

Institute of Actuaries of India

Subject SA3 – General Insurance

May 2009 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

1 (a)	<u>Personal lines motor insurance</u> Excess Cover – Third Party or Comprehensive Vehicle age Vehicle use Mileage Make and model of the vehicle Security features Not in use location – garaged Age of main driver Gender of the main driver Driver address Driver occupation Marital status Past experience like NCD	<u>Motor fleet insurance</u> Level of excess Type of cover Number of vehicles Type of use Goods carried Type of vehicle Mileage Quality of drivers Past claims experience Radius of operation Training and recruitment standards for drivers
-------	---	---

1 (b) The insurance company may be selected against by policyholders for:

- Age
- Driving experience
- Location
- Vehicle use

Propensity to claim increase as they need not worry about the next year premium
 Increase in moral hazard. But rating could be including this increase; this is a risk as any allowance in rating may still be inadequate.

Delay in receipt of premium; under personal lines the premiums are received on day 1. In India, risk starts after insurer receives premium- this is mandatory. The car manufacturer may still take few days before passing the premium to the manufacturer.

If volumes are small, it may not cover costs.

Car sales may be seasonal e.g. during Diwali or New Year; this may pose administration problems.

There may be difficulties obtaining appropriate reinsurance cover.

Solvency capital considerations as new business may increase at unanticipated levels of growth rates.

Difficulty in setting the fixed price as the inability to identify the mix of business.

The insurer does not have any historical data of heavy goods vehicles to set the price.

Due to the economic downturn, the car manufacturers have been suffering from reduced sales volumes and are increasingly at risk of bankruptcy. The risk of car manufacturer going bankrupt may imply that the insurance company may not get paid whilst the insurance cover has been provided.

There is the risk that the insurer itself may become insolvent.

Billing mechanism will need the facility for verification so both parties how many cars have been sold; establishing precise exposure levels may a problem.

Premium earnings may be variable as the insurance cover has been provided for 2 years and the car sales are subject to seasonality.

Need to consider the investment strategy in respect of investing receipts for longer than 1 year and there are associated risks with the level of expected returns & security of those investments.

Tendency to overstate small claims below Rs.5,000 in view of manufacturer settling claims and may cause reserving problems.

1 (c) Agree on a premium payment methodology; arrange for the motor manufacturer pays

up front to mitigate the risk of the motor manufacturer defaulting after the cover has been provided.

Agree on the retrospective rating methodology when the customer and vehicle information become available; similar to fleet business, collect deposit premium based on estimated car/heavy good vehicle sales and then an adjustment premium at the end of each quarter based on actual car/heavy goods vehicle sales.

Use a cautious rating method for lack of all rating factors (other than vehicle type) as well as lack of experience with the particular motor manufacturer and heavy goods vehicles insurance. This may not be cost effective for the motor manufacturer.

Agree on a profit share as this will encourage good underwriting; also the motor manufacturer is carrying the insurance risk on every property damage claims up to the limits specified.

Identify the customer profile of the motor manufacturer looking at the sales data which may aid setting the premium rates.

Agree up front on the right to change the premium rates so the mix of business can be analysed and changes implemented quickly. At the same time, consider the expenses of frequent analysis, implementing any changes and attractiveness of the rates to the motor manufacturer.

Negotiate appropriate reinsurance; perhaps use their expertise to set the premium rates.

Use the market knowledge and expertise of actuarial consultants to set the initial premium rates and monitoring measures.

Contractual agreement to get out quickly if the experience is not as expected as well as sharing costs if the taxes/levies increased subsequently. Say 90 days notice for termination

Agreement with manufacturer on claim settlement standards and procedures

1 (d) Motor insurance claims fall into two major categories – property damage and bodily injury.

The claims experience would differ because personal motor would be all types of makes and models whilst the motor manufacturers would be few makes & models. A particular batch of vehicles due to substandard parts may all lead to more claims.

The claim frequency and average cost of claims will be smaller from the motor manufacturer's portfolio as they bear claims up to a certain amount.

There may be differences in the target profile of customers as the insurance company may target customers different to the motor manufacturer.

Very little underwriting is involved in the case of motor manufacturer.

Motor manufacturer is more likely to have exposure to large fleets (a corporate entity); small property claims from fleet cars and heavy goods vehicles may take longer to settle as the insured may be unwilling to take the vehicles out of service to rectify minor cosmetic damages. This may increase the cost of those claims when they settle.

If a heavy good vehicle had an accident, the damages to goods and other vehicles/people, this could lead to much larger claims than if a car had a similar accident.

Again if a heavy good vehicle hit another vehicle, it could do more damage than a car; therefore bodily injury claims are more likely and are likely to have higher average cost.

1 (e) There are not many rating factors being used for the motor manufacturer's portfolio. Therefore, it is important to closely monitor the claims – to infer about the policyholder ages, size of cars, location of those cars, etc.

The motor manufacturer's portfolio requires monitoring of claims handled by all those service centres across the country, which may exceed the excess and agree on a periodic settlement of claims.

Apart from the regular monitoring of loss ratios, claim frequencies and severities, type of claims (property damage and bodily injury) the company need to monitor the mix of business – private cars, fleet and heavy good vehicles. As explained above, fleet and heavy goods vehicles have different claim characteristics.

Volumes of business whether this is as expected; will there be additional requirements for capital, reinsurance, resources, etc.? This needs to be done very regularly e.g. monthly.

- 1 (f) Any change in the reinsurance programme will depend on various things – current solvency position, level of free assets, quality of assets, management risk appetite and future strategy (more business growth on other classes).

Motor manufacturer pays for claims up to Rs. 5,000 on cars and Rs. 10,000 on heavy goods vehicles. Therefore, the company is liable for claims between Rs.5,000 or Rs.10,000 and Rs.20,000.

The company may also want to add a stability clause to protect itself from claims inflation.

[There is also overlap of reinsurance for losses between Rs.50,000 and Rs.70,000.](#)

Because this is a new arrangement, the company may want to buy quota share reinsurance to gain capacity as well as technical expertise.

Because the experience from this new portfolio is highly uncertain (fleet and heavy goods vehicles), stop loss reinsurance would be ideal. This may not be available or may be too expensive.

The current reinsurance programme covers losses only up to Rs.5 lakhs. The claims from heavy goods vehicles and fleet may be larger than Rs.5 lakhs. The company may want to increase the limit or buy another layer of reinsurance say Rs20 lakhs xs of Rs.5 lakhs depending on the volume of business expected to write from the motor manufacturer.

Similar to the above, a motor car pile or an accident involving a heavy good vehicle may lead to multiple claims. Therefore, the insurance company may want to purchase event excess of loss reinsurance. This may be available and cheaper compared to stop loss reinsurance.

- 1 (g)
- Maximise investment return subject to meeting liabilities with chosen level of certainty.
 - Match assets and liabilities by term, amount and nature.
 - Motor property damage claims will be short-tailed; so need liquid assets like cash deposits or short dated government securities to match liability outgo.
 - Motor bodily injury claims will be medium to long-tailed and costs will be influenced by inflation (medical, legal cost, loss of income, etc.); need to hold medium to longer dated real assets like index-linked securities or low risk equities.
 - Consider regulatory requirements like restrictions on assets that can and cannot be held, limits of assets that can be held, mismatching allowed.
 - Size of free reserves (in excess of solvency requirements)
 - Level of investment expenses, tax efficiency and availability of each asset type.
 - Availability of additional capital and ability to raise additional capital when needed.
 - Diversification of assets.
 - Benchmarking against competition.
 - Expected growth plans.

- Shareholders and management's attitude to risk.

[50]

- 2 (a) The insurance needs must cover all risks that may potentially cause financial loss to the organisers of cricket events. In particular, the main insurance needs will be:
- Employers' Liability – for any claims made by the staff, contract workers, etc. for the event.
- Public Liability – any claims made by the public for any accidental bodily injury or property damage; would cover claimant's costs, expenses and legal costs.
- Property damage – all risks covering any loss or damage to insured property at the event venues, including transit to and from the event venues.
- Cost of hiring any replacements items for the cricket events.
- Accidental loss or damage to money whilst in transit or in storage at any authorised residence.
- Cancellation of events: covering cancellation or postponement of the event due to any reasons beyond the control of the organiser e.g. weather conditions. This should cover the cost of tickets sold, loss of advertisement revenue, the fee to the players, salaries to the staff, etc.
- Non-appearance cover: covering the cancellation or postponement of the event due to non-appearance of key players due to reasons beyond the control of the organisers.
- Travel insurance for all players and staff between different places.
- Theft by employees and fidelity guarantee.
- Terrorism cover: covering the cancellation or postponement of the events due to or damage/injury caused by, riot or terrorist activities.
- 2 (b) Sum insured for all property damage covers including money.
- Limits of indemnity for all liability covers.
- Dates and duration of cricket events – to estimate the total period of risk as well as any weather risks.
- Location of cricket events – to assess the security situation and assess the probability of cancellations.
- Number of players participating in the events.
- Capacity of each cricket venue for public – helps to determine the loss in the event of cancellation or postponement.
- Will there be police supervision or other protection – as this will minimise the number of accidents for participants
- Number of staff including contract workers – as this will affect the potential injury to employees
- Details of all the equipments required for the cricket events – balls, bats, etc. – to determine the potential costs involved in the event of damage and additional hir costs.
- Expected costs, budget expenses and net profit from the cricket events – in order to determine the potential cost of cancellation and potential impact in respect of loss of cash.
- Details of celebrities/officials attending the events (for non-appearance cover).
- Level of excess for each section of cover.
- Modes of transport and the number of trips throughout the duration of the event.
- Other activities during the days of events – cheer groups of dancers, etc. – increases the risk of public liability claims.
- 2 (c) Quota Share

This is a new type of business that the insurance company is considering. Therefore, the company can benefit from sharing the experience as well as technical expertise with a reinsurer.

Aggregate XL

Quota share will not protect the company against the accumulation of claims from a single source, so aggregate XL may be required.

Risk XL

The cricket events will be watched by thousands of cricket fans. There could be large public liability (injury to the fans) and an insured event may cause multiple claims. Recommend risk excess of loss for individual claims as well as aggregate event excess of loss reinsurance for multiple claims from a single event.

Similar to the above, a single insured event may cause injuries to many employees/contract workers at the same time. Again recommend risk and aggregate event excess of loss reinsurance protection.

Terrorism Cover

The company may want to protect itself from any damages due to terrorist activities which may cause large damages to the property and people.

CAT XL

Weather events may cause wide spread damages as well as leading to the cancellation of cricket events. The company may want to arrange for some CAT cover.

Co-insurance

Alternatively, the company may want to co-insure the risks with other insurers. This way, the insurance company will be liable only for its share of the total losses.

The company may still require some amount of risk and aggregate event reinsurance.

Ask the organisers to self-insure some of the claims cost.

Introduce high excesses or exclude certain perils (e.g. terrorism) to reduce the exposure.

The other option (not so preferable) would be to refuse cover. The options and the decision will depend on the capacity and the amount of free assets available to the company.

[25]

3a Assume that:

The accident year 2003 has fully developed.

The past inflation included in the claim amounts is a good indicator of future inflation.

The reporting and settlement patterns of storm and flood losses are not different from the other claims in the household business.

The policy terms & conditions, case reserving policy and claims settlement procedures have not changed in the past and are likely to remain the same in the future.

Loss\Devmt Year	0	1	2	3	4	5
2003	125	135	138	139	141	138
2004	116	122	126	126	121	
2005	117	132	125	125		
2006	107	122	124			
2007	146	159				
2008	109					

Link Ratio	1.097	1.004	1.003	0.989	0.979	1.000
CDF	1.068	0.974	0.970	0.968	0.979	1.000

LossYear	CDF	Reported Losses	Ultimate Losses	Loss Ratio
----------	-----	-----------------	-----------------	------------

2003	1.000	138	138.00	50.9%
2004	0.979	121	118.43	44.5%
2005	0.968	125	120.96	48.7%
2006	0.970	124	120.30	51.2%
2007	0.974	159	154.85	68.4%
2008	1.068	109	116.40	53.8%

Alternatively, assume that storm and flood losses during 2007 is a one-off event and remove those losses from the triangle for projections purposes.

Loss\Devmt Year	0	1	2	3	4	5
2003	125	135	138	139	141	138
2004	116	122	126	126	121	
2005	117	132	125	125		
2006	107	122	124			
2007	105	118				
2008	109					
Link Ratio	1.1035	1.0039	1.0026	0.9887	0.9787	1.0000
CDF	1.0747	0.9739	0.9701	0.9676	0.9787	1.0000
		Reported				
LossYear	CDF	Losses	Ultimate Losses			
2003	1.000	138	138.00			
2004	0.979	121	118.43			
2005	0.968	125	120.96			
2006	0.970	124	120.30			
2007	0.974	118	114.92+41.0=155.92			
2008	1.075	109	117.15			

3b 40% of the policies incept on 1 January and the remaining 60% of the policies are written uniformly throughout the year.

Assuming the company wrote Rs.271 lakhs written premium in 2002 also.

Calculating the earned premium as follows:

2003: $0.4 \times 271 + 0.5 \times 0.6 \times (271 + 271) = 271.00$ 2004: $0.4 \times 264 + 0.5 \times 0.6 \times (271 + 264) = 266.10$

2005: $0.4 \times 242 + 0.5 \times 0.6 \times (264 + 242) = 248.60$

2006: $0.4 \times 232 + 0.5 \times 0.6 \times (242 + 232) = 235.00$

2007: $0.4 \times 224 + 0.5 \times 0.6 \times (232 + 224) = 226.40$

2008: $0.4 \times 213 + 0.5 \times 0.6 \times (224 + 213) = 216.30$

During the year 2007, the company suffered flood losses amounting to Rs.41 lakhs.

Excluding flood losses, 2007 loss ratio = $(154.85 - 41.00)/226.40 = 50.3\%$

Alternatively, Rs.41 lakhs storm and flood losses may be distributed over 6 years. In which case, the loss ratio will increase by approximately 2%.

Assume that the company is able to maintain the premium rates at the technical level and has not reduced the premium rates in the last 3 years.

Alternatively, we may assume that the premium rates may go down from the technical level and it may add a few % points to the loss ratio.

The average two-year loss ratio before 2008 and excluding 2007 flood losses = 50.7%.

2008 loss ratio = 53.8%.

If we assume that the increase in 2008 loss ratio is entirely due to increased theft and accidental damage claims in the last 6 months, the increase in loss ratio = 53.8% -

50.7% = 3.1%.

The underwriting and claims staff has raised concerns about the increase in theft & accidental damage claims.

If we assume that the increase in claims from theft and accidental damage at the same level for the full year, 2009 expected loss ratio = 50.7% + 2 × 3.1% = 56.9%

- 3c Expenses can be categorised into two major categories – fixed and variable. Variable expenses vary with the volume of policies being written; it may be linked to the number of policies or claims or the amount of premiums or claims; e.g. issue of policy document. Fixed expenses are those expenses that do not necessarily vary with the policy volume e.g. cost of installing and maintaining data system. In the long term, all the expenses can be categorised as ‘variable’ expenses. Alternatively, they may be called as direct and indirect expenses. Direct expenses can be identified directly as belonging to a particular class of business. Indirect expenses are those that do not have a direct relationship to any one class of business. All variable expenses are direct whilst fixed expenses can be direct or indirect. Split according to functionality e.g. investment, acquisition, renewal, etc. or allocate expenses based on time-spent. It is important to use the results of the expense analysis as it helps:
- To incorporate suitable expense allowances into future premium rates; otherwise the final premium charged may be inadequate or excessive, which may lead to cross-subsidisation of expenses across various products and lines of business.
 - If the premiums are cheaper, the company may be selected against and ultimately the company may not be able to recoup all its expenses.
 - Inadequate premium rates may have implications on the capital requirements and solvency position.
 - To identify the profitability of different lines of business and help with the future strategy & business planning.
 - To identify the profitability of business from different sources – direct, internet, intermediated, etc.; again to help with the business planning.
 - To monitor and control overall outgoings from the business.

3d Probability of 0 claims = $e^{-0.08} = 0.923$

Probability of 1 claim = $1 - 0.923 = 0.077$

Consider 1,000 policies

Year	NCD Category					Total
	0	1	2	3	4	
1	1,000					
2	77	923				
3	77	71	852			
4	77	71	66	786		
5	77	71	66	60	726	
Year	NCD Category (contribution to expenses)					Total
1	1,000.0	0.0	0.0	0.0	0.0	1,000.0
2	77.0	876.9	0.0	0.0	0.0	953.9
3	77.0	67.5	766.8	0.0	0.0	911.3

4	77.0	67.5	59.4	668.1	0.0	872.0
5	77.0	67.5	59.4	51.0	580.8	835.7
<hr/>						
Total						4,572.7

Revised contribution to expenses = $5,000 / 4,572.7 \times X = 1.09X$.

[25]