The Institute of Actuaries of India

Subject ST3 – General Insurance

17th May 2007

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.

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Q.1) Possible risk factors for private motor car insurance:

- Profile of driver with regard to accident proneness
- Average number of hours of use of car and mileage driven
- Place at which car is kept while not in use
- Average and maximum speed at which car is normally driven
- Area of use of car and time of day at which car is driven
- Number of passengers carried in the car
- Mechanical/ technical features of car (size, weight, etc.)
- Period of risk cover

[4]

Q.2)

- Most IBNR claims in product liability relate to those which arise after the failure of a particular product, e.g. side effect of a drug
- Until such failure is recognised on a definite basis (which could be a long process) the existence of IBNR claims is not known (not clear)
- Till such recognition the method of providing IBNR could be on an approximate basis such as a small percentage of premiums.
- Although at some stage this approximate basis may prove inadequate, any correction may have to be gradual/ ad hoc till adequate market data is available.

[4]

Q.3)

a)

- Proposal forms should be designed using simple and easily understandable language to collect correct information
- Proposal forms should enable policy data to be entered directly into the system
- Design edit checks to validate data input entries
- System to be designed to generate unique proposal and policy number with a check digit
- Random checks on sample cases of data to identify errors of different kinds
- Checks intended to identify errors by extreme values
- Checks on blank cells
- Process to monitor data movements and volumes and reconciliation with financial and statutory statements

b) Data drawn from other companies may not be comparable because of:

- Differences in policy conditions and terms
- Differences in underwriting and claim settlement practices
- Differences in markets in which they operate
- Differences in data definitions and nature of data

Other sources for distortion may be:

- Heterogeneity within data
- Data is out of date by the time it is available
- Poor quality of data of some companies
- Degree of detail required for rating may be less than what is desirable

[8]

Q.4)

(i) Claims incurred = claims paid - outstanding claims brought forward + outstanding claims carried forward.

So, claims paid = 44100 + 71300 -90800 = 24600

Assuming discounting is applied to both outstanding claims b/f and c/f for mean term of 2 years at 8% p.a.,

Discounted o/s claims b/f = 71300 ÷ $(1.08)^2$ = 61128

Discounted o/s claims c/f = 90800 ÷ $(1.08)^2$ = 77846

Claims incurred on discounting = 24600 – 61128 + 77846 = 41318

Underwriting profit = Earned premiums – incurred claims – commission – expenses = 53550 – 41318 - 53550×.15 – 8317.5 = - 4118

The underwriting loss reduces from 6900 to 4118,

Because increase in outstanding claim reserve for the year is reduced by discounting

Profit is brought forward by anticipating future investment income

With undiscounted reserves investment income emerges in future years to increase profit or reduce losses.

(ii) Investment income arises from the reserves. When reserves are discounted, the reserves are lower and so investment income reduces. However, the total investment return is the same.

Change in investment income allocated in future depends to some extent on how the income of 6350 in the example arises.

The revenue account may be allocated income at the same rate as the discounting rate and any difference credited to the P&L account.

(iii)
- Discounting of reserves only changes the pace at which profits emerge.
- It does not affect the actual amounts paid as claims and so underlying level of profitability is not changed.
- If discount rate is equal to investment return earned, the profits would be recognised in the year the premiums are earned.
- In the first year when discounting is introduced profits will be higher but thereafter will be lower for each subsequent year.

<u>Illustration:</u>

Annual premiums of Rs 10 mn received on 1 Jan and expenses of Rs 2 mn spent immediately. Claims of Rs.7 mn paid on 31 Dec of following year. 8% p.a. earned on investments.

Undiscounted reserves on 31 Dec of the year Rs 7 mn

Discounted reserves at 8% p.a. (same as earned rate) Rs 7/1.08= Rs. 6.48 mn

Trading profit with discounted reserves is as follows:

	Year 1	Year 2
Earned premium	10.0	0.0
- expenses	2.0	0.0
-claims paid	0.0	7.0
-o/s claims c/f	6.48	0.0
+o/s claims b/f	0.0	6.48
Underwriting result	1.52	(0.52)
+ Investment income	0.64	0.52
Trading result	2.16	0.0

Trading profit with undiscounted reserves is as follows:

	Year 1	Year 2
Earned premium	10.0	0.0
- expenses	2.0	0.0
-claims paid	0.0	7.0
-o/s claims c/f	7.0	0.0
+o/s claims b/f	0.0	7.0
Underwriting result	1.0	0.0
+ Investment income	0.64	0.56
Trading result	1.64	0.56

Although profit profile is different between the two approaches the result is same, i.e. 2.16 = 1.64 + 0.56/1.08

[15]

Q.5)

(i) Risks:
- Injury/ disability and or sickness to self and/ or other persons accompanying
  - Tour cancellation/ delay/ curtailment
  - Burglary of home while away on tour
  - Loss of international driving licence
  - Loss of or delayed delivery of checked-in baggage
  - Cause damage to third parties leading to personal legal liability
- Theft/ robbery of personal belongings or cash while on tour
- Loss of personal belongings while on tour particularly passport
- Hijack

- Employment contingency (substantive change in job to disadvantage)
- Death while on tour
- Interruption to study or death of sponsor supporting overseas study

(ii) Benefits can be designed for each of the above risks and expressed in home currency or a foreign currency depending on place of occurrence of risk. In stead of actual foreign currency benefits can be expressed in terms of single currency such as US Dollars or Euro. Benefits such as PA will be fixed while for medical expenses benefits will be reimbursements subject to specified upper limits.

Examples of benefit types:

- personal accident- residence to international airport and back- permanent and total disability or temporary and partial disability
- hospital daily cash
- medical/ dental expenses reimbursement
- baggage loss or delay compensation
- compensation for loss of passport or international driving licence
- home burglary
- financial emergency benefits
- repatriation of mortal remains on death to home country
- hijack allowance

Options may be related to:

- choice of level of benefit or sum insured
- adventure sports (bungee jumping, paragliding, etc.)
- cashless claim settlement by access to global network of hospitals and special clinics
- initial trip duration of say 90 days and additional duration extension
- special family plans- savings on family tours with choice to cover named members of family- normally parents and or up to 2 children
- annual multi trip for frequent travel, say 3 to 4 trips, each of defined duration
- options for maximum trip duration of say 30 days to 90 days
- cover for cruise travel and one way travel
- initial cover to help immigration travel
- option to choose mix of covers

(iii)

- Medical check up for higher ages (say above 60) to reduce costs on disability, medical expenses, etc.
- Advance notice for additional cover to extend trip duration to avoid anti-selection by policyholder
- Geographical area definition/ restriction to avoid high risk locations and keep claim costs within expected level
- Deductibles to discourage small claims and administration costs relating to medical/ dental expenses and short delays (of say 12 hours) of baggage delays and ensure proper care to avoid loss of passport or driving licence
- Exclusions of pre-existing medical conditions, HIV, radiation, war, etc.

(iv)

- Premium rates may be expressed as rate for a selected period or as a per day rate if company has data from past experience.
- Rate for each benefit (described in (ii) above separately by level of cover and number of family members and their ages (who is covered)
- Rates by geographical scope
- Additional premium for adventure sports depending on professional status- say skilled, semi skilled, amateur

The rate table may be expected to have different types of benefits covering one or more perils as a number of rows and a number of columns relating to level of cover, number of family members covered and applicable deductibles.

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Q. 6)

- Claims related investigations:
  - Frequency and average cost trends
  - by accident year, development year and payment year

  - to highlight any potential development
  - cost per unit exposure analysis
  - large loss ratio
- Probably only have statutory accounts and returns available
- Need to investigate reserving trend in conjunction with the claims related trends
  - e.g. UPR, (additional) URR, IBNR
  - Compare with previous years. Note for any noticeable trends
- Further, Investigate the trend in
  - Claims handling costs and associated reserves
  - Solvency level and free reserves
  - Statutory solvency requirements / levels of coverage
  - Market share
  - portfolio movements
  - New Business levels / Premium Volumes
  - Premium rates charged (if can be obtained) / Industry premium levels
  - Assets mix and associated changes
- Funding of the takeover
- Alternative use of funds
- Restrictions on Purchase - any anti-competitive laws
- Other accounting ratio investigations
  - Loss/Claims ratio, expense/combined ratio/ commission rates/ investment returns / Profit margin / return on capital employed / share price / PE ratio
  - Reinsurance purchased, recoveries made, reinsurance security
  - goodwill
  - taxation and regulations
  - policy conditions
- Check for trend in the wording of audit statement
- Investigate any possible recent or possible future legislation changes that may impact the business
- investigate similar trend in other potential companies
- investigate the credit standing of the company
- investigate the combined model office
- investigate the synergies that combined operation will have
- investigate the impact upon the data owing to different product structure
- investigate any saving in claims handling expenses.
- Investigate the benefit of any diversification by location, industries and material handled etc.

[10]

Q.7)

(i) Given that the treaties are on loss occurrence basis, we will use the data of claim event. Let's assume that the total incurred can be taken as sum of paid and estimated amounts. We can now calculate the claim recoveries from each of the two excess of loss (XOL) treaties remembering to net down the gross claim amount for the quota share treaty first.

Claims number	Year of claim event	Gross claims incurred	Claims Incurred (net of QS)	Cost of 1st XSL treaty	Cost of 2^{nd} XSL Treaty
1	2003	480	336	36	0
2	2003	660	462	162	0
3	2003	270	189	0	0
4	2004	300	210	0	0
5	2003	1,200	840	300	240
6	2004	420	294	0	0
7	2005	2,400	1,680	300	600
8	2005	480	336	36	0
9	2005	360	252	0	0
10	2005	720	504	204	0

		300,000 XS 300, 000 Treaty		600,000 XS 600, 000 Treaty	
Year	Premiums net of QS (INR m)	Claims (INR 000)	Burning cost (%)	Claims (INR 000)	Burning cost (%)
2003	11.20	498	4.45	240	2.14
2004	14.00	-	-	0	-
2005	15.40	540	3.51	600	3.90
TOTAL	**40.6**	**1,038**	**2.56**	**840**	**2.07**

Estimated burning cost for 2006 is :

For 300, 000 XS 300,000 : Gross Premium for 2006 x (1- QS retention) x 2.56 %
= 25 x 70% x 2.56 % = 0.447 INR million

For 600, 000 XS 600,000 : Gross Premium for 2006 x (1- QS retention) x 2.56 %
= 25 x 70% x 2.07 % = 0.362 INR million

(ii) Why burning cost is unlikely to be the premium actually charged:

- Data development is unlikely to be complete, need to allow for the IBNR
- Need to consider how estimates have been calculated and whether they tended to be under or overestimated in past.
- The volume of the data is unlikely to be credible enough to rely upon it solely. Reinsurer is likely to consider claim data for similar risk with other insurers.
- Need to consider if there are any changes that may invalidate use of the past claims data, e.g:
  - Changes to perils covered, excess levels
  - changing mix of business
  - consider claims data from earlier years to see if 2002 to 2004 was unusual in any way.
- Allowance may be made for expected trends in the claim experience
- There is no stability clause or index mentioned. Hence would expect premium to rise as the real value of treaty is eroded by claim inflation.
- Burning cost premium ignores the loading for Expenses, commission (or brokerage) and profit.
- Actual Premium will also depend upon the competition among the reinsurers. Burning Cost premium depends upon an estimate of earned premium. An end of year adjustment is likely to reflect the actual figure once it becomes known.

(iii) Estimation of the liability outgo:

- Need to project the liabilities for the next at least 5 years to explore an appropriate retention level.
- To make this decision the projection need to be realistic. Hence all assumptions have to be on a best estimate basis.
- Use historic claim data to build a model of the gross original claims expected in the market in the future. To do this we need to adjust the historic data for :
  - IBNR Claims and over/under reserving of reporting outstanding claim
  - Claims inflation
  - any changes to claim definition or cover provided
  - effect of any previous reinsurance
  - excess or deductibles
- The policy limit at the date of loss should be inflated for each claim into current value terms using appropriate index.
- Motor claim tend to be seasonal so projection should be done on a monthly basis.. …(Initially at least)
- Claims distribution can then be fitted to each major claims type separately to minimize problem with changing mix of business and heterogeneity generally, e.g.
  - fire, theft, accidental damage and bodily injury
  - comprehensive and non comprehensive
- The adjusted data should be analyzed by claim frequency and amounts separately.

This will enable us to spot any trend in the data. This should be investigated and projected appropriately in future. Claims amount and frequencies then should be combined to produce an aggregate loss distribution.

- Realistically, company will continue to write business so need to allow for new business. This is sensitive assumption, so we should explore the effect of different level of business on the results obtained.
- similarly other liabilities such as expenses need to be modeled.
- reinsurance recoveries and premiums payable need to established and modeled to vary the choice of retention level.
- The effect of the number of free reinstatements and reinstatement premium also need to be modeled.

[25]

Q.8)

a) assets that could be used to match the liabilities

- Consider property and bodily injury separately

Property is short tailed so, ………….

…………………..same currency, short tailed government securities, other fixed interest and cash.

- Bodily Injury is long tailed, real, …………….

………… for which equities may offer the best match.

- however, need to match short term claims in the same way as property unless there enough cash flow to pay out the premiums.

b) Factors that will influence whether the company decide to match liabilities and assets.

- Size of the company
- absolute size of the free reserves
- size of free reserves carried forward ultimate liabilities in a year
- size of free reserves carried forward absolute liabilities at a point in time
- existence of any required statutory minimum
- reinsurance arrangement
- reinsurance arrangement
- liquidity of free reserves
- attitude to the risk of the company
- statutory regulations e.g. admissibility of assets
- availability
- expected return on assets
- value for money
- desire to diversify/security considerations
- extent of positive cash flow

[6]

Q.9)

a) Moral hazard refers to the risk that an insured may attempt to take unfair advantage of the insurer e.g. by suppressing information relevant to assessment of risk or by submitting a false claim.

b)
- The homeowner under-declares the rebuilding cost of home at proposal.
- This may simply be through failing to provide accurate information at purchase.
- Or may be due to failing to advise the insurer where modification has taken place.
- E.g. Extensions, loft conversions, etc.
- With regard to content insurance, the home owner may deliberately under declare the value of their contents at proposal.
- Or may fail to revise the figure through time where affected by inflation.
- The insured may fail to notify the changes to personal circumstances relevant for assessing the risk.
- E.g. the home may now be empty during the day.
- The home owner may now work at home
- Or may have provided misleading information regarding the security measures at the property.

- The homeowner may submit a false claim.
- Or Inflate a valid claim, perhaps including items that were never there or were not damaged.
- The homeowner may have failed to disclose risk related information on the proposal form
- E.g. Past Claims, etc.
- Fraud, arson and deliberate damage
- Household security e.g. leaving window open when gone out.

[7]

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