
- e. In any case, the company has been receiving higher claims for the same exposure
- f. It is possible that this deteriorating trend is driven by adverse weather-related events, which may not be catastrophic in nature
 - i. For instance, excess rainfall leading to waterlogging.
 - ii. Increased instances of short circuits -> leading to fire, etc
- g. The insurer seems to have effective Reinsurance programs in place to limit the upside of the claims.
- h. Although, we have allowed for the increasing claim cost in our projections based on historical average of latest 5 years.
- i. We have also considered the Net claim cost in 2020 in the average above...
- j. ... rather than excluding it
- k. This was done to allow for volatility and to err towards prudence...
- l. ...since increased weather-related events which may have a higher return period
- m. And thus impact the future expected claim ratio adversely

[Max 6]

- viii)** Reinsurance suggestions:
- a. Quota share
 - b. surplus reinsurance treaty
 - c. Risk XL working layer with maximum size of risk
 - d. Or combination thereof
 - e. Aggregate XL to cover against accumulations of risk.
 - f. Cat XL to cover against widespread storm damage, etc.
 - g. Perhaps stop loss for commercial property or for whole business to protect against insolvency.
 - h. May also include limits to the size of risks, number of each type of risk, volumes of risk by location.
- [Max 4]
- ix)** Data required:
- a. Owner, location, type of business.
 - b. Size (floor area), type of property, age of property, method of construction, number of floors.
 - c. Security systems, fire prevention systems.
 - d. Policy number, value, premium, EML, SI, Period of cover.
 - e. Date inception, underwriter's name. Expiry date, if policy not annual.
 - f. Previous reinsurer, claims in last five years for whole company insured.
- [Max 3]
- x)** Reinsurance pricing (TBU):
- a. Proportional reinsurance arrangements – relevant proportion of premiums + commissions / loadings, etc.
 - i. However, may want to consider the volatility in the underlying claims experience due to large losses
 - ii. Historical experience to be adjusted for unusually heavy / light experience
 - iii. Allow for brokerage payable under the contract
 - iv. The rate realization in respect of the underlying risks and expected changes
 - v. Applicable event limits
 - b. XL covers (theory):
 - i. Risk and Aggregate XL covers will need to be modelled by frequency...
 - ii. ...and average cost from ground up
 - iii. Though the reinsurer will have to base this on data available from its existing book of similar reinsurances.
 - iv. Use different sets of assumptions to see how results may vary
 - v. Base on assumed business volume with adjustment clause for significant deviations from expected.
 - vi. Premium will reflect expected claims outgo + contingency loading to reflect the expected variance in the results
 - vii. Reinsurer may also want to use the insurer's own experience...and
 - viii. ...give some weight to the same (Credibility models)

However, In practice:

 - ix. The theoretical rate will need to be assessed.
 - x. In practice though the rates charged will be largely dictated by market rates
 - xi. The reinsurer may not have too much flexibility to allow for additional climate change related risks if the competitors are not following suit.
 - c. Cat XL — look at past experience on other similar Cat covers offered.

- i. Can also use proprietary Cat risk models to ascertain the cat risks. *
- ii. Cat XL - Likely to reflect market rates more than actual experience.
- iii. The reinsurer may want to allow for climate-related risks.

[Max 8]

xi) Impact of RI in pricing:

- a. As per the current Claims data provided, it seems that insurer opts for Non-Proportional Reinsurance covers.
- b. Depending on change in reinsurance programmes, the reinsurance loading may increase.
- c. If so, then it is possible that the company may need to revise the Premium rates upward to maintain 10% profitability.
- d. However, it is also possible that the insurer has used stochastic RI optimization techniques...in which case, the overall Reinsurance cost may be lower than earlier.
- e. It is also possible that the overall expected Net claim cost might reduce due to higher recoveries. And thus, the net impact on the expected profitability is negligible.

[Max 5]

[59 Marks]**Solution 3:****i)**

- Premium rating structure does not accurately reflect the cost of the insured risks. This may result in adverse selection. The overall level of office premiums may be too low
- Allowance for expenses is too low due to business volumes lower than expected Business volumes / profit may be volatile due to competition.
- Poor policy wording may result in additional unanticipated claims. The insurer will have to take appropriate measures to avoid moral hazard.
- The insured risk profile may not be even over the policy duration. Claims costs or frequency may be greater than expected - adverse fluctuations.
- Claims costs or frequency distributions may be different from those expected.
- There may be concentrations of risk, for example for fleet business where more than one driver from the same fleet is travelling to the same destination. Geographical spread of risks should be considered, to avoid unnecessary accumulations of risk.
- Possible under reserving by the insurer poses a serious risk of insolvency.
- Incorrect recording of data poses considerable risk as accurate data is crucial for the correct assessment of premiums and reserves.
- Higher inflation than anticipated represents a minor risk. If liability cover is included then most of the liability is short tailed, though there may be some longer tailed third-party liability / injury elements which have greater impact.
- Poor performing, illiquid or mismatching investments pose a considerable risk. Where the market is competitive, underwriting margins will be tight and investment returns a more significant element.
- If investments are not sufficiently liquid, then there is a risk of exposure to random fluctuations in the level of claims.
- Risk of investment default
- Catastrophes represent a considerable area of uncertainty.
- Inappropriate or insufficient reinsurance levels of reinsurance Third party default
- Exposure to risk from political and legal changes/precedents.

[10]

ii) The company must make judicious strategic choices to deal with risk and uncertainty

- Creating a comprehensive risk management framework,

- Embracing advanced analytics for more accurate pricing,
- Fostering strong reinsurance partnerships, and
- Fostering a culture of agility and innovation are all paramount.

Ultimately, the company's ability to effectively manage and mitigate the multifaceted challenges will be pivotal in carving its path to sustainability and profitability in the dynamic and ever-evolving Indian general insurance landscape.

[2]

[12 Marks]

Solution 4:

- i) The changing external dynamics of General Insurance, propelled by technological progress and evolving customer habits, are significantly reshaping conventional actuarial methodologies and approaches to risk assessment. This impact requires a careful examination of how these influences intersect and offers opportunities for insurers to adjust their strategies.

Technological Advancements:

1. Data Accessibility and Utilization: The advent of digital platforms and IoT devices has unleashed a wealth of real-time data. Traditional actuarial models, rooted in historical data, now face the challenge of accommodating this influx. Embracing advanced machine learning algorithms may be necessary for accurate predictive modeling.
2. Telematics and Usage-Based Insurance: Telematics devices in vehicles and wearable health monitors have introduced usage-based insurance. Actuarial models must be redesigned to encompass personalized risk profiles and capture the dynamic nature of evolving risks.

Changing Customer Behaviours:

1. Demand for Personalization: Modern customers expect tailored insurance solutions. This requires actuaries to devise intricate pricing models that consider individual preferences and risk factors.
2. Sharing Economy and Peer-to-Peer Insurance: The sharing economy's emergence has presented new complexities in risk assessment. Actuaries must innovate pricing models to account for unconventional ownership and usage patterns.

[8]

ii) Adapting Actuarial Methodologies and Risk Assessment:

1. Advanced Analytics: Insurers must invest in advanced analytics tools to process and derive insights from the avalanche of data. This includes integrating machine learning, AI, and predictive modelling techniques for more accurate risk assessment.
2. Dynamic Pricing Models: Actuaries should transition from static pricing to dynamic models capable of real-time premium adjustments based on evolving risk exposures. This requires seamless data integration and intricate algorithms.
3. Customer-Centric Approaches: Insurance providers should prioritize customer needs by offering flexible coverage and personalized pricing. Collaborating with behavioural economists can aid in understanding customer preferences and refining pricing strategies.
4. Collaboration with Technological Experts: Adapting to the evolving landscape requires actuaries to collaborate closely with technology experts, data scientists, and software developers. This multidisciplinary approach ensures the development of innovative pricing models aligned with the digital era.

[4]

[12 Marks]
