

Institute of Actuaries of India

Subject SA3 – General Insurance

May 2008 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.

Q1 Part (i)Assumptions:

- No reinsurance
- Uniform written business
- Uniform risk

	Company X	Company Y	Company Z
<u>Assets:</u>			
Total investments	700	1,700	3,800
Current assets	35	50	100
Deferred acquisition costs (Acquisition Costs % * GWP * 0.5)	147	50	240
Total Assets	882	1,800	4,140
<u>Liabilities:</u>	0		
Outstanding claims reserves	210	400	2,800
APUR	140	0	0
UPR (50% of GWP based on uniform written basis)	210	500	400
Current liabilities	84	60	120
Free reserves (Balancing Item)	238	840	820
Total Liabilities	882	1,800	4,140

{1 each mark for calculating DAC and UPR}.

Q1 Part (ii)Assumptions:

- No change in GWP from 2006, hence GEP = GWP for 2007
- No APUR brought forward for any of X, Y and Z.

(a)	Actual SM = Free Reserves / Net Written Premium
	X = 238 / 420 = 56.7%, Y = 840 / 1000 = 84% and Z = 820 / 800 = 102.5%
(b)	Claims Ratio = Incurred Claims / Earned Premium Incurred Claims = Gross Claims Paid + Gross Outstanding Claims c/fwd – Gross Outstanding Claims b/fwd
	X = 420 / 420 = 100%, Y = 500 / 1000 = 50% and Z = 480 / 800 = 60%
(c)	Return on Capital Employed = Profit / Free Reserves
	Profit = Earned Premium – Incurred Claims – Increase in APUR – Expenses + Investment Income
	X = - 784 / 238 = -329.4%, Y = 425 / 840 = 50.6% and Z = -160 / 480 = -19.5%

Q1 Part (iii)

X has much lower SM than Y and Z. This would, other things being equal, imply that Y and Z are more strongly financed than X. However, X may value its assets and liabilities more conservatively than Y and Z which reduces the value of the Free Reserves and hence the SM. The difference in the solvency levels is too large for this point to give comfort to X and hence X may want to enhance its capital requirements; under the IRDA regulations companies are expected to operate at not less than 150% of statutorily defined solvency margin (RSM).

Also X may have suffered some poor claims experience recently which is implied by the higher claims ratio of 100% compared to 50% and 60% for Y and Z, thus reducing its Free Reserves.

As none of the 3 companies have bought any reinsurance cover a large claim will clearly affect the results to a greater degree for the smallest company, i.e. X.

The outstanding claims reserve for X at the end of the year is 3 times higher than at the start which leads to the high claim ratio. A smaller level would have given a claim ratio of 67% which would then not have been that much greater than Z.

This increase in the outstanding may be the result of a large claim not yet settled or of a stronger reserving basis.

The above mentioned factors have also lead to the Return on Capital Employed for X being negative. The same is true for Z also but both companies have very high acquisition costs, which is probably a strategy for expansion.

A further factor leading to the poor return is the setting up of an APUR at the end of 2007.

This would indicate that either the premiums charged by X have been inadequate may be through poor underwriting standards or latent claim effect, or, a catastrophe has occurred shortly after the end of 2007 affecting X only and thus an APUR has been set up.

Q1 Part (iv)**Expense Ratios:**

Management expenses / written premium

Commission (if applicable) / written premium

These give an overall indication of the cost of writing the business. Widely varying levels of one or both of these will indicate how the business is written and/or the classes of business written.

Combined Ratio / Operating Ratio:

Claim ratio + expense ratio

This gives an indication of the overall insurance performance of the company.

Reinsurance Ratios:

Net written premiums / gross written premiums

Net claims incurred / gross claims incurred

These give an indication of the dependence on reinsurance cover and the effect of reinsurance on the statutory solvency margin.

Investment Return:

Investment income / net asset value

This gives an indication of the investment performance of the company.

Asset Liability Ratio:

Total assets / total liabilities

This is probably a better indication of the solvency margin than that in part (ii) as this takes into account the effect of different lengths of run-off.

Premium Ratio:

Earned premium / written premium

Indicates patterns of writing of business in the year assuming that it is mainly annual type business i.e. showing a general growth/fall in volume.

Claim Pattern Ratios:

Paid claims / outstanding claims reserve

Indicates settlement pattern and thus possibly classes of business written.

Profit Margin:

Underwriting profit / written premium

Insurance profit / written premium

Total profit / written premium

The second ratio includes investment income on the technical liabilities in the numerator.

This therefore gives an overall indication of the performance including investment return which may be considered to be better than the UW definition as due allowance is made for length of tail of business written.

The third ratio includes investment income on free reserves. As this depends upon the level of free reserves it is of less use than the other two ratios for comparing insurance performance.

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Q2

Cover Available:

The insurer will indemnify the bank if a borrower defaults on their mortgage and the sale proceeds (to the bank) are insufficient to cover the amount of the mortgage plus outstanding interest.

The basis for cover will be worked out between the lender and the insurer. Cover will vary, but basically the insurer will indemnify the lender for those losses suffered as a result of the mortgage advance being greater than the normal advance of 75% of the valuation amount.

The insurer may limit the amount of loss on each policy. For example, there may be a limit of 100% or 150% of the Indemnity Amount.

There may also be limits on the total losses that the insurer will pay out on any individual underwriting year, e.g. a limit of 4x the premium for the year.

Although the premium is collected at the beginning of the mortgage, the policy cover will extend for the duration of the mortgage. Some borrowers may not move home for 25 years. This means that, theoretically, the insurer is at risk for a long time.

Exclusions & other policy conditions

Examples of common underwriting conditions are:

- Reducing the level of the normal advance to 70% (from 75%).
- Making the mortgage provider meet x% of the claim (e.g. 10% or 20%).
- Restricting the loans which can be covered (e.g. exclude loans for over 95% of the valuable amount).
- Requiring the mortgage provider to introduce stricter lending criteria.

Risk and rating factors

The key risk factors for the insurer are:

- the extent to which the mortgage exceeds the normal advance (so it makes sense that this should be the exposure measure)
- the ability of the borrower to keep paying the mortgage (e.g. consider the mortgage payments as a proportion of income, likelihood of unemployment)
- the attitude of the borrower
- the possibility of the house price falling
- the term of the mortgage
- the type of mortgage (the amount outstanding will fall over the term with a repayment mortgage)

In practice, insurers do not incorporate the circumstances of the individual borrower into the rating structure. They rely upon the lender to be prudent in granting mortgages.

The term of the mortgage might be used for rating. Otherwise, standard rates will apply for all policies issued through particular mortgage lenders.

Characteristics of claims

Reporting delays

This depends on the system of communication between the lender and the insurer. If the insurer is informed as soon as the mortgage account falls into arrear, the insurer will be aware of the potential problem at an early stage. However, there may still be a long delay between when the lender repossesses and when the property is finally sold.

Settlement delays

Claims are settled quite quickly once the details are known.

Claim frequency

Highly variable depending upon the level of economic prosperity.

Claim frequency will be highest when there are high interest rates, increasing unemployment and falling house prices.

Claim severity

Claim severity also increases with higher interest rates and lower house prices.

Compared with other classes of insurance involving individuals, claim amounts can be large, e.g. claims for Rs.10 lakhs are quite feasible from large mortgages.

Accumulations of risk

Mortgage guarantee insurers face potentially enormous accumulations of risk from the economic factors described above.

As well as this global exposure to economic factors, an insurer could have a concentration of risk in several other ways:

- selling through a particular lender which has much higher than normal level of defaulting borrowers
- selling through a local bank; the insurer is exposed to local unemployment, e.g. if a major factory closes.

Reinsurance requirements

The main risk is that a large accumulation of risk when there is an economic downturn and increase in unemployment.

Quota Share reinsurance will limit the exposure.

Better option will be an aggregate XL cover over a period of time – say 3 years; may be difficult to obtain.

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Q3 Part (i)

- The per-risk limit of the treaty is Rs.5 lacs, but the range of insured values is up to Rs.25 crores. This means that individual losses between Rs. 5 lacs and Rs. 25 crores will not be reinsured.
- The per-occurrence limit is Rs.20 crores, which could be reached by accumulation of small or large losses that result from bad weather events (storms and flood).

Q3 Part (ii)

- The insurer can buy excess of loss reinsurance for the layer between Rs.5 lacs and Rs.25 crores.

- The insurer can buy catastrophe reinsurance to indemnify them against losses from a weather event. The catastrophe reinsurance would be cheaper if the quota-share agreement inures to its benefits.

Q3 Part (iii)

Surplus Share reinsurance: still provides a ceding commission and the insured sets a retained line where it would wholly retain policies with limits below the line.

Variable Quota Share: this functions like surplus share. The insurer would seek reinsurance that enables to retain low-limit policies. It is likely that this would still provide a ceding commission.

Q3 Part (iv)

	(1)	(2)	(3)	(4) = (1) * (2) * (3)	(5)	(6)	(7) = (4) * (6)
Policy Year	Layer Losses	LDF	Trend	Trended Ult. Losses	Subject Premium	On-level factor	Adjusted Premium
2003	25,000	1.100	1.300	35,750	1,00,000	1.200	1,20,000
2004	35,000	1.200	1.150	48,300	1,20,000	1.100	1,32,000
2005	30,000	1.300	1.070	41,730	1,30,000	1.050	1,36,500
2006	15,000	1.500	1.000	22,500	1,40,000	1.000	1,40,000
				1,48,280			5,28,500

Experience Rate = $1,48,280 / 5,28,500 = 0.281$

Q3 Part (v)

Premium should still be charged for this layer since there is significant exposure. Experience rating this layer will result in 'free cover'.

Experience rating should be used to price the part of the layer that has had losses, then the relativity between the exposure rate and experience rate should be used to adjust the exposure rate in the highest part of the layer.

Q3 Part (vi)

The insurer will want to look at the solvency margin of the reinsurer. This should be at least twice the minimum requirement depending upon the strength of the valuation basis, classes

reinsured, etc. IRDA regulations expect reinsurers to have a minimum of BBB rating from standard rating agencies of international repute.

Further, the reinsurer's ability to meet claims could be assessed by looking at its current standing with credit rating agencies. Any other market comment or sentiment will be worth considering too.

The reinsurer's assets and liabilities should be analysed. Consider whether the level of assets is likely to be adequate to meet the cash flow requirements of the liabilities. Are the assets suitable in terms of liquidity, nature, term and currency when compared with liabilities?

Are the liabilities of the reinsurer adequately reserved? Consider whether the reinsurer is exposed to accumulations of risk, catastrophe or latent claims. Check to see whether the reinsurer's own reinsurance is adequate and secure enough given the points raised in the previous sentence.

Consider the quality of the company, its management, staff and owners. This may well have to be a subjective assessment based upon hearsay, personal visit to reinsurer's office/ personal discussions and market sentiment. Nevertheless, any adverse comments may reinforce other doubts or alert the insurer to particular issues that should be explored further. The insurer will be concerned that the reinsurer is still around when a recovery has to be made. For long-tailed business the point may be many years in the future.

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- 4 (i) Payroll
Number of employees
Type of industry or occupation
Exposure
Claims experience
Location of workforce
Materials handled
Processes involved

- 4 (ii) **Base period**
choose a reasonable base period
minimum of 5 complete policy years
to allow for long tail bodily injury claims development
especially latent industrial disease type claims
and to identify trends in claims experience

latest policy year will be incomplete as quoting prior to renewal
may gross up for unexpired period

but must allow for IBNR and significant development of reported claims and exposure will also need adjustment
may be better to ignore or give low weight to this policy year.

Data required

Data may need to be adjusted
to allow for past mergers, acquisitions or changes in nature of work undertaken
standard rating factors as in (i) to give book rates if less than full credibility given to actual experience.

For each policy year in base period

Exposure amounts i.e. payroll (or number of employees or man-hours worked)

Claims experience including:

- number of claims
- number of nil claims
- number of open claims
- cumulative claim payments
- outstanding claims (using insurer's estimates)
- details of individual large losses / accumulations from one event
- above items analysed by claim type i.e. accident or industrial disease

Projected exposure amount for next policy year

Difficult to verify outstanding claims estimates if new policyholder in recent past.
Data separately for manual and clerical staff or other relevant risk groups.

IBNR

IBNR affects prior policy years

Especially if industrial disease e.g. deafness

And development of reported claims

Use incurred claim development patterns from analysis of EL portfolio

Which allow fully for inflation to expected settlement dates

For policy/accident years interpolating to point at which data compiled

Assuming reporting delays and development patterns for this risk are typical

Treat accident and industrial disease separately.

Large claims:

Adjust data to truncate these at appropriate cut-off point

Apply grossing-up factor appropriate to risk group

These determined from analysis of whole EL portfolio

Treat accident and industrial disease separately

Inflation:

An appropriate index e.g. national average earnings for relevant industry
Or index reflecting court award inflation

Applied to exposures (if payroll used) and claims costs

To bring all monetary values to level at mid point for policy year being rated.

Trends:

Look separately at claim frequency and average cost/claim for trends
May exclude nil claims otherwise the average cost may be distorted

Individual policy years may have very heavy/light experience

May be sudden relatively large changes

Use judgment to project to rating year

Credibility:

Formula $P = ZA + (1-Z)*E$, $0 < Z < 1$

E = premium based on insurers guide rates and standard rating factors

A = premium based on past experience of this risk

i.e. projected frequency by projected exposure by projected average cost

Alternatively A would be calculated using a burning cost approach.

Z = credibility factor reflecting size of risk relative to self-rating point at which full credibility given

Commercial pressures often mean more credibility given to smaller risks than justified by theory.

Loadings:

Risk premium needs to be loaded for

Commission

Expenses

Contingencies

Profit

Less credit for investment generated from premium receipt to mean claim settlement date.

Competition in market will affect actual premium quoted.

Premium to be adjusted at expiry of policy when actual exposure available.

4 (iii) **Prospective experience-rating**

- Premium at renewal depends on experience prior to renewal.
- Insurer takes on all the underwriting risk.

Retrospective experience-rating

- Premium for current period is adjusted based on experience for that period.
- Deposit and adjustment premium/refund.
- In practice, adjustment premium is simply added to the next renewal premium.

4 (iv) **Allowing for the deductible**Fit a distribution for the amount of the claim with the deductible

The first step is to find a distribution function for the total amount of claims for all the employees within the scheme, without the deductible applying.

This can be found either by taking the data from part (ii) and fitting a distribution, or by stochastic simulation.

This distribution can now be amended to allow for the deductible, i.e. fit a distribution for the claim amount after the deductible has been applied.

Fit a distribution for the claim frequency

As for claim amount, a distribution must be fitted for claim frequency. After allowing for the deductible, the claim frequency will fall.

Calculating the premium and other considerations

The premium should use the revised claim amount and revised frequency.

Since the premium will fall, the office must consider revising its expense allowance. The possibility of expenses rising due to the complexity of administration of having the deductible should also be considered.

The insurer is now exposed to large claims, so its profit and contingency loadings should be revised.

The insurer should question whether this is appropriate for this class according to the laws and legislations applicable.

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Q5 Part (i)

Fixed at 10%

- + simple and consistent from year to year
- would not be allowed by the regulators
- probably very high
- does not reflect actual assets held and returns expected from them.

Q5 Part (ii)

Base rate set by RBI at year end

- + reflects current short-term interest rates
- + almost appropriate for very short-term liabilities e.g. travel and household
- not appropriate if the interest rates are high
- inappropriate for long-term liabilities e.g. commercial liability
- inconsistent from year to year
- does not reflect actual assets held but a reasonable proxy.

Q5 Part (iii)

Long term government securities

- + reflects current rates
- + almost appropriate for long term liabilities
- does not necessarily reflect the actual assets held
- some inconsistency from year to year
- inappropriate for short-term liabilities

Q5 Part (iv)

Previous financial year's return

- + reflects assets held over last year
- possibly imprudent
- historical, so not necessarily appropriate for the future
- inconsistent from year to year

Q5 Part (v)

Expected return over next year

- + reflects assets currently held
- + IRDA regulations allow discounting for long term covers as decided by Appointed Actuary
- + appropriate for short-term liabilities
- subjective and could well be wrong
- possibly imprudent for longer-terms
- inconsistent from year to year

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