INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2016

Subject ST8 – General Insurance: Pricing Specialist Technical

Introduction

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 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. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Luke Hatter
Chair of the Board of Examiners
December 2016

A. **General comments on the *aims of this subject and how it is marked***

1. The aim of this General Insurance: Pricing Specialist Technical subject is to instil in successful candidates the ability to apply, in simple pricing analysis situations, the mathematical and economic techniques and the principles of actuarial planning and control needed for the operation on sound financial lines of general insurers.

2. Subject ST8 deals with applications of general insurance pricing techniques across many different types of product. Candidates should expect the examiners to draw these applications from all parts of the syllabus in order to test as wide as possible a range of skills and, in particular, to achieve a fair balance between personal and commercial lines.

3. Examiners will sometimes require the use of standard general insurance actuarial and statistical techniques that are covered in earlier subjects. Candidates should ensure that they are familiar with these when preparing for the ST8 examination.

4. As well as pricing techniques, ST8 also covers the workings and use of reinsurance products, so candidates should also expect the examiners to set questions on these aspects.

5. In questions with an element of calculation, different numerical answers may be obtained from those shown in these solutions depending on whether figures obtained from tables or from calculators are used in the calculations. Candidates are not penalised for this. However, candidates may lose marks where excessive rounding has been used or where insufficient working is shown. Where questions require looking up values in tables, candidates are expected to interpolate between two values if reasonable to do so, even when this is not stated in the question.

6. Where examples are given in the solution to illustrate the points made, marks were awarded to candidates who gave these particular examples or an equally valid alternative.

7. Candidates who give well-reasoned points, not in the marking schedule, are awarded marks for doing so.

B. **General comments on *student performance in this diet of the examination***

1. In general the performance of candidates was similar to recent sittings.

2. Yet again, a number of candidates displayed poor handwriting at this sitting, which made it difficult for examiners to award full credit. Candidates who struggle with the legibility of their handwriting are asked to contact the Examinations Team well in advance of the sitting for advice on what support may be available.

3. Bookwork questions were generally well answered, and better prepared candidates successfully tailored the answers to the questions, instead of making more general

> comments. Candidates did not score well on questions 6, 9 and 11. Answers to these questions generally lacked breadth and depth.
>
> 4. The comments that follow the questions concentrate on areas where candidates could have improved their performance. Candidates approaching the subject for the first time are advised to concentrate their revision in these areas.

C.   Pass Mark

The Pass Mark for this exam was 67.

Solutions

Q1   The other types of insurance cover could be:

- Employers liability insurance   [½]

- for claims made by staff / stewards   [½]

- owing to negligence on the part of the organisers   [½]

- Property damage insurance   [½]

- covering loss or damage to insured property at the event   [½]

- including transit to and from the event   [½]

- cost of hiring replacement items for the event   [½]

- Theft by employees / fidelity guarantee insurance   [½]

- Accidental loss or destruction of entry fee and other money while in transit or in storage at the authorised organisers' location   [½]

- Cancellation insurance   [½]

- covering cancellation, abandonment or postponement of the event due to reasons beyond the control of the organisers   [½]

- Motor insurance   [½]

- to cover losses to/from vehicles used in the event   [½]

- and claims from third parties for damage caused by the vehicles   [½]

- Non-appearance cover   [½]

- covering cancellation, abandonment or postponement of the event due to the non-appearance of specified persons (e.g. VIPs) due to reasons beyond their control or the organisers   [½]

- Terrorism cover   [½]

[Maximum 5]

> Generally well answered. Those scoring highly gave answers specific to the situation and described the covers clearly.

Q2   (i)   Size of fleet, i.e. number of vehicles …   [½]

… if possible, split by type of vehicle (make/model) or by value   [½]

… and size of vehicle / engine cc.   [½]

Age of vehicles   [½]

Location/postcode of where the fleet is based or where they are stored overnight   [½]

What the vehicles are used for or the type of business   [½]

Whether they carry valuable or hazardous materials/equipment/people.   [½]

Excess   [½]

Number of drivers …   [½]

… and their experience   [½]

Claims history for the fleet   [½]

Security features of fleet and storage depot   [½]

Annual mileage   [½]

Territories covered   [½]

Duration of policy   [½]

[Maximum 4]

    (ii)   A burning cost approach is really the only option here.   [1]

             Individual loss data is not available so we don't know the number of claims …
                            [½]
             … and therefore we don't know the claim frequency.   [½]
             Likewise we don't know the claim severity.   [½]

             The burning cost can be calculated easily from the data available (as total cost of claims/total exposure).   [½]

                                [Maximum 2]

                                [Total 6]

> Part (i) was answered well although some did not seem to appreciate the question was about fleet motor, and not private car.
>
> Most appreciated that burning cost was required for part (ii), but often the rationale given was vague.

Q3   (i)   Allows company to compare its own experience with wider industry so its premiums might become more competitive   [½]

             Which can help it understand how its business differs from competitors   [½]

             And/or benchmark its own performance   [½]

             Can allow the company to be more confident that its pricing structure is correct   [½]

             Gives company access to data it may not have   [½]

             e.g. for new products, or products with very small volumes/not much historic data   [½]

             The insurer can thus price risks it wouldn't otherwise be able to   [½]

             Or data that's more stable/reliable than its own data   [½]

             Industry based development factors may be available for pricing, especially useful for small or new insurers.   [½]

                                [Maximum 2]

(ii)   The data supplied by different companies may not be precisely comparable [1]

e.g. companies operate in different geographical /socio-economic sections of
the market   [½]
policies sold by different companies are not identical   [½]
companies will have different practices   [½]

e.g. underwriting, claim settlement and outstanding-claim reserving policies
                                                                                                                          [½]

the nature of the data stored by different companies will not always be the
same   [½]
the coding used for the risk factors may vary from company to company   [½]

data will be much less detailed and less flexible than those available internally
                                                                                                                          [½]

external data is often much more out of date than internal data   [½]

data quality will depend on the quality of the data systems of all its
contributors   [½]

not all companies contribute or only a small number do   [½]

specialist lines may not have any/much data   [½]

[Maximum 4]

[Total 6]

Both parts were answered well.

Q4   (i)   The desirable qualities of a complement of credibility are:

Accuracy as a predictor of next year's mean loss costs (i.e. low variance
around next year's mean loss costs)   [½]

Unbiasedness as a predictor of next year's mean subject to expected losses
(i.e. the difference between the predictor and the subsequent loss costs should
average out near zero)   [½]

Independence from the base statistic   [½]

Availability of data / easy to obtain   [½]

Up to date   [½]
Ease of computation (quick and cheap to calculate)   [½]

Explainable and easy to communicate [½]

Bears a relationship to the loss costs of the class or individual being rated. [½]

[Maximum 2]

(ii) The impact of the introduction of the experience rating system:

There could be a potential large movement in the individual premiums at the point of renewal [½]

The customers may not like the volatility introduced by such a system [½]

Customers may also be put off by the complexity, or perceived unfairness [½]

In general, the poorer risks will see an increase in premiums [1]

... and they may leave and go to a cheaper insurer [½]

The better risks will see a reduction in premium [1]

... they are more likely to stay [½]

The company is likely to attract better risks from competitors too [½]

Should reduce potential for anti-selection [½]

Therefore expect profits to increase [½]

And an overall improvement in persistency of customers [½]

Increased need to monitor the experience of new business closely [½]

Underwriting and claims systems will need to be changed or improved to be capable of capturing necessary information … [½]

… and this is likely to have a cost implication [½]

May become complex to administer… [½]

… Brokers may be unwilling to capture extra information from their customers in order to obtain a quote [½]

Difficult to apply experience rating to new policyholders ... [½]

... as may need to rely on their honesty [½]

... especially as no other insurer in this market uses such a system [½]

If premiums are reduced, broker commission is likely to fall and this could impact the relationship with brokers [½]

It is likely to affect policyholder behaviour, e.g. reduce moral hazard [½]

and the number of small claims being made is likely to fall [½]

which will lead to reduced claims handling expenses and other fees [½]

experience rating may not be permitted in certain countries where the insurer operates [½]

[Maximum 5]

[Total 7]

Part (i) was reasonably well answered.

Some candidates struggled to generate a wide range of points for part (ii), focussing on the workings of the system rather than the implications. Higher scoring answers considered the insurance company and policyholders separately.

Q5 The possible reasons are:

Data changes

The number of years of historical data used has changed	[½]
The threshold of claims for reporting has changed	[½]
... e.g. now all claims are reported even for pricing the lowest layer	[½]
Correction of data errors	[½]
Data groupings have changed	[½]

The method used for pricing has changed [½]
... e.g. a change from experience or exposure rating to a blended method [½]

... or a change from a deterministic approach to a stochastic one [½]

The curve used for exposure rating has changed [½]

Changes in frequency trends, e.g. increased propensity to claim [½]

There may have been errors in the calculation (this year or last year) [½]

The terms and conditions of the contract have changed [½]
... e.g. annual aggregate deductible, reinstatements, etc. [½]

The cedant may have changed their terms and conditions [½]

The discounting of expected claims may have changed [½]

Pricing can be very sensitive to the discount rate as this is a long tail line [½]

Recent experience of the cedant may have been unusually light or heavy [½]

Treatment of exceptionally large losses may have changed (e.g. a change from a large loss loading to spreading over several years) [½]

New information on latent claims may be available [½]

The inflation rate may have changed [½]

Even if inflation hasn't changed there is still a need to allow for another year's worth of inflation [½]

Changes in the severity trends [½]
Changes in the cedant's mix of business [½]

Regulatory or legislative changes affecting expected claims cost [½]

Changes in inuring reinsurance [½]

[Maximum 7]

> Reasonably well answered, however the question was about the risk premium and a large number of candidates gave points that do not affect the risk premium and therefore do not score marks..

Q6 (i) May have profit share arrangements in place [½]

There may be some form of experience rating [½]

Full exposure for some risks may only be estimated [½]

e.g. number of vehicles in a fleet will probably not be known when premium is charged [½]

may be notification delays in booking premium [½]

the figure will be reduced for policies not taken up due to notification delays [½]

the figure will be increased for policies reinstated following cancellation in error [½]

the insurer may write some policies through a binder/delegated underwriting authority, … [½]

… and may have had to rely on estimates of how much of this business has been written [½]

There may have been changes to the premium following mid-term cancellations or endorsements [½]

The premium may also have to be adjusted for currency movements [½]

Adjustments may be required for profit commission if this is in the form of premium rebate [½]

There may be errors that are subsequently corrected [½]

Brokers and/or policyholders may default on some of their premium (e.g. if paying by instalments) [½]

[Maximum 3]

(ii)   Will have to inflate historic large losses to present values
(or deflate the €1m threshold) [½]

And inflate to future time when claims expected to be paid [½]

Need to allow for past claims just below €1m threshold that might be included as large losses after inflation [½]

Historic losses will need to be developed, which will introduce uncertainty [½]

As it can take a long time to settle historic claims [½]

Especially for complex bodily injury claims [½]

And recent claims may not have been reported yet [½]

There may be a lack of data to base claim development patterns on (e.g. if base period too short or not enough detail) [½]

Past experience may not be indicative of the future, e.g: [½]

changes in medical practice make claims more expensive [½]
changes in legislation/court awards changing settlement patterns [½]
changes in internal claim handling processes [½]
mix/type of business may be changing [½]
underwriting standards changing [½]
may have had unusually heavy or light experience in the past [½]
changes in terms and conditions (e.g. excess) [½]

Large loss experience will be uncertain and subject to random fluctuation　[½]

e.g. it may incur a single loss over €10m　　　　　　　　　　　　　[½]
May not have a lot of history to base the loading on　　　　　　　　[½]

e.g. may have written much less business in the past　　　　　　　　[½]

or may not have incurred many large losses　　　　　　　　　　　[½]
Actuary may not have information on how exposure is changing/has changed
　　　　　　　　　　　　　　　　　　　　　　　　　　　　[½]

There may be model or parameter error　　　　　　　　　　　　　[½]

There may be calculation error　　　　　　　　　　　　　　　　[½]

Errors in the data used the calculate the €10m figure　　　　　　　[½]

Uncertainty over reinsurance if the figure is net of reinsurance　　　[½]
Currency risk may also contribute to the overall uncertainty　　　　[½]

[Maximum 7]

[Total 10]

> Many struggled in part (i) to generate a wide range of points, focussing largely on experience rating.
>
> Again in part (ii) answers tended to lack breadth and scores were generally low for this question.

Q7 (i)　Address of policyholder　　　　　　　　　　　　　　　　[½]
　　　Name of policyholder/company　　　　　　　　　　　　　　[½]
　　　Number of buildings covered　　　　　　　　　　　　　　[½]
　　　Link to previous policies taken out by same policyholder　　　[½]
　　　Original inception date　　　　　　　　　　　　　　　　[½]
　　　Number of years on cover　　　　　　　　　　　　　　　[½]
　　　Start date of cover　　　　　　　　　　　　　　　　　[½]
　　　End date of cover　　　　　　　　　　　　　　　　　　[½]
　　　Endorsement details　　　　　　　　　　　　　　　　　[½]
　　　Policy Number　　　　　　　　　　　　　　　　　　　[½]
　　　Premium amounts　　　　　　　　　　　　　　　　　　[½]
　　　Currency of premiums　　　　　　　　　　　　　　　　[½]
　　　Age of building　　　　　　　　　　　　　　　　　　[½]
　　　Building Material/ Construction Type　　　　　　　　　　[½]
　　　Excess　　　　　　　　　　　　　　　　　　　　　　[½]
　　　Limit of cover/Sum Insured　　　　　　　　　　　　　　[½]
　　　Rebuild cost of building/EML　　　　　　　　　　　　　[½]

Square footage/number of floors/size of building [½]
Proximity to water [½]
Exclusions [½]
Processes undertaken/goods manufactured/use of factory [½]
Perils covered [½]
Location of buildings [½]
Source of business/sales channel [½]
Risk management processes e.g. safety/security features [½]
Percentage of risk insured e.g. if co-insured [½]
Previous claims indicator [½]

[Maximum 5]

(ii) Date of Loss [½]
Cause or Peril of Loss [½]
Paid Amount(s) [½]
Case Reserve(s) (i.e. estimate of outstanding amounts) [½]
Reopen Date(s) [½]
Close Date [½]
Date of Notification/Reported [½]
Dates of each payment [½]
Dates of change in reserve [½]
Claim Number [½]
Policy Number, or other link to policy [½]
Description of claim [½]
Currency of claims [½]
Type of claim (e.g. buildings or contents) [½]
Reinsurance recoveries [½]
Loss adjustor fees [½]
Status of claim i.e. open/closed/reopened [½]

[Maximum 5]

[Total 10]

A very straight-forward question with most scoring highly.

Q8 (i) Claims are usually reported quickly as the insured will want to recover any veterinary bills paid without delay. [½]

Some claims may need to be pre-authorised which could reduce delays [½]

Settlement may be delayed as the insurer needs to ensure claim is valid and will probably have to request medical records from the vet. [½]

Settlement may also be delayed if there is need to wait to see whether treatment/surgery has been successful [½]

Liability claims that involve legal disputes may not settle quickly [½]

However, in the main most will be short-tailed. [½]

Claim frequency is likely to be relatively high [½]

Some claims, e.g. for ongoing treatment/medication, may last for several years or even the lifetime of the dog/cat. [½]

Claims may be small, e.g. a course of antibiotics, vaccinations [½]

… or very large, e.g. major surgery, third party liability [½]

Claims may also be known in advance, e.g. routine operations. [½]

Other claims may be highly variable and will depend on the nature of treatment required. [½]

Claims costs may be subject to medical or vet fee inflation, … [½]

… as well as regular advances in veterinary science. [½]

Liability claims will be subject to court award inflation [½]

Claims are all likely to be in the local currency [½]

It is possible that there could be epidemics [½]

It is likely that the claims will display some seasonality [½]

[Maximum 3]

(ii) As the models are nested, and we have the scaled deviances D_A, and D_B [½]

$$D_B - D_A \sim \chi^2_{df_B - df_A}$$ [½]

The *age of animal* factor has 6 levels, so the difference in the number of degrees of freedom is 5. [1]

$$D_B - D_A = 16$$ [½]

$$\chi^2_5 (1\%) = 15.09 \text{ and}$$ [½]

$$\chi^2_5 (0.5\%) = 16.75$$ [½]

Alternatively, the *p*-value is just below 1%.

Alternatively $16 > \chi^2 (5\%) = 11.07$ *(as it is common to perform tests at the 5% level)*

This suggests the two models are statistically different *(or A is a better model)*... [½]

… and therefore that the factor *age of animal* should be included in the model. [½]

The AIC is not usually used when the models are nested … [½]

… however in this case the AIC is lower for Model A which suggests that it is a better model. [½]

It makes sense for the age of the animal to affect the claim frequency. [½]

e.g. would expect older animals to require more treatment [½]

The pattern shown in the first chart suggests the first level is significantly lower than the other levels … [½]

…though the amount of exposure in that level is very small, … [½]

… the error bars are tight so the parameter estimate looks credible. [½]

In the second chart we note that the year 2011 is an exception. [½]

Other than 2011, the lines are fairly parallel… [½]

… which suggests that the trend is fairly consistent over time. [½]

This gives some confidence in the observed trend.

Much of the data however is Unknown [1]

it might be better to leave for another year until there is more exposure in the other levels, … [½]

… or the insurance company should try and gather this information in some other way. [½]

The insurer should consider whether other insurers are using this factor … [½]

… as if they are then it should use it to avoid potential anti-selection [½]

There are several reasons outlined above justifying why the factor age of animal should be included as a rating factor. [½]

However some may argue that given the level of Unknowns it should not be used [½]

[Maximum 8]

[Total 11]

Part (i) was reasonably well answered, but some did not consider the liability element of pet insurance or give enough description in their answers to score well.

In part (ii) the higher scoring candidates commented on all aspects of the information provided, as well as the practical reasonableness of including age as a factor. A high number of candidates failed to calculate the degrees of freedom correctly.

Q9 (i)   The insurer may believe that better conditions are just round the corner   [½]

E.g. other insurers may be about to pull out   [½]

Although soft, the market may still be profitable   [½]

Desire to maintain relationship with brokers/policyholders   [½]
It may write niche business that does not follow the general trend   [½]

... so it might have been able to increase premium rates   [½]

... resulting in an increase in business volumes   [½]

Its brand may be strong and allow it to keep rates higher than the market   [½]

It may be cross subsidising with other profitable products   [½]
It may not want to lose market share and market standing   [½]

... and miss out on profitable business when the market improves   [½]

... or incur costs of re-entering the market   [½]

There may be other barriers to entry in which case best not to get out   [½]

Profitability may not be the prime driver, e.g. for a captive   [½]

Exiting the market may have a knock-on impact on other products / brand reputation   [½]

It could be a strategic business decision   [½]

... e.g. writing business at market rates might retain clients [½]

... and provide the opportunity to increase rates at future renewals [½]

Reinsurance rates may be even softer, so a gross loss may give a net profit [½]

Pulling out may significantly raise capital requirements as likely to lead to lack of diversification [½]

It might have adopted some actions to remain in business [½]

E.g. bring more selective about the risks being written [½]

Or tighter claims underwriting controls [½]

Reduced expenses e.g. through cost cutting or renegotiating commission [½]

Regulation bars leaving the market or makes it difficult/time consuming [½]

It may still be possible to make non-premium-related profits e.g. investment return. [½]

[Maximum 9]

(ii)   The possible shortcomings are:

Insurers are likely to make losses [½]

Lower profits lead to lower dividend and negative shareholder impact [½]

Credit rating may be downgraded [½]

The impact of the soft market could become more extreme and competitors may have deeper pockets [½]

If there is a reliance on investment return and the markets fall the insurers will be placed under greater pressures [½]

Likewise if the insurers rely on reserve releases to stay in the market [½]

This could lead to the overuse of reinsurance to hedge low rates [½]

... which could lead to reinsurance disputes [½]

... e.g. if reinsurers think that the expected controls in place by their cedants are not being met, and as a result slow down payments to their ceding companies [½]

Capital-challenged companies could be forced to sell off strong and viable businesses [½]

Some companies may be forced into regulatory supervision [½]

Some companies could become insolvent [½]

Reputation could be damaged, and customers lost if the insurer goes into regulatory supervision [½]

The business is likely to face redundancies/staff turnover in prolonged soft market. [½]

[Maximum 2]

[Total 11]

In part (i) candidates struggled to generate a wide range of points and therefore scores were not particularly high. A number wrote at length about hard and soft markets and the insurance cycle which was not asked for.

Many candidates missed the more obvious points in part (ii).

Q10 (i)

Number of claims per policy	Count	Number of claims
0	18,797	0
1	5,270	5,270
2	831	1,662
3	91	273
4	10	40
5	1	5
	25,000	7,250

The mean number of claims per policy is 7,250 / 25,000 = 0.29 [1]

(ii)   Under H_0 : claims per policy ~ Poisson(0.29)

$$\sum \frac{(O-E)^2}{E} \sim \chi^2_{k-1}$$

Number of claims per policy	O	E	$\frac{(O-E)^2}{E}$
0	18,797	$\frac{e^{-0.29}(0.29)^0}{0!} \times 25000 = 18706.59$	0.4370
1	5,270	5424.91	4.4236
2	831	786.61	2.5048
3	91	76.04	2.9436
4	10	5.51	3.6523
5	1	0.32	1.4472
	25,000		15.41

[Maximum 6]

(iii) p-value $= P\left(\chi^2_5 > 15.4084\right) \simeq 0.9\%$ using linear interpolation   [1½]

Alternatively $\chi^2_5(1\%) = 15.09$ and $\chi^2_5(0.5\%) = 16.75$.

Alternatively $15.41 > \chi^2(0.5) = 11.07$ *(as it is common to perform tests at the 5% level)*

Hence the distribution is not a good fit to the claims data.   [1]

[Maximum 2]

(iv)   The total number of claims for the block of policies is Po(290).   [½]

Generate an observation from this distribution,   [½]
For the number of claims produced, generate costs for these claims by sampling from the gamma distribution.   [½]

For each claim, subtract the excess.   [½]

Taking care to rule out any resulting claims that are negative   [½]

After taking off the excess, any resulting claim should be capped at $1m   [½]

Sum the resulting claims together and cap at $10m.   [½]

This gives the expected loss cost in a year. [½]
Repeat the above steps a large number of times, ideally > 10,000. [½]

The mean of the expected loss costs is an estimate of the risk premium. [½]

The variance of the expected loss costs is an estimate of the variability in the risk premium. [½]

The variability could also be measured through looking at confidence intervals (or percentiles) within the distribution of simulated outcomes [½]

[Maximum 3]

[Total 12]

(It is equally valid for the simulation to be performed at individual policy level.)

Parts (i) and (ii) were generally well answered.

In part (iii) many used the wrong degrees of freedom and also incorrectly concluded that the distribution provided a good fit.

Answers to part (iv) were often light on detail and did not demonstrate a proper understanding of simulation in practice.

Q11 (i)   There are five modules as follows:

Event module [½]
This is a database of stochastic events (the event set) [1]
with each event defined by its physical parameters, location, … [½]
… and annual probability/frequency of occurrence. [½]

Hazard module [½]
Determines the hazard of each event at each location [½]
The hazard is a consequence of the event that causes damage [½]
e.g. for an earthquake, it is ground shaking, or other valid example [½]

Inventory or exposure module [½]
This is a detailed exposure database of the insured systems and structures [½]
As well as location, this will include further details such as age, occupancy and construction [1]

Vulnerability module [½]
Vulnerability can be defined as the degree of loss to a particular system or structure resulting from exposure to a given hazard [1]
often expressed as a percentage of sum insured [½]

Financial analysis module [½]
Uses a database of policy conditions (limits, excess, sublimits, coverage
terms) … [½]
… to translate the total ground-up loss into an insured loss [½]
The inventory and financial analysis modules rely primarily on data input by
the user (an insurer of reinsurer) of the models [½]
The data will be specific to the user [½]

The other three modules rely on specific assessment (seismological,
meteorological and engineering) … [½]

… and are also the engine of the cat model [½]

[Maximum 8]

(ii) Effect on cat model

The components of the existing event module and hazard module will no
longer be appropriate [1]

every component will have to be modified using the newly published
information [½]

They will probably want to review the vulnerability module in light of the new
information [½]

The new levels of intensity will lead to an increase in the number of hazard
levels [½]

The seven counties of Tectonia which were not previously covered will need
to be brought into the model with the recent information [½]

... these seven counties might be different to the existing eight counties, e.g.
less risky, more populous, etc. [½]

The results produced for the new counties will be very different to what the
insurer would have had for these counties before [½]

The financial analysis module would indicate the overall impact due to all
perils [½]

The new model may lead to the pricing of some products changing [½]

If the company decides to implement these price changes, there could
eventually be a change in the inventory module [½]

Will need to incorporate such changes if they are not automatically built in [½]

More effort/cost required to maintain the model and update with new data [½]

If the company uses another cat model (i.e. does not use the government data directly) it may use the new information to validate their current model   [½]

[Maximum 3]

(iii)   Approaches used to update cat model

Engage with government to understand what they have done   [½]
Speak to cat modelling experts/consultants   [½]

The insurer should build the new information into its cat model via the appropriate modules   [½]

The cat model should be calibrated to the insurer's own portfolio and historical cat experience   [½]

If possible the results of the update model should be compared with those produced by another model, e.g. proprietary model if available   [½]

The results of this model before and after revision would need to be studied carefully ...   [½]

... to see if any of the parameters of the vulnerability and financial analysis modules need to be amended   [½]

Consider whether any change is needed in the parameters for other perils   [½]

This can be decided based on peril related information available from the government or other external sources   [½]

If the existing model has links to a reinsurance model, then consider how changes are to be made to the relationships with the reinsurance model   [½]

Consider building in a flexible feature for any future changes in the event and hazard module databases.   [½]

The flexibility has to enable a history of changes (including effective dates of the changes) ...   [½]

... so that links to the other three modules would help generate a history of financial assessments and help review the nature of fluctuations on reserves   [½]

Depending on the insurer's exposure in the new areas or its risk appetite, it may decide not to update the model [½]

[Maximum 4]

[Total 15]

Part (i) was well answered.

Candidates did not score well in parts (ii) and (iii). Those that considered the different elements of the model and considered the practicalities of updating the model in the specific example given scored better.

END OF EXAMINERS' REPORT