INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 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.

F Layton
Chair of the Board of Examiners
July 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 be penalised 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.

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

1. The level of difficulty of the paper and the general performance of candidates were similar to recent sittings. There was no evidence of time pressure in this paper for well-prepared candidates.

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 their answers to the questions, instead of making more general comments. Candidates did not score well on questions 4, 9 and 10. In questions 9 and 10 candidates were asked to assess or discuss a suggestion made by another manager,

however answers generally lacked breadth and depth. Questions 9 and 10 are typical examples of problems faced by qualified pricing actuaries and it is disappointing that candidates are unable to respond well to these types of questions.

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. Comparative Pass Rates for the past 3 years for this diet of examination.

Year	*%*
April 2016	38
September 2015	41
April 2015	41
September 2014	38
April 2014	41
September 2013	39

Reasons for any significant change in pass rates in current diet to those in the past:

The pass rate for this examination diet is lower than recent pass rates. There were no issues with the paper, and time did not appear to be a problem. Some variation in the pass rate between sessions is expected as different cohorts of students sit the examination.

D. Pass Mark

The Pass Mark for this exam was 60%.

Q1 (i) Change to the policy wording that takes effect during the original period of insurance

usually following a change in the risk covered

usually, but not necessarily, accompanied by an alteration to the original premium.

(ii) *(below are a number of examples; credit was given to any valid and distinct examples)*:

an increase to sum insured for a domestic home contents policy

adding an additional driver to a motor insurance policy

change of car, or modification to car, or adding cars to multi-car policy

building extension on a household buildings policy

exclusions of certain perils that would otherwise be covered as standard

addition of coverage of a new class of product now being sold by a company under product liability

change in nature of work carried out under an EL policy

Generally well answered, however a number of candidates did not attempt this question. It is important when giving examples that they are distinct.

Q2 (i) Moral hazard refers to the actions of a party who behaves differently from the way that they would behave if they were fully exposed to the circumstances of that action.

The party behaves inappropriately or less carefully than they would otherwise…

…leaving the organisation to bear some of the consequences of the action.

Moral hazard is related to information asymmetry…

…with the party causing the action having more information than the organisation that bears the consequences.

(ii) *(as with 1(ii), there are many possible examples and credit was given for valid and distinct examples)*

Employer may not take health and safety training seriously as they know that employers' liability insurance will cover them against compensation claims. Business interruption cover may mean the insured takes longer than they otherwise would have done to start trading/production.

A business may not vet prospective staff as thoroughly once fidelity guarantee cover is in place

Mortgage lenders may provide mortgages with very high loan to value ratios, once protected by mortgage indemnity guarantee insurance.

Trade credit insurance may make industrial suppliers less careful about customers they enter into agreements with, e.g. leading to non-payment for machinery supplied to a client company.

Commercial property insurance in place may make firms more lax about risk management, e.g. minimal fire safety equipment, poorer security

Crop insurance in place may make farmers take less care in preventing crop disease or destruction by pests

(iii) Disallowing claims where normal risk management would have avoided occurrence.

Claims averaging in line with culpability.

Increased premium (to deter repetition) or NCD system or experience rate.

Increased risk assessment at outset

Improve communication with policyholder about their duty of responsibility/care.

Introduce or increase the excess on each claim.

Exclusions, e.g. exclude car theft when keys are left in the ignition

Profit sharing or participation clauses

Increased investigation of claims to identify causes of moral hazard

Parts (i) and (ii) were generally well answered, however many candidates appear to confuse moral hazard with anti-selection, and seem unable to distinguish between moral hazard and deliberate fraudulent acts. In part (ii) some failed to give examples in commercial lines insurance. Part (iii) was generally well answered.

Q3 Introduce/Increase the excess.

Reduce cover to remove non-compulsory elements of cover.

e.g. Fire damage or "downgrade from fully comp to 3rd party only", breakdown assistance *(or other valid example)*

Work with policyholder to improve risk management

e.g. Upgrade safety features of vehicles

or better training of staff.

Introduce telematics devices/install black boxes/PAYD/PHYD

Restrict the mileage of members of the fleet

Introduce exclusions

e.g. Ban on young drivers *(or other valid example).*

Put a limit, on the amount of any claim …

… or reduce it if one already exists …

… though this may not be possible for bodily injury claims.

Introduce (or reduce) an annual aggregate limit on claims

Ensure repairs are undertaken by insurer-owned mechanics to manage costs, or any other measure to manage claims costs (e.g. require several quotes)

Ban private use, or use by spouses/children.

Introduce some profit share to encourage less risky behaviour as part of a range of measures (as this wouldn't work in itself).

Improve fleet overnight parking facilities to reduce risk (e.g. theft, malicious damage, storm)

If cover is new for old, switch to indemnity

There was a tendency for candidates to make general remarks rather than tailoring their answers to the specific situation in the question. This question was about reducing the cost of the claims made by the policyholder so points such as increasing premiums and purchasing reinsurance did not score. Some of the proposals suggested by the candidates would not be suitable to the policyholder, e.g. reducing the size of the fleet.

Q4 (i) The OEP file considers the probability that the largest individual event loss in a year exceeds a particular threshold …

… whereas the AEP file considers the probability that the aggregate losses from all loss events in a year exceeds a particular threshold.

They are the two bases for the distribution of events usually output from a catastrophe model.

Generally used to price property catastrophe reinsurance.

(ii) The reinsurer can use these event files in a stochastic frequency severity model

to simulate catastrophe loss experience from the cedant in an annual period.

The reinsurance contract terms can be applied to these simulated losses to calculate the resulting recoveries.

The distribution of the annual reinsurance recoveries can then be derived,

along with the expected annual recoveries and the volatility measure being used in the risk loading (e.g. standard deviation).

This distribution can be used to calculate a risk premium.

In part (i) many missed the fact that the OEP considers the **largest** individual event loss in a **year.** Part (ii) was poorly answered with only the strongest candidates recognising that a simulation approach is required to allow for the reinsurance contract terms.

Q5 **Short tail claims**

The Claims Director may be correct, if there is little in the way of claims inflation (or has very little impact) for the likely claim types …

… or are for short periods of cover or claim types that are settled quickly.

Claims with long tails

Although the period between receipt of premium and payment of claim may be short for many claims, there are some heads of damage that may take a considerable period of time for claims to be settled…

…for example, subsidence, (or liability or legal dispute)…

…which may not be discovered for many years, …

… and could then take even longer to settle the claim.

In such cases, the effect of claims inflation could be significant.

Other Causes of Delay

The period of time between receipt of premiums and payment of claims should not be the only time period considered…

…as this ignores the period of time between setting the rates and receiving the premiums…

Allowance should therefore be made for claims inflation over this full period of time if it is likely to be a significant effect.

Approval from regulators can be a cause of delay (e.g. filing of rates)

There will be a need to inflate historical data to the current period (of date of claim)

Annual premium policies could still have delays of 6 months on average

Impacts of not allowing for inflation

Insufficient allowance for inflation may mean that premiums are too low.

This could lead to anti-selection, …

… high volumes of new business …

…creating new business strain…

… strain on resources, …

…reducing profitability, and …

… higher (regulatory) capital requirements.

The country concerned may be experiencing very high rates of inflation and as repairing building damage could easily take three months, inflation could seriously augment the final claim.

Most candidates scored well when describing the long-tail nature of certain perils, however only a few mentioned other types of delay and the impact of ignoring inflation, resulting in answers that lacked breadth.

Q6 (i) Non-proportional reinsurance

covers all losses above certain attachment point/retention

and usually up to a limit.

There will often be a "stability clause" *(accepted "indexation clause"),*

that increases the attachment point and limit in line with a pre-defined index

… to maintain real value of the limit and retention for the reinsurer.

Insurer may share in losses within a layer (e.g. there may be a deductible)

Can cover losses on individual risk (Risk XoL).

Aggregate will cover losses from a single event …

… or from a defined peril.

Aggregate XL can be written in different ways, including:
Excess of a monetary amount …
Excess of a monetary amount, with an interior deductible …
Excess of a percentage (loss ratio) amount …

Cat XL operates at a much higher level of aggregate cover than aggregate XL.

Cat XoL will have an Hours Clause

Can be treaty or facultative.

A limited number of reinstatements may be available, for which there may be a reinstatement premium.

Cover will be for a defined period, usually one year.

It is often bought in layers.

Brokerage fees will normally apply.

(ii) The first layer above the cedant's retention

where a fairly regular flow of claims is expected.

OR moderate to heavy loss activity is expected by the cedant and reinsurer

OR those layers above the cedant's retention where moderate to heavy loss activity is expected by the cedant and reinsurer

Reinsurance of this layer will often include adjustable features to reflect actual underwriting results.

e.g. premiums that increase to some extent with adverse claims experience, profit share etc.

(iii) The layer above $1m is a working layer.

Given it's a working layer, the current reinsurance programme is likely to be expensive.

Reinsurance at such a low level is unlikely to prove to be value for money.

A higher attachment point will reduce the cost of reinsurance…

… which may improve profitability and lead to cheaper and more competitive premiums.

This should increase shareholder value which will be the Finance Director's main objective.

Given it's a large, diversified company the Finance Director may feel it should be able to absorb the losses arising from these claims.

Inflation over the years may mean it's much more of a working layer than it previously was.

As experience has grown in this layer the insurer can price these more accurately.

The company may have expanded significantly over the years (or motor account has expanded), so no longer needs motor reinsurance in order to protect itself at that level.

Cost of reinsurance may be increasing significantly.

Reinsurers may be imposing unfavourable terms for the working layer (e.g. decreased profit share).

Given it's written business for a number of years, the company is unlikely to need technical assistance from reinsurer.

Reduced default/counterparty risk from the reinsurer as a result of a higher attachment point.

A change in the risk appetite of the insurer – it has become less risk averse
Large claims experience may have changed, e.g. lower frequency of large losses due to improved car safety features in the country concerned, or a change in the law relating to alcohol limits for drivers, or reduced speed limits

The company's capital position may have improved so that it is better able to absorb large losses.

Parts (i) and (ii) were generally well answered, though some candidates wasted time giving the pros and cons of XoL in part (i). Most were able to generate a variety of points in part (iii), with the better candidates using the specific details in the question to derive relevant points.

Q7 (i) (a) **Claim Frequency**

The number of claims in a period per unit of exposure.
such as number of claims per vehicle year for a calendar year.

(b) **Credibility**

A statistical measure of the weight to be given to a statistic.

OR An approach that allows for consideration of actual experience as well as external information.

(ii) (a) Mean = Total Claims / Exposure

= (8,420 + 7,750 + 8,450 + 8,400 + 8,060) / (55,505 + 52,257 + 54,928 + 56,124 + 55,053)
= 41,080 / 273,867
= 0.15
= 15%

(b) Based upon an exposure of 50,000 in 2015, the expected number of claims is:

50,000 * 0.15 = 7500

Variance in number of claims = Expected number of claims = 7,500

Therefore the probability of more than 7,600 claims is, using a continuity correction, approximately

$1 - \Phi((7{,}600.5 - 7{,}500) / \sqrt{7500})$
$= 1 - \Phi(1.16047)$
$= 1 - (0.953 * 0.87698 + 0.047 * 0.87900)$
$= 1 - 0.8771$
$= 0.1229$
$= 12.29\%$

(iii) Let $P = 95\%$

$\Phi(y) = (1 + P) / 2 = 97.5\%$

therefore $y = 1.960$ (from tables)

$k = 0.05$

$n_N = y^2 / k^2 = (1.960 / 0.05)^2 = 1536.64$

Therefore we need at least 1,537 claims for full credibility.

The formula for partial credibility is $Z = \sqrt{(n / n_F)}$

Where Z is the credibility
n is the number of claims in the data
n_F is the number of claims required for full credibility

Therefore $0.75 = \sqrt{(n / 1537)}$

$n = 0.75^2 * 1537$

$= 864.56$

Therefore at least 865 claims is required for credibility in excess of 75%

(iv) Sparse data, leading to a need to incorporate additional credibility data

When historical losses have a large error around the underlying expected loss

Lack of availability of additional data, so not possible to use credibility

Ease of computation and/or communication

The level, or method of calculation, may be prescribed by regulators

Where there is uncertainty in the components used to generate premiums

Anything that adds to uncertainty reduces the credibility

How recent the data is, the older it is the less credible it might be.

Well prepared candidates scored highly in parts (i), (ii) and (iii). Some got into difficulty when trying to use the distribution of the claim frequency, rather than the distribution of the number of claims. Part (iv) was generally poorly answered with most giving influences relating to the mathematical calculation of credibility factors even though the question precluded these.

Q8 *(any four from the list below)*

Marine Liability

To indemnify against legal liability to compensate a third party…

…for bodily injury, death, or damage to property…

…arising from the operation of the vessel.

To provide indemnity to the insured against losses made as a result of having to pay compensation to dissatisfied guests.

Perils:

Loss of or damage to passengers' property, including luggage

Bodily injury or death of passengers…

… while on board, boarding, or disembarking the vessel

Bodily injury caused by the vessel

Damage to 3rd party, non-passenger property caused by the vessel

Passenger compensation perils will include:

Outbreak of disease on board

Not fulfilling all promised excursions or visiting all ports

Delays to departure or return

Employers' Liability

To indemnify the insured against legal liability to compensate an employee or their estate…

…for bodily injury, disease, death or loss/damage to property…

…due to the negligence of the employer or other employees.

Perils:

Accidents caused by the negligence of the company or other employees

Exposure to harmful substances

Exposure to harmful working conditions

Marine Property

To insure against loss of or damage to hull and cargo of the vessel.

Perils:

Perils of the sea

Fire

Explosion

Jettison

Piracy

War

Collision

Business Interruption / Consequential Loss

To provide indemnity to the insured against losses made as a result of not being able to conduct business.

BI will cover the same perils as Marine Property

Environmental Liability (may be covered under Marine Liability)

To indemnify the insured against legal liability to compensate third parties…

… as a result of bodily injury, death and damage to property as a result of unintentional pollution for which the insured is deemed responsible.

The costs of cleaning up the pollution and regulatory fines may also be covered.

The insured perils are any incident causing gradual or sudden environmental pollution

This question was generally well answered, however some candidates struggled to articulate their answer and demonstrate to the Examiners a proper understanding of general insurance products and what they cover.

Q9 (i) To understand the effect of premium change at renewal it would make more sense to divide the policies into groups according to the size of increase/decrease

The relationship suggests that by increasing premiums at renewal, the number of policies that renew will increase, …

… and conversely that the number of renewals will drop as premiums are reduced at renewal

This does not make intuitive sense…

… e.g. a customer who paid £300 last year is more likely to renew if their renewal premium is £280 compared to £320.

Regardless of how the policies have been divided into groups, the one-way analysis performed does not allow for correlations that exist amongst the various factors that influence retention…

… for example, premiums may increase with age of policyholder, and older policyholders may be more likely to renew (or made a claim in last year)

… or different lines of business may have been combined in the analysis and the market is soft for one line and hard for another

The ten groups should be homogeneous in terms of probability of renewing, however this seems unlikely here.

There may have been renewal incentives in place which may have made it more likely for those with higher levels of sum insured to renew.

Premium offered may not be the same as the premium charged.

It will be necessary to understand any discretionary discounts

There is no mention about the impact of underwriting acceptance criteria which may influence retention rates…

… for example, it may be more difficult for high risk policies (and therefore high premium) to be accepted by other insurers.

Depending on the number of renewals that happen each month, the four weeks may not give sufficient volume of data to make the results credible.

The seasonality of renewals may also affect the volume of data captured over a four week period.

The company may be offering more competitive premiums than the rest of the market for the higher-risk customers and less competitive premiums for the lower-risk customers. This would help to explain the observed pattern.

(ii) The manager wants to know, all else being equal, how the premium change at renewal will affect the likelihood of renewal.

This requires a multivariate analysis approach.

However a preliminary analysis should be carried out, such as a 1-way and 2-way analysis.

For the four week period, the manager should capture all available and potentially useful factors that could have an influence on the customer's retention.

It should only use factors that will be known at the time of renewal.

One of the factors should be premium change at renewal.

And other price related factors (such as competitiveness)

Multi-way Analysis of Variance (ANOVA) may be used to select the most important factors.

However it is likely that a Generalised Linear Model (GLM) will be used to identify the important factors and how they drive retention behaviour.

The significance of factors should be tested to decide which ones to keep, e.g. using a chi-squared test on change in scaled deviance or graphical tests showing parameter values with error bars

The outcome of the renewal – whether they renewed or not – will be the response in the GLM.

A Binomial error distribution should be used…

.. with a logit link function *(i.e. a logistic regression model).*

Data should be collected for modelling which will be representative of the future.

Sufficient data will be required to ensure the model parameter estimates are credible.

If different classes of business are combined in the data, we should split them out and build separate models for each

Group policies so that the risks within each risk segment have similar characteristics. e.g. contents only vs buildings and contents for household.

The data should be appropriately checked and cleaned where necessary.

And allowance made for changes , e.g. in legislation or market conditions

The model should be fitted, interactions examined, and the model smoothed.

A holdout sample should be used to test how predictive the model is.

And other validation methods should be employed, e.g. plot of actual versus expected grouped into bands by predicted probability of renewal, or gains or lift curves.

Having produced the final model, the model relativities for the premium change factor, and any interactions with it, will show the marketing manager how the change in premium at renewal affects the likelihood of renewal.

(iii) Administration (including business planning/recruitment)

Accounting

Investment strategy and/or performance analysis

Financial control and/or management information

Risk management

Reserving (including unexpired risk assessment)

Experience statistics/analysis

Statutory returns / regulatory returns/solvency requirements

Premium rating and product costing

Capital modelling/allocation

Catastrophe modelling

Reinsurance

Business strategy

In part (i), most picked up the main points, but only the better candidates managed to generate breadth in their answer. Part (ii) was particularly poorly answered, with very few going into any detail and therefore missing out on the many marks available. Part (iii) was standard bookwork and most scored highly.

Q10 (i) Data should be divided into homogeneous subsets.

Data should be analysed with as many subdivisions as possible …

… though sufficient data will be required in each cell for credible analysis.

It may be necessary to gain market acceptance when launching particular risk divisions.

There may already be company standard ways of dividing the data and the merits of maintaining this should be considered

The way in which we express premiums per risk should accommodate distributors' interests.

Adjust subdivided data to allow for changes in insurer's practice

or relevance of past data.

The validity of other risk groupings should also be tested.

Divisions of the data will depend on what is practical given the data captured …

… and what may be permitted by regulation/law.

The claims data included in the subdivisions must be recent …

… including up-to-date case estimates, projected amounts and/or reserves.

It should be based on consistent approaches to claims recording, payment and settlement.

It should include both the number of claims (frequency) and amounts (severity).

An allowance should be made for large losses and cat losses

(ii) The current division seems sensible as you would expect risk to vary by these levels.

For example:

motor accidents more frequent in the cities

motor accident costs higher outside cities

household theft frequency probably higher in the cities

household storm frequency probably higher outside cities

motor theft higher in cities

malicious damage to cars probably higher in cities

The proposal to use population density seems a more sophisticated and objective extension to the current allocation.

However there are valid alternatives to population density.

e.g. property values, distance to motorways, height above sea level, …

and the same measure may not be suitable for all perils

e.g. population density might influence theft claims, but unlikely to be a driver of escape of water claims

A decision however needs to be made on the definition of population density as this requires some kind of partition of the country in the first place.

Four levels of rating area, assuming each will have a large amount of historical exposure, will give credible estimates for the fitted model parameters.

However the four levels will probably each contain a large range of experience …

… e.g. some inner cities will be very low risk, and others will be very high.

The four levels may not be able to partition the spectrum of risks appropriately …

… e.g. some of the inner cities risks may be more similar to city suburbs and vice versa.

Increasing the number of rating areas will therefore help resolve the issues above and lead to more accurate pricing …

… provided that with 50 groups instead of 4 we do not lose too much credibility in our estimates …

… this is where care needs to be taken in deciding the 50 population density bands.

The choice of exactly 50 seems arbitrary
It will also lead to a change in competitive position

and reduce the risk of anti-selection.

which should be seen positively by reinsurers/reduce cost of reinsurance.

and profitability could therefore also increase

Motor and household should each have their own rating area allocation.

A good example of this is a location where subsidence risk is high – subsidence is not a concern for motor and therefore is unlikely to have much influence on the assessment of the level of motor risk for the location.

It will be necessary to check that the IT systems used will be able to accommodate this change, or if there is a cost to make this change …

… and this will have to be checked for all sales channels the insurer uses.

Staff training/internal communications may be needed given the extra complexity

The population density information may not be readily available and/or the cost of obtaining it must be taken into consideration.

The Pricing Manager might want to consider whether separate rating area allocations should be derived for claim frequency and claims severity.

The existence of a correlated factor in the model may limit the benefit of the proposed suggestion

Introducing this may generate large swings in customers' premiums so may want to smooth the transition over time.

(iii) The two main types are distance-based …

... and adjacency-based.

Distance-based smoothing uses the distance between two locations to determine the credibility or influence of neighbouring locations.

The further the points are from the location, the less influence they have and vice versa.

This makes the method insensitive to natural boundaries (e.g. rivers) and non-natural boundaries (e.g. motorways/railways).

Thus distance-based smoothing is ideally suited to weather-related perils.
Distance-based methods are easy to understand and compute.
Distance-based methods make no distributional assumptions.

Distance-based methods can also be enhanced by amending the distance metric to include "dimensions" other than latitude and longitude. For example, including urban density in the distance metric would allow urban areas to be more influenced by experience in nearby urban areas than by nearby rural areas, which may be appropriate.

Adjacency-based smoothing uses information about directly neighbouring locations, regardless of distance.

Neighbours of neighbouring locations will also influence the result.

Therefore the algorithm is iterative and complex to implement.

Adjacency-based methods can incorporate distributional assumptions

Adjacency-based methods allow for natural boundaries (e.g. rivers) and non-natural boundaries (e.g. motorways/railways).

It is up to the user how neighbours are defined so boundaries can be reflected in the smoothing.

Adjacency-based smoothing is therefore more suited to non-weather perils (such as theft).

Adjacency-based smoothing can sometimes handle urban and rural differences more appropriately (for non-weather-related perils)…

… because location codes tend to be smaller in urban areas than in rural areas.

(iv) Employing too low a level of smoothing will capture too much noise (i.e. over-fit)…

… causing distortions and reducing the predictiveness of the model.

Employing too high a level of smoothing will blur the experience so that some of the true underlying residual variation is lost.

Over or under smoothing will lead to inaccurate pricing …

… and anti-selection.

Despite being largely bookwork, part (i) was poorly answered. Part (ii) was also disappointing with few going into the breadth and depth required for a 10 mark discussion question.
Part (iii) was generally well answered, however many struggled with part (iv). The responses suggest that candidates know what spatial smoothing is, but have little understanding of it.

END OF EXAMINER'S REPORT