

Institute of Actuaries of India

Subject ST3 – General Insurance

May 2008 Examination

INDICATIVE SOLUTION

Marking Schedule

1 (i)

Suretyship:

Insurance to provide a guarantee of performance or for the financial commitments of the insured.

Moral hazard:

The risk that an insured may attempt to take an unfair advantage of the insurer, for example by suppressing information relevant to the assessment of risk or by submitting a false claim.

Subrogation:

The substitution of one party for another as creditor, with a transfer of rights and responsibilities. It applies within insurance when an insurer accepts a claim by an insured, thus assuming the responsibility for any liabilities or recoveries relating to the claim. For example, the insurer will be responsible for defending legal disputes and will be entitled to the proceeds from the sale of damaged or recovered property.

Risk based capital:

The assessment of the capital requirement for a general insurer by considering the risk profile of the insurance business written and of any other operations .
In the USA, the required minimum margins of solvency are determined after considering RBC requirements and some other markets are considering the RBC Model.

(ii)

- Ensure policy wordings are clear and unambiguous
- good underwriting
- provision of suitable cover, including....
 - limits and excesses
- data sharing with other companies
- claim information analysis .. may highlight pattern
- regular contact with insured to build confidence and underwriting
- expert claims handling
- obtain relevant information regarding financial status and obligation of insured

[Total 8]

2 (i)

- Claims will generally be short tailed as typical trade credits are 3-6 months.
- Claims will be in a number of currencies
- Individual claims will generally be small and limited to the value of the export consignment.
- There will be nil claims as late payments are made to the exporter resulting in the outstanding claim amount being reduced to zero
- There will be claim recoveries because some original invoices will be paid after the insurer has paid the exporters claim

- There is likely to be accumulations of claims if a large number of exporters supply the same customer.
- Accumulations are also likely if a large number of foreign companies experience financial difficulty due to economic conditions within those countries.
- There is potential for fraudulent claims if the exporter and the customer are colluding.

(ii)

- Unique policy identifier
- Name & Address of policyholder
- Premium for the policy.
- Policy excess or deductible
- Value to consignment
- Currency of payment.
- Name & Address of customer
- Country of customer
- Business type of customer (retail, manufacturing, services etc)
- Terms of trade for paying the invoice e.g. 30 days
- Date policy issued
- Date of dispatch
- Date when invoice is payable.

(iii)

- Split by Country
- Split by Currency.
- Group claims by the month in which the invoice is payable.

(iv)

The Premium would all be earned on the date the invoice is payable as that is when all the exposure is.

Therefore UPR should simply be all the premiums on policies where the invoice date falls after the accounting date netted down for commission and other initial expenses.

(v)

Aggregate XL reinsurance to protect against accumulations from failure of a single customer / multiple failures in foreign countries.
Stop loss reinsurance (if available) to protect poor experience across the book of business.

Risk excess of loss to protect against individual large claims
Quota Share reinsurance to lay off some of this risk and enable it to write a diverse portfolio.
Financial reinsurance to smooth results over economic cycles.

[Total 17]

3

- Actual investments held at start of projection
- Amount of liabilities at start of projection split by currency
- The expected payment profile and variability associated with payments
- Nature of liabilities and how strongly correlated to price and wage inflation
- An asset / economic model that produces projections of expected wage and price inflation and their variability, expected investment returns by type and currency of investment and variability of investment return by type of investment
- The amount of business to be written in the future, split by currency and nature
- Tax rate
- Reinsurance programme details
- Any restrictions on investment policy, either statutory or management specific
- Definitions of solvency and return to be used in assessing the benefits of any one investment strategy
- The amounts of any dividends paid
- A directive or target

[Total 5]

4 (i) To maximise the long-term return for shareholders

(ii) Company A:

200 Crore free reserves so more investment freedom

Depends on level of caution required

Could invest 400 Crore in secure assets to match liabilities by term

e.g. cash/short bonds/index-linked gilts

Could invest the rest in higher risk investments

e.g. equities/property

to maximise returns

volatility of this not so critical

Company B

Low free reserves of 10 Crore so little investment freedom

Need value of assets to exceed value of liabilities

so avoid volatile assets

Suggest mainly short-dated assets (to match liabilities by term)

secure assets

e.g. cash/short bonds

Possibly small proportion in equities/property/longer bonds

(iii) What basis has been used for calculating assets and liabilities (cautious?)

If too cautious, could constrain investment policy too much

What premium income is expected in the future?

If high then could use income stream to help pay out liabilities, meaning greater investment freedom

How much variability is there in the liabilities?

If high then less investment freedom

What is the required statutory minimum solvency margin?

This must be invested in safe assets and may be restricted via admissibility rules

Are the liabilities mainly short or long-term?

This would affect the term of the chosen assets

[Total 13]

5 (i) Risk premium

The total expected risk premium is Rs.120 m, with average claim amount Rs.150,000.

Hence the expected number of claims is Rs. 120m ÷ Rs.150,000, i.e. 800 claims.

The average claim amount will be:

$$\int_0^{\infty} x \frac{1}{2} \beta^3 x^2 e^{-\beta x} dx = \frac{3}{\beta} \int_0^{\infty} \frac{\beta^4 x^3}{3!} e^{-\beta x} dx$$

The integral is equal to 1, from the formula given in the question.

Since the average amount is equal to Rs.150,000 then

$$\frac{3}{\beta} = 150,000$$

$$\beta = \frac{1}{50,000}$$

With a retention of M, the average reinsurance recovery per claim will be:

$$\int_M^{\infty} (x - M) \frac{1}{2} \beta^3 x^2 e^{-\beta x} dx$$

Which can be written as,

$$\frac{3}{\beta} \int_M^{\infty} \frac{1}{6} \beta^4 x^3 e^{-\beta x} dx - M \int_M^{\infty} \frac{1}{2} \beta^3 x^2 e^{-\beta x} dx$$

From the formula given, this is

$$\frac{3}{\beta} e^{-\beta M} \left(1 + \beta M + \frac{\beta^2 M^2}{2!} + \frac{\beta^3 M^3}{3!} \right) - M e^{-\beta M} \left(1 + \beta M + \frac{\beta^2 M^2}{2!} \right)$$

Since M = 400,000 and $\beta = 1/50,000$ this evaluates to

$$e^{-8} (150,000 \times 126.33 - 400,000 \times 41) = 855.26$$

So the total risk premium for the reinsurance should be $800 \times 855.26 = 684,208$.

Assumptions :

- The claim distribution, volume and type of business written are unaffected by reinsurance.
- Inflation can be ignored.

(ii) **Loadings**

The office premium will make allowance for:

- fixed expenses
- any commission
- other variable expenses
- profit
- fluctuation margin
- other contingency margins (e.g. unanticipated inflation, adverse trends)
- investment income

Rating Structure

- The premium may be experience rated.
- A minimum premium may apply.

Market Considerations

- The premium quoted will be strongly influenced by the current market rates.
- The reinsurer may wish to charge a premium that does not reflect the true cost e.g. if this line of business is a loss leader or it is part of a “package” of cover offered.

Inadequacies of Theoretical Premium Calculation

The model/assumptions may be invalid, e.g.

- the gamma family of distributions may not provide a good model
- the power of β (i.e. the second parameter) may not give a good fit
- the same formula might not apply equally well “at both ends”

The reinsurer may have made a different assumption about the mean claim amount.

Miscellaneous

- The reinsurer may have assumed a different volume of business.
- There may be an end of year premium adjustment to reflect the actual amount of business written.
- Other interacting reinsurance contracts may reduce the potential recoveries.
- There may be exclusions in the reinsurance cover which are covered by the original policy.

[Total 16]

6

Improve profitability by:

Increasing premiums

Suitability: may not be practicable if there are competitors who do not face this problem

The margins will improve over a longer period. Immediate effect may not be seen

Reducing expense levels

Suitability: depends on the current expense levels, and scope for reduction

Impact, if any, will be gradual

Improvements in underwriting and claim settlements

Suitability: this can be achieved on a long term basis

More investigations would mean higher expenses

Stop doing business or weed out poor risks in loss making classes

Suitability: the impact will be over a period only

Diversification into other profitable classes

Suitability: the impact will be over a period only

Adequate expertise has to be acquired -- may be costly

Ensure that there are no inadmissible assets

Suitability: if the company has investment abroad, these can be sold and the proceeds invested in domestic investments

Result would be immediate

Sell volatile assets and minimise impact of fluctuation in market prices

Suitability: quite suitable if minimum requirement is not met.

However if the market is depressed, it will result in losses.

Also consideration should be given to asset liability matching having regards to both nature and term of the liability

Increase capital

Suitability: shareholders should be convinced about the benefits from investing more

Seek merger partner

Suitability: tough negotiations may have to be made

Value of liabilities

Dilute valuation basis of liabilities

Suitability: if the company has been consistently using a stringent valuation method, there is scope for this

Result is achieved immediately

Regulators may object

Reduce MSM level

Reduce gross written Premium

Suitability: impact will be seen after one year.

May result in loss of profitable business

Buy (more) proportional reinsurance

Suitability: share of profit will go to reinsurer. May be high cost of reinsurance

[Total 15]

7 (i)

Claims ratio = incurred claims / earned premium

Expense ratio = expenses(including commission) / written premium

(ii) Claims ratio =	182 / 225	378 / 525
	81%	72%

Expense ratio =	120 / 450	160 / 600
	26.7%	26.7%

(iii) Free reserves = Assets - technical reserves - current liabilities

(iv) Free Reserves at 1 April	100	76
Profit	-9	37
Unrealised losses	-15	-10
Free Reserve at 31 March	76	103

Assumptions:

No dividends paid.

No interest on free reserves.

(Or calculations changed if different assumptions)

(v) Earned premium	225	525
Claims paid	120	300
Discounted o/s claims b/f	0	51.2
Discounted o/s claims c/f	51.2	115.7
Incurred Claims	171.2	364.5
Expenses & Commission	120	160
Increase in DAC	35	10
Underwriting profit/(loss)	-31.2	10.5
Investment income(allocated to technical reserves)	33	40
Insurance profit/(loss)	1.8	50.5

(Discounted o/s claims = o/s claims ÷ 1.1²)

(vi) Actual amount of claims paid is not affected by the introduction of discounting
 But it alters the rate of emergence of profits
 Profits will be higher in the first year and lower in subsequent years
 If the discounting rate is equal to return on investment profits will emerge in the year of business

[Total 15]

8 (i)

Cumulative paid claims

Accident Year	Development year					outstanding claims end 2006-07
	0	1	2	3	4	
2002-03	500	760	833	848	853	0
2003-04	525	777	858	874	883	9
2004-05	521	767	839	856	864	25
2005-06	560	860	946	965	975	115
2006-07	600	900	990	1010	1020	420
Dev Ratio	1.502	1.098	1.018	1.006		
Selected	1.500	1.100	1.020	1.010		
Total outstanding claims						569

1 for cumulative claims, 1 for dev ratios, 1 for projected claims, 1 for o/s claims.

Note: different development ratios could be selected e.g. actual sum/sum

- (ii) The assumption that claims paid in a development year can be estimated as a fixed proportion of the claims in the previous development year is unlikely to be accurate as the claims paid in each year can be subject to very large variability. In this particular case the development is relatively stable so there is not much difference in the results
.... apart from the last development year if allowance for further development is made in selection of ratio for the chain ladder method
- (iii) Possible sources of error while using statistical method for estimating outstanding claim reserves:

Basic assumption invalid: that there was a stable pattern of claims paid and settled in the past and that the stable pattern will continue in the future

Insufficient data

Data unable to be split into homogeneous groupings

Large claims distortions

Changes in policy conditions

Changes in product mix

Unrealistic inflation assumption -- past and future

Changes in reporting delay pattern

Changes in the average cost of claims

Inappropriate assumptions as to run-off patterns

Errors, omissions or distortions in past data

If used for inappropriate data, e.g. APH

[Total 11]
