

EXAMINATION

September 2006

Subject ST3 — General Insurance Specialist Technical

EXAMINERS' REPORT

Introduction

The attached subject report has been written by the Principal Examiner with the aim of helping candidates. The questions and comments are based around Core Reading as the interpretation of the syllabus to which the examiners are working. They have however given credit for any alternative approach or interpretation which they consider to be reasonable.

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Chairman of the Board of Examiners

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Comments

Individual comments are shown after each question.

1 *Restriction on the types or amounts of assets that can be taken into account when assessing solvency.*

Prevent the company from holding certain assets.
Prescription to hold certain assets.
Custodianship of assets
Requirement to hold mis-matching reserves.
Prescribing asset valuation basis for assessing solvency.
Risk-based capital requirements varying by asset class
Tax incentives/disincentives
Requirement to hold assets in domestic currency.

Comments on question 1: A bookwork question generally reasonably well answered.

2 (a) *Risk attaching basis: A basis under which reinsurance is provided for claims arising from policies commencing during the period to which the reinsurance relates.*

The insurer knows there is coverage for the whole policy period when written. Alternatives are “losses occurring” or “claims made”.

(b) *First loss: A form of insurance cover in which the sum insured is less than the full value of the insured property, so that the policyholder has to bear any loss in excess of the sum insured. It is appropriate in circumstances where the policyholder considers that a loss in excess of the sum insured is extremely unlikely or the item is effectively priceless. Commonly used in fire business/commercial property.*

This approach is used to establish a more relevant figure for the sum insured on which to base the policy coverage.

(c) *Discovery period: A time limit, usually defined in the policy wording (e.g. in the sunset clause) or through legislative precedent, placed on the period within which claims must be reported.*

This term is used in policy wording to provide certainty regarding the length of time the (re)insurer is exposed to the risk of receiving claims — i.e. it limits the (re)insurers exposure. It generally applies to classes of business where several years may elapse between the occurrence of the event or the awareness of the condition that may give rise to a claim and the reporting of the claim to the insurer. e.g. employer's liability or professional indemnity.

Comments on question 2: Many candidates failed to define some or all of these terms. This was somewhat surprising as the answers for this question come directly from the glossary of terms in the core reading. Candidates should learn the meaning of the key terms in general insurance before attempting to sit the exam.

3 (i) *Average:* This relates to the practice of scaling down the amount of a claim by applying the ratio of the actual sum insured to the amount deemed to have been the appropriate sum insured.

(ii) Usually used in household buildings/contents insurance.

For household buildings/contents insurance, the sum insured can only be obtained accurately by expert valuation which is expensive. By allowing the insured to select his own sum insured means that the cost of property valuation is not required which saves the insured money: to the insured's benefit.

To the insurer's benefit, in the event of a claim, if the house is over-insured the insurer will not pay more than the actual claim, if under-insured the insurer pays the appropriate percentage.

Ensures that the policyholder only gets the cover they have paid for.

Discourages under-insurance.

(iii) The insurer may:

- pay out in full
- pay out in full, but deduct an amount for the additional premium that would have been due if correctly insured
- pay out in full, but deduct an amount for the additional premiums that would have been due over several past years if correctly insured
- negotiate an alternative settlement
- decline to pay out at all/void policy
- improve underwriting involvement to ensure correct SI/introduce escalation clause
- use different exposure/rating factors to eliminate the potential for this to occur
- provide better upfront education of policyholders with regard to (under)insurance issues

Comments on question 3: Most candidates understood the meaning of the term average, and could think of one or two alternative approaches available to a general insurance company. The better candidates were able to generate a range of alternative approaches. In part (ii) few candidates attempted to answer the specific question on why average might be used.

4 *For a risk to be insurable:*

The policyholder must have an interest in the risk being insured.
This distinguishes between a wager and insurance.

The risk must be of a financial and reasonably quantifiable nature.
Financial as claims settlement will be financial.
This means the insurer can determine how much to pay out in the event of a claim and how much risk they are accepting.

Individual risk events should be independent of each other.
This is so that there is a spread of risk.

The incidence and/or magnitude of the insured event must be uncertain.

There should be a relatively low probability of the event occurring. Events that are certain to happen cannot be insured as payout is certain, need to be able to spread risk.

There should be a large number of potentially similar risks which can be pooled in order to reduce the variance and hence achieve more certainty.

There should be an ultimate limit on the liability undertaken by the insurer.
This is so the insurer knows what they are liable to pay out in claims.

Moral hazards should be eliminated as far as possible.
These are difficult to quantify, result in selection against the insurer and lead to unfairness in treatment between one policyholder and another.

There should be sufficient existing data/information to enable insurer to estimate extent of risk and likelihood of occurrence.
This is so that the insurer can come up with a price.

Comments on question 4: Bookwork: well answered by most candidates.

5 (i) Experience rating systems are systems by which the premium for an individual risk takes into account the claims experience of that individual risk.

Some systems relate to numbers of claims, e.g. NCD schemes,
Some systems relate to amounts as usually used for fleet rating purposes

Some systems are retrospective.
Some systems are prospective.

Benefits:

Small claims may be discouraged (benefits Insurer).
Gives the policyholder an incentive to be cautious and take precautions to avoid claims (benefits Insurer and Insured).

Rewards good claims experience and penalises bad claims experience (benefits Insurer and Insured).

Insurer must experience rate if this is standard market practice to avoid being selected against.

Premium charged should be more representative of the risk of the policyholder having a claim (more so by amount rather than by number) (benefits Insurer and Insured).

May encourage customer loyalty.

Insured could be bad risk and be lucky (benefits Insured).

Reduces administration for experience rating by amount (benefits Insurer and Insured).

Can increase insurance companies' control of underwriting for large risks (benefits Insurer).

Drawbacks:

Operates against the insurance principle of spreading costs (drawback Insured).

Can make policyholders feel aggrieved if after many years claim free driving they have a claim and are penalised for it, e.g. in NCD systems (drawback Insurer and Insured).

Can make policyholders feel aggrieved if they lose discount through a claim that was not their fault.

Penalty for having a claim may be a large increase in premium, e.g. loss of NCD (drawback Insured).

Increased administrative costs for rating by individual claims (drawback Insurer).

Limited ability to distinguish between high and low risks if on average one claim is made by a policyholder once every five years (drawback Insurer).

Does not achieve objective of rewarding better risks as the reward is given for not making a claim and not for being accident free (drawback Insured for NCD systems).

- (ii) *The statistics the insurance company would ideally require to analyse initially should be sub-divided by:*

regional area and by intercity services separately
data over the past ten years would be ideal
with data further sub divided by type of bus

Particular consideration for the following is required in respect of each exposure period:

The number of miles travelled.
Number of passengers per year.
Number of vehicle years.

Similar information (expected mileage, vehicles, number of passengers etc) is required for the future policy period.

Claims Data

Historical claims information is required.
A one to one link is required between statistics on exposure and statistics on numbers of claims.
Strict definition of year of claim required, by date of accident or notification.

The following statistics are required:

Data are required at individual claim level
Type
Paid
Outstanding

Historical claim development data required:

Dates of reporting / settlement
Changes in case estimates over time

Additional information required is:

The method of claim recording.
The method of claim handling
Age of bus fleet.
Speed of renewal of bus fleet.
Experience of drivers increasing or decreasing.
Information on drivers (previous driving experience, endorsements, convictions).
Turnover of staff.

One person operated buses or driver plus conductor.
Changes in bus routes over the past year/planned changes for the future
Additional safety features in buses, if any, incorporated over the past years.
Terms of insurance required, limits, excesses, etc

Additional information used to assess:

Any adverse/beneficial trends that are likely to develop in the future that will tend to increase/decrease the number of claims and/or the cost of claims

Reasons for any change in the experience over the past few years that can be detected in the statistics.

Comments on question 5: Weaker candidates produced generic lists of statistics that could be used in pricing a motor risk. These lists generally failed to consider the particular features of the risk in question, for example, that the bus company has been self insuring for some time. As a result, some candidates listed statistics that were irrelevant to the particular risk, or missed out useful statistics. In addition to tailoring their answers to the risk described in the question, the best candidates clearly structured their answers. For example, strong answers separately described claims and exposure statistics, and the need for correspondence between the two.

- 6** (i) How much data
... needs to balance what's essential to avoid discouraging potential policyholders and cover likely future data requirements.
- IT issues – how much storage capacity will be required
System structure should be flexible enough to permit future changes
Need to design secure, logical and efficient IT systems
... to provide reassurance to potential policyholders and encouraging new business.
- Aim to have advanced internal cross-checks
... to ensure majority of potential inaccurate info is corrected at source.
- Aim to ensure info is entered in a consistent manner
... to ensure the info captured can be analysed meaningfully.
- Need to design exception reports to investigate potential oddities.
- How will the data be captured and/or verified.
e.g. Proof of possession, Claims History, access to car registration database, proof of entitlement to NCD.
- What information will other users require
e.g. reinsurers, regulators, auditors.
and the uses to which the data will be put
e.g. reserving, rating, marketing, etc.
- Need to ensure backup arrangements exist ...
... and disaster plans.
- Aim to ensure designed for ease of data retrieval after input
... to ensure ease of reporting and analysis.
- Data security issues.
Data Protection Act issues.
Payment security issues.

- (ii) May charge incorrect premium rates
 - ... which may result in larger than planned volumes
 - ... at loss making rates / worse than expected
 - ... or smaller than planned volumes
 - ... leading to insufficient coverage of fixed / start-up costs
- Or have incorrect rating structure
 - ... resulting in adverse selection.
- May result in early solvency pressure
 - ... at a time when capital is most scarce.
- May result in loss of regulator confidence
 - ... leading to subsequent business restrictions / closure.
- May result in loss of market confidence
 - ... with longer-term business retention implications.
- Inappropriate reinsurance purchased.
 - May result in loss of reinsurer confidence.

Comments on question 6: *Candidates that scored poorly on part (i) often failed to read the question carefully enough, and as a result produced lists of rating factors for motor insurance. Also candidates often did not generate the breadth of points, getting bogged down in the detail of just one area. In part (ii), most candidates correctly identified that use of inaccurate data could lead to incorrect premium rates. Better candidates went on to identify the consequences of mis-pricing with regard to capital, regulation, reinsurance and market confidence.*

- 7**
- (i) To avoid distortions in any statistical analysis it is important to ensure that all information is converted to a consistent basis for consideration.
 - Changes in cover
 - ... these will affect the relative exposure levels between different cohorts and hence the likely claims trends.
 - Inflation ... differences in both past and future levels
 - ... may affect the analyses if not stable through time.
 - External changes affecting exposure.
 - e.g. legislative or building regulation changes
 - ... may affect both the likelihood and severity of claims.
 - Change in geographic spread or premium rates
 - ... may affect the mix of business.
 - Large one-off claims
 - ... where these may distort the analysis.

Significant / Catastrophe event.
e.g. Weather related / Subsidence
... where these may distort the analysis.

There are also many issues that may affect the claims runoff and distort any trend.

e.g. reporting delays due to internal or external issues
or mass sickness or postal strikes.

Handling / settlement delays.
Internal system changes.
Seasonality / Regional bias.
Changes in claim settlement procedures.
Split data into homogenous groups, by class or claim type.
Data cleaning/removal of errors.
Reinsurance if net paid data is being projected.
Consistent treatment of claims handling expenses.
Tail factor.

- (ii) Different basis of reserving, e.g. loss adjusters may have under/over reserved, actuary may have included margins.

Loss adjusters may each have different views on costing and inflation issues
... both of these can be investigated by means of an audit / review process
... with particular focus on the largest case estimates.

Loss adjusters have more information upon which to base their estimates.

... Comparison of the largest differences can be investigated at cell level to see if there are any particular isolated large discrepancies.

Statistical estimates may include loss adjustment expenses
...example of investigation for loss adjustment expenses

Statistical estimates may include IBNR/unexpired risk provision
... example of investigation for IBNR/unexpired risk provisions

Statistical estimates may include reinsurance recoveries
Statistical estimates may have been discounted

There may be errors in either or both statistical and case estimates
... which can be investigated by rigorous review of both sets of estimates.

IBNR may be negative due to computer generation of too many case estimates for small claims, which later become redundant on the system.

Case estimates may be out-of-date
... which may be highlighted through investigating the dates on which the case estimates were established.

There may be currency errors
... which may be highlighted through exception reporting.

Statistical adjustments are approximated across groups of claims rather than assessed at individual claim level.

To investigate any inaccuracies arising from this, statistical estimates can be calculated on several different bases using several different methods
... to ensure internal consistency / identify any flaws
... ensure the estimates are robust and not affect significantly by “rogue” cells
... to help understand any oddities in the results.

Statistical estimates may be more accurate if, for example, they were based on incurred claims rather than paid claims, or premiums were used.

Investigate the accuracy of data used in the statistical analyses.

There may have been changes in loss adjustment procedures.

Investigate whether loss adjusters look at all claims or whether case outstandings on small claims are set using a formulaic approach. Check reliability of formula based approach.

Comments on question 7: Part (i) was reasonably well answered with many candidates identifying a range of issues that could require adjustment. Many candidates found part (ii) more difficult than part (i) even though this is a question that has been asked a number of times in the past. Stronger candidates appreciated that both statistical methods and case estimates are based on judgemental assumptions, and considered the possibility of different views being taken on these assumptions. Some candidates did not describe the investigations at all and therefore scored poorly. Generating a breadth of reasons for the difference was again a problem for many candidates.

8 (i) Collect claims data over an appropriate historical time period.

The time period chosen should be long enough to have credible data and it should be recent.

Subdivide the data into homogenous groupings (e.g. by peril or exposure period) taking care to ensure credibility within the cells.

Adjust data to allow for:

Claims inflation over the historical period to now.

Changes in exposure over the period.

Changes in policy conditions, limits and deductibles.

Changes in legal / regulatory conditions.

Projection to ultimate.

It may be advisable to allow for large/catastrophe losses separately

Fit a range of probability distributions to the data within each grouping.

Find separate loss distributions for frequency and severity of loss within the homogenous groupings.

Use of binomial, Poisson, negative binomial for frequency, whole numbers or normal or translated gamma for severity.

Select appropriate parameters for the fitted distributions.

Combine the loss distributions for separate perils by closed form or simulation methods to obtain an overall aggregate claim distribution.

The company might also have fitted a distribution (e.g. Lognormal, Pareto, Weibull) to the aggregate claims directly.

Test goodness of fit.

$$(ii) \quad \mu_{A+B} = \mu_A + \mu_B = 30 + 20 = \text{£}50\text{m}$$

$$\sigma_{A+B}^2 = \sigma_A^2 + \sigma_B^2 = 10^2 + 30^2 = 100 + 900 = 1000$$

$$\text{Standard Deviation of } A + B = \sqrt{1000} = \text{£}31.62\text{m}$$

$$(iii) \quad \text{Mean of a lognormal distribution} = e^{\mu + 0.5\sigma^2}$$

$$\text{And variance} = e^{2\mu + \sigma^2} (e^{\sigma^2} - 1)$$

$$\text{Std Deviation} = e^{\mu + \frac{1}{2}\sigma^2} \sqrt{e^{\sigma^2} - 1}$$

$$\text{Std Deviation} = \text{Mean} \cdot \sqrt{e^{\sigma^2} - 1}$$

$$\text{Std Deviation} / \text{Mean} = \sqrt{e^{\sigma^2} - 1} = \text{Coefficient of variation} = CV$$

$$\Rightarrow \sigma = \sqrt{\log_e (CV^2 + 1)}$$

$$\text{and } \mu = \log_e(\text{Mean}) - 0.5\sigma^2$$

where μ and σ are the mean and standard deviation of the underlying normal distribution.

Class	A	B	Total
Mean = m	30.00	20.00	50.00
Stdev = s	10.00	30.00	31.62
CV = s/m	0.33	1.50	0.63
$\sigma = \sqrt{\log_e(CV^2 + 1)}$	0.32	1.09	0.58
$\mu = \log_e(\text{Mean}) - 0.5\sigma^2$	3.35	2.41	3.74

If working in £, mean of A is 17.16, mean of B is 16.22 and mean of total is 17.55.

- (iv) 99.5th percentile for a standard normal distribution is at 2.58.

So the 99.5th percentile is given by $\mu + 2.58\sigma$

Class	A	B	Total
$\sigma = \sqrt{\log_e(CV^2 + 1)}$	0.32	1.09	0.58
$\mu = \text{LN}(\text{Mean}) - 0.5\sigma^2$	3.35	2.41	3.74
99.5 th percentile	4.19	5.21	5.24
99.5 th Percentile claim	65.76	182.62	188.74

Alternative answers were allowed based on alternative number of decimal places used for the 99.5th percentile of a standard normal distribution

- (v) Claims experience between the two classes is likely to be correlated due to:

Both classes are likely to be affected by underlying economic conditions. For example, at time of low economic growth there tend to be more fraudulent claims, and theft claims.

Events such as windstorms, earthquakes, flooding tend to cause losses in both classes of business.

Both classes would be subject to bigger losses in inflationary environments.

Legal changes may affect claims severity and frequency in both classes e.g. changes in court procedures, statute of limitations, and other legislation could affect both classes.

Similar claim handling procedures.

Higher crime rates would lead to more theft claims from both classes.

- (vi) If we assume independence between the two classes of business, then loss given that losses are at 99.5th percentile = $100 - 25 - 188.74 = -113.74$.

If we assume that the two classes are 100% correlated, then the loss given losses at 99.5th percentile = $100 - 25 - 65.76 - 182.62 = -173.38$.

Negative correlation is not likely.

Adjust for premium received (100)

Adjust for expenses (25)

Therefore capital required is between £113.74m and £173.38m.

Comments on question 8: Part (i) was generally well answered with better answers discussing the aggregate distribution, poorer answers trotting out the standard bookwork. Part (ii) was simple but not universally well answered. Parts (iii) and (iv) were not difficult but many struggled or did not attempt. Part (v) was often poorly answered even though completely independent of the calculations. A few candidates actually suggested that the results of the calculations in previous parts of the question, which were based on assuming independence, indicated that the classes were not independent without spotting the flaw in this logic. Part (vi) was only answered reasonably by a small minority. Many candidates who correctly identified the method required for the question went on to lose marks due to calculation errors suggesting that they had not left sufficient time to check their answers.

END OF EXAMINERS' REPORT