

# INSTITUTE AND FACULTY OF ACTUARIES

## EXAMINER'S REPORT

April 2012 examinations

### Subject SA3 – General Insurance Specialist Applications

#### **Purpose of Examiners' Reports**

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and who are using past papers as a revision aid, and also those who have previously failed the subject. The Examiners are charged by Council with examining the published syllabus. Although Examiners have access to the Core Reading, which is designed to interpret the syllabus, the Examiners are not required to examine the content of Core Reading. Notwithstanding that, the questions set, and the following comments, will generally be based on Core Reading.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report. Other valid approaches are always given appropriate credit; where there is a commonly used alternative approach, this is also noted in the report. For essay-style questions, and particularly the open-ended questions in the later subjects, this report contains all the points for which the Examiners awarded marks. This is much more than a model solution – it would be impossible to write down all the points in the report in the time allowed for the question.

T J Birse  
Chairman of the Board of Examiners

April 2012

### **General comments on Subject SA3**

Consistent with previous examiners reports, we would offer candidates two key pieces of advice – read the question properly and take the time to actually think about what is going on.

On the first issue, candidates should always work on the assumption that the question wording has been carefully chosen. It is therefore essential to read the question properly.

If something is not asked for then candidates will waste valuable time writing answers that will gain no marks. These broader answers may be a logical next step to the question and so may be appropriate for candidates to discuss in a professional context. This is an exam however with a finite number of marks available and so the scope must necessarily be limited and specifically defined.

If a question does specifically mention something, candidates should also assume that there are definitely marks available for this aspect of the question. During the exam setting process, any content that is superfluous will have been removed.

Wording of question sections should also be considered in the context of the position within the overall question. Where new question information is provided between sections, candidates should recognise that this information is specifically relevant to the following section or sections.

On the second issue, candidates should note that SA3 is the key paper at which we test candidates broader thinking. This is generally the final paper before qualifying as a professional, and we consider a capacity for broader thinking to be one of the best indicators of a candidate’s suitability to act in a professional capacity once qualified.

As such we aim to design exam papers so that it is difficult to pass without displaying some capacity for independent and broad thinking, as well as to heavily reward instances where these skills are displayed. When reviewing past papers, candidates should assume that the marks available for generic points are substantially less than those awarded for the more challenging points that would be the mark of high quality professional insight in a practising actuary.

Even among passing candidates, this capacity for broader thinking is not always in evidence. We strongly recommend that candidates step back and take the time to thoroughly think about what is actually going on in question situations proposed rather than simply considering numbers to be analysed with standard techniques. For example, candidates might stop to think about what claims actually are for a particular class of business, considering factors such as what actually causes the claim, who brings the claim, how it is dealt with once brought, what makes one claim small while another is substantial etc.

This more grounded, real world perspective will help candidates to consider such things as practical issues, stakeholders involved and their potentially diverging objectives, wider impacts, regulatory or ethical issues, inappropriateness of certain actuarial techniques for the specific situation, current economic or cyclical effects etc. This is likely to lead to significantly broader point generation (and indeed reflects the thought processes of the examiners in drafting the questions and solutions) and a more rounded understanding of the

underlying risks and dynamics which should also be of value to candidates when dealing with different stakeholders in their professional life.

More generally, we would also advise candidates to employ basic exam techniques such as well structured answers and effective time management.

### **Comments on the April 2012 paper**

At an overall level, performance on the paper was reasonable, reflected in an above average pass rate (although in line with recent sessions).

Looking at individual sections however, the performance was significantly more mixed. A disproportionate level of the overall marks gained came from 1(i) for most candidates, with this being a more vanilla SA3 question compared to the remainder of the paper. This is clearly disappointing, as it raises concerns that candidates are still not developing critical thinking capacity to handle previously unseen challenges and are instead relying on regurgitating answers to questions they are familiar with.

- 1 (i) Domestic property:
- Most domestic property contents claims are small as mostly property damage claims
  - More domestic buildings claims are large as they tend to be caused by extensive events, e.g. total rebuild for subsidence or total destruction due to fire
  - But generally the proportion of large individual claims is smaller than for motor (or some other comparison with another line) from a household policy
  - There may be a possibility to have large public liability claims
  - Catastrophes are a significant feature for domestic property insurance, being a key driver of profitability for a particular accident year
  - These are generally due to weather events such as flood, storm, freezing temperatures (or any other sensible suggestions)
  - Subsidence claims are not generally particularly large (on average about £12,000–£15,000) although they tend to aggregate regionally (due to locality of soil type for example)
  - And their occurrence is strongly linked with weather conditions so there is a possibility that a bad year for subsidence may be considered a catastrophe year

Commercial property:

- Large individual commercial property claims are common
- As a proportion of the total claims cost large individual claims are more significant for this class than for domestic property or motor (or some other valid comparison with other classes)
- Potential for very large claims depends on nature of the portfolio (i.e. are they mainly retail/industrial, small/medium/large assured?)
- Large claims can arise when there is significant property damage e.g. fire destroying complete building or significant flood damage to machinery etc.
- They can also result from business interruption claims if this cover is included as part of the policy
- Catastrophes generally arise due to weather conditions, although can also be caused through terrorism events depending on exclusions within the policy
- Potential for accumulation of losses owing to the local proximity of risks

Motor:

- Might expect a reasonable proportion of total claims costs to arise from large individual claims greater than £100,000 or level which the firm deems claims large
- Large individual claims are likely to arise due to bodily injury rather than property damage
- Likelihood of large claims higher for younger drivers which may be purchasing non-comprehensive policies rather than comprehensive policies
- Likelihood of large claims increasing with increased litigious nature of population

- Likelihood of increased values of large claims due to increased usage of periodical payment orders
- Catastrophes may arise from, say, a motorway pile-up, accidents involving level crossings, or a weather related event
- Catastrophes could arise from damage due to hailstorm
- Catastrophes could arise from damage due to flooding
- If the firm is writing commercial motor as well as personal motor there will be an increased risk of accumulation of risks, although these are unlikely to have a larger impact on overall claims costs when compared to large claims

Employers liability:

- Employers liability gives rise to bodily injury claims of various sizes including some very large ones which can be linked to industrial diseases as well as accidental injury
- Large individual claims can arise where bodily injury is such that cost of medical care is very high, e.g. back injuries or severe disease claims
- Or where an individual's salary is high
- Or employee is young and therefore future earnings when unable to work would be high
- The most serious asbestos exposure claims – mesothelioma can give rise to claims in excess of £500,000
- The likelihood of some large claims (e.g. exposure to certain substances) will depend on exposure to such substances and therefore the trades covered by the policy
- Occasionally catastrophes can affect this class, although less so than for domestic property (or some other valid comparison)
- An example of such a catastrophe could be Piper Alpha oil rig disaster in 1988, or some other valid example
- Ogden table type events could be considered catastrophic
- Court awards or legislation can produce a whole new tranche of claims if claims become actionable, e.g. if pleural plaques became claimable
- The level of catastrophes will depend on the trades covered by the policy

Public liability:

- Public liability gives rise to property damage and bodily injury claims of various sizes, including some very large ones
- Likelihood will depend upon the business covered, e.g. major sporting event
- Claim size distribution is generally more skewed for public liability than for employers liability
- Sometimes public liability includes product liability cover and this can lead to aggregation of claims (e.g., product recall)
- Or large individual claims (e.g. from pharmaceutical products)
- Pollution liability could result in large or catastrophe claims

Professional indemnity:

- Claim sizes depend on the professions covered within the account
- Likelihood of a large claim depends upon policy terms and conditions and generally frequency is more variable than for the other classes the firm writes
- A professional negligence claim against a large firm of solicitors may result in a very large claim if a company lost a large law suit as a result of negligent advice
- Market wise issues such as pensions misselling claims on IFAs may be considered a catastrophic event.
- A macroeconomic downturn could result in a significant aggregation of claims which could be considered catastrophic

(ii) Reserving

- If left unadjusted in aggregate data, individual large claims may distort the projections of outstanding claims reserves
- This will be the case if the individual large claims have a different claims development pattern than the attritional claims in the portfolio
- There may be specific differences in specific years, for example the new MOJ settlement process for sub 10k claims for motor third party or following a change to internal claims processes for high value claims etc.
- If the mix of large and attritional claims is variable from year to year then leaving the large claims in the aggregate data could result in an unstable triangle on which chain ladder or other methods of reserving are used
- This will result in unstable claims development factors with average claims development factors coming out of the analysis being potentially inappropriate for those years of account with higher/lower large claims experience
- Catastrophes cause a similar problem to individual large claims although the difference in development may not be as marked as those for large claims
- A significant problem could be that the catastrophe claims if left in the data could bias the average occurrence date,
- E.g. a storm occurring at the end of an accident year may result in the year being less mature than normal as claims arising from storm damage tend to be reported quickly and therefore distort the reporting patterns, whereas subsidence claims tend to take a long time to report, so the splitting of these types of claims from the aggregate data will lead to greater accuracy within the claims reserving
- Catastrophes may lead to greater claims leakage owing to pressure of making payments and this again will distort the true payment pattern
- Inflationary effects on large claims is likely to be different from those of attritional claims
- There may be very specific features of individual large claims and catastrophes for which subjective inputs by underwriters and other experts would be valuable in forming an appropriate view on the ultimate position

(iii) Pricing

- If left unadjusted in aggregate data, individual large claims would unduly dominate the experience of the risk group
  - and this may lead to inadequate pricing,
  - and in turn antiselection
  - This is particularly relevant for rating cells with lower premium volumes of data,
  - e.g. older drivers, or new construction type housing where a presence of a large claim may be more due to random occurrence rather than systematically bad experience
  - This could create non-competitive premiums
  - Pricing of insurance structures would require an understanding of the distribution of larger losses of this type, and separate analysis of these claims would be required to identify the appropriate ILF / deductible / limit adjustments
  - Pricing the catastrophe element of an insurance premium may be done with input from catastrophe modelling software and so the claims data would need to be adjusted to avoid double counting
  - There may be a desire to recognise the capital intensity of different contracts in their price, and this would be heavily driven by the large claim / catastrophe potential
  - There may be coverage or mix changes brought in after major losses that mean that similar events are unlikely to occur going forward
  - There may be different trends expected on large claim events, for example greater claim inflation due to court awards, PPOs etc.
- (iv) Capital modelling
- Would want to model CATS & large claims separately in underwriting risk as they can be major drivers of experience at the tails of distributions
  - CAT events can also impact across multiple lines of business and without separating the claims for analysis would not understand them
  - Would also want to remove CAT events if model receives any inputs from CAT models such as RMS as otherwise would end up double counting with the non CAT UW risk
  - Would want to be able to model these events individually where possible as the severity distribution affects reinsurance recoveries
  - Reinsurance recoveries have a major impact on capital at the tails of distributions
  - Would not want to model attritional claims individually however as this would lead to such a high volume of claims that it would be computationally challenging to model
  - In any case it would be hugely difficult to fit a severity curve that was a good fit to attritional claims while still being heavy enough in the tail to adequately represent large claim potential
  - Catastrophe events would even need to be modelled separately from large claims as they would have a different severity distribution
  - and would produce different reinsurance recoveries for the same severity
  - and may even be covered by different reinsurance programmes
  - Large claims and catastrophes will also distort reserve runoff patterns so may need to be removed for reserving risk models to be appropriate

- In particular, if using stochastic methods such as bootstrapping the presence of these large claim events may cause the methods to produce extremely volatile results
- For historic losses or major events in the claims history it may be appropriate to include a specific model or to model as a separate class of business
- This could recognise specific features of the claim or event, such as the current uncertainty over market losses (particularly for recent CAT events) or the particular legal position of a large claim
- These events are also likely to be more strongly correlated with credit risk as they may also impact reinsurers and affect their capital position
- There may also be links with market risks, particularly for large catastrophe events which often impact the equity market in particular
- There may be some links with operational risks as well as management may be distracted by large events of this nature

(v)

- There are many way to define a large individual claim
- There are various different ways that large losses can be extracted from the claims triangles
- The different approaches that could be used are:
  1. Do not extract the large claims from the data
  2. Extract the whole of each large claim and any associated history if its incurred claim amount exceeds a predetermined threshold, e.g. £150,000
  3. Only extract the part of the large individual claims that are in excess of the threshold
  4. Only extract the claim from the point at which it is classified as large
  5. Once a claim is large it remains large – even if it develops to a figure below the threshold
  6. Apply an index to the large claim definition, i.e. threshold increases with given inflation index

(vi)

1. Do not extract the large claims from the data:
  - + This will be simple to do
  - + This will be quicker than making any
  - + This will be fairly robust adjustments if the historic claims experience has been stable year to year
  - + Makes a reasonable allowance for unreported large claims
  - May result in under/over estimation of IBNR if large loss experience has not been stable historically
  - Ignores any trends in large individual claims experience

2. Extract the whole of each large claim and any associated history if its incurred claim amount exceeds a predetermined threshold, e.g. £150,000:
  - + Non-large claims data and hence triangle is not distorted by history or part history of large claims
  - It will be necessary to restate all non-large claims triangles each year as non-large claims become large
  - This will make reconciling the data problematic
  - Will need a process to allow for non-large claims to be reclassified as large once they breach the predetermined threshold, with the associated impact on the triangles taken into account
3. Only extract the part of the large individual claims that are in excess of the threshold:
  - + The non-large claims history should be stable over time
  - + If the threshold is set at the RI retention point then RI IBNR can be identified more easily
  - May be difficult to design systems to the excess over this threshold
4. Only extract the claim from the point at which it is classified as large:
  - + The history of the claim before it reached the threshold is still in the aggregate data and therefore no need to amend the data each year
  - Likely to get negative development in the non-large claims triangles from year to year
  - Development factors estimated from such a process would result in optimistic non-large IBNR estimate
5. Once a claim is large it remains large – even if it develops to a figure below the threshold:
  - + Less adjustment needed an historical data for non-large triangles
  - + Recognises the potential for large to become non-large claims and may therefore avoid over estimation of reserves for large losses
  - May distort average large claims analysis
6. Apply an index to the large claim definition, i.e. threshold increases with given inflation index:
  - + Ensures that large loss definition maintains real value over time
  - + Increases reliability of claims triangle analysis as if there was no indexation you would have less large claims in earlier years increasing over time
  - + Threshold could be set at level of RI retention
  - More complex
  - Difficult to set inflation rate

*Part (i) was well answered, with reasonable performances on parts (ii) and (iii).*

*Part (iv) was very poorly answered, continuing the very concerning trend of underperformance on capital related questions. As examiners, we are concerned that (on both ST7 and SA3) candidates are passing in spite of poor performance on capital modelling questions by relying on reserving or pricing knowledge to compensate, thus making the qualification of little value in certifying that candidates are suitable for capital modelling work.*

*Parts (v) and (vi) were also not well answered. Candidates were able to identify several variations on large claim classification methods and commented on some of the more obvious ramifications, but very few gave any consideration to wider implications or to the suitability of different methods for different circumstances*

- 2** (i) Under a sum insured basis, the insured is restored to the same financial position after a loss as before the loss.

The concept that insurance restores to the pre-loss position is known as the principle of indemnity.

The maximum payment of the insurer is limited to a fixed sum insured. Most general insurance is written on this basis.

Replacement is a basis of cover under which the insurer pays the cost of replacing the insured item with a similar but new item.

In the context of home buildings insurance, this could mean constructing a new house if an insured house was destroyed/suffered extensive damage.

Also referred to as “replacement as new” or “new for old” (generally in the context of home contents insurance).

This contrasts with “the principle of indemnity”.

- (ii) *Advantages of Replacement*

Individuals may not be able to accurately estimate the sum insured (insufficient expertise)

Even if homeowners initially obtain expert advice on the appropriate sum insured, cover may become insufficient in future years if inflation is underestimated

Demand surge following a significant catastrophe event can cause the sum insured to become inadequate.

Problems with estimation can leave people unexpectedly out of pocket following a claim

A replacement basis eliminates the risk of underinsurance, and so reduce hardship

If there is widespread under-insurance, moving to proper level of cover would increase premium income

And avoid reputational risk to insurers when customer is left out of pocket

Replacement basis also avoids people being over insured, which would be a waste of value for the policyholder

*Advantages of Sum Insured*

Insurer may prefer just to pay sum insured, rather than have the responsibility to replace the house

For example, under replacement basis, insurer may have greater admin requirements, and has associated risks of cost overruns

May be more potential for dispute with replacement, whereas sum insured clearly limits insurer’s liability

Homeowner may be unable to provide details necessary for replacement cover, e.g., describing building size, fixtures and fittings, and the condition of the property

Insurer may find it more difficult to estimate premiums on a replacement basis than a sum insured basis

Some of the potential disadvantages of the sum insured basis can be partially mitigated.

*For example:*

An alternative would be to build a hidden margin in to sum insured – discriminated against people who accurately estimate sum insured and so have no need to pay for a top up

Some insurers automatic index sum insured each year to help mitigate the risk of under insurance

Some insurers specify a minimum sum insured

*Normally a question such as this, which is heavily bookwork is much better answered.*

**3** (i)

- It is likely that the firm will use the RI broker who places their RI program.
- This will allow the RI broker to have full understanding of the firm’s catastrophe exposures
- The reinsurance broker will have knowledge of the available catastrophe models available in the market, being able to identify the strengths and weaknesses of all models available.
- In general there are 3 proprietary model providers, RMS, Eqecat and AIR.
- There is no single model that is best to cover all risks and the broker is able to use their experience to either use certain models for certain perils or use other vendors models to validate output or check sensitivity of the results.

- The RI broker will also use the most appropriate loss curves for the given project, either OEP (per occurrence) which is used mostly for evaluating per event reinsurance, or AEP (annual aggregate) which will tend to be used for reserving/capital projections
- The RI broker would require policy data in respect of locations of business, normally at postcode level although it may be aggregated to CRESTA level for some purposes
- IT would also have to supply the physical characteristics of buildings such as construction type, occupancy, number of employees, etc.
- And the financial terms of the policies, coverage value, limits, deductibles etc.
- The RI broker will need to construct rigorous analysis of the firm’s exposure
- Their independence from the firm may also allow them to address nuances of their exposures which the firm is too close to recognise.
- The broker can also use wider market trends in use of such models to help the firm’s catastrophe risk management.
- The service may be free alongside reinsurance brokerage
- Gives access to additional expertise

(ii)

- Unmodelled contracts in modelled classes – this could be allowed for by a pro-rata adjustment to the model output based on understanding of the exposure missing from the model inputs relative to that modelled
- Unmodelled component of modelled contracts, e.g. a multi-location contract where only one post code has been input or where contract extensions have been input – again this would be allowed for by pro-rata adjustments
- Unmodelled classes – Analyse historic experience both in terms of frequency and severity and build bespoke model if data is available, otherwise analyse impact and compare with classes which are modelled and use comparison to give catastrophe estimate
- Unmodelled unconsidered classes, where natural catastrophe exposure is not considered, e.g. medical facility liability and financial institution crime – Analyse historic experience if available, or use industry data to build bespoke model
- Unmodelled elements of a modelled loss, e.g. Caribbean windstorm surge and flood vs storm surge from Katrina – Loadings applied to model output based on historic experience or market data
- Unmodelled perils/territories – Use the long term ratio of catastrophe losses to non-catastrophe losses to identify the proportion of reserves to be held for non-modelled perils/territories, or by using a trended method to analysis the potential change in catastrophe/exposure concentration for example.

(iii)

- + Allows control of modelling to be in-house
- + Allows management to understand more fully the processes involved in modelling

- + Allows more detailed validation to be completed
- + Reduction in broker fees as no longer relying on their catastrophe modelling
- + Direct line of communication with the proprietary modelling firms who will have the most knowledge of the models themselves
- + Should be able to evaluate reinsurance pricing easier
- + Can run the catastrophe module at firm’s frequency
- + Less reliance on external party
- You will not necessarily have the skill set in-house currently and may have to acquire such skills at a cost
- You will have to licence the proprietary models and this may be costly
- You will need to store the relevant data required for the modelled in their defined formats which may differ from how the data are currently used
- Will be time consuming to build and maintain the models
- Output from the model will need to be interpreted internally and will need the relevant skill sets
- Will now have more reliance on the proprietary model providers

(iv)

- Understand the changes in the industry exposure database in detail through documentation and discussion with vendors
- Make a comparison analysis with the previous industry database to identify the key areas/lines of business of change
- Carry out validation tests for the updated industry exposure database
- Make comparisons of the updated database with the firm's portfolio to compare the levels of diversification such as to anticipate where differences in loss estimates may arise from
- Carry out a detailed analysis of the firm's inland exposures so as to understand whether there is now a concentration risk in terms of inland flood exposures (in excess of the National Flood Insurance Programme or for commercial and industrial properties that the firm may be writing).
- Carry out a detailed analysis of storm surge exposures to understand whether there is now a concentration risk in terms of storm surge exposures.
- Communicate these results with the capital modelling team
- Coordinate the efforts for with the capital modelling team for understanding what the loss implications of these changes might be and whether they will be translated into setting new accumulation limits for specific lines of business or perils.

(v)

- Create (if not existent already) a plan for testing the new model and its assumptions with specific governance around it, sign off processes, responsibilities etc.
- Re-run the portfolios with the new model and carry out a change analysis in terms of loss estimates (per line of business, peril etc.).
- Validate the updated vulnerability assumptions of the vendor by comparing with own loss experience

- Review and understand the documentation and references around the slower decay of hurricane strength in the new version of the model
- Validate the assumptions of the updated industry exposure database and communicate and coordinate with the exposure aggregation management team
- Validate the new storm surge model by reviewing the relevant documentation and references
- Keep in close contact with the vendor and potentially seek for advice on specific parts of the model that relate more to the firm’s business
- Obtain a holistic view of the changes in the new model and decide whether any adjustments will have to be made (either upwards or downwards) on the loss estimates
- Update the model to include an explicit allowance for parameter error to recognise the potential for future shocks of this nature

(vi)

- Prepare a short and cohesive (non-technical) description of the main changes in the model and what drove them (e.g. new scientific evidence, claims data)
- Focus on numbers: Brief the Board on loss numbers if the new model is to be adopted as is: What are the changes overall, what do they mean for capital setting?
- Describe to the Board the process and controls by which the model was tested and validated.
- Provide the Board with a clear view on whether the validation process have led you to decide whether the model will be used for capital setting as it is, whether it will be adjusted or whether it will be completely ignored.
- Provide the Board with an analysis of the implications of this decision to capital setting and risk appetite

*Parts (i)–(iii) were surprisingly well answered with candidates appearing to have a good functioning knowledge of key components of catastrophe modelling in spite of the likelihood that few candidates actually directly use the models in their daily work. This suggests that the issues with capital modelling questions referred to in the comments on question 1 are not simply a reflection of the lack of exposure to capital modelling from the average candidate.*

*Parts (iv)–(vi) were poorly answered, with many candidates failing to specify the basic approach of comparing outcomes on the different bases in order to understand the issues faced.*

## **END OF EXAMINERS’ REPORT**