INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2017

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 2017

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. This paper was more challenging than ST8 papers in recent diets and so an upwards adjustment was applied to every candidate's marks to allow for this. Most candidates demonstrated a good knowledge of the subject areas examined, however questions which required application of this knowledge and tested higher order skills proved more challenging. There was no evidence of time pressure in this paper.

2. 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 application and higher order skills questions, in particular 2, 4 and 9. A common fault was candidates not reading the question properly and making lots of points that were not relevant.

3. 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 55.

Solutions

Q1 (i) Quick and easy to calculate [½]

Unlikely to be appropriate: [1]

no information on exposure/size of fleet [½]

if exposure is growing or shrinking, would need to restate historic experience accordingly [½]

4 years is unlikely to be sufficient experience for these types of risks [½]

in particular, some potential risk events may not have happened in previous 4 years, but should allow for non-zero probability of such risks in pricing [½]

Likewise the observed losses may not reflect the true underlying risks, as the period over which losses have been observed may be much shorter than the return period of the losses under consideration. [½]

cat losses appear to be trending upwards, which straight-average doesn't properly capture; would need to understand reasons for this [½]

increase may be due to changes in mix of business [½]

e.g. change in ships covered, or routes/seas they operate in [½]

or deteriorating experience [½]
or just very prudent case reserves in recent years [½]

no allowance has been made for inflation/trends [½]

the incurred claims may need to be projected to ultimate depending on how they have been defined [½]

It is not clear whether the incurred losses are gross or net of reinsurance – any year-on-year changes in reinsurance need to be allowed for [½]

As it uses data provided by the insured it may have errors or omissions [½]

Does not allow for changes in the external environment including exchange rates [½]

The proposal doesn't appear to allow for changes in CHE [½]

Nor for any possible changes in legislation which may affect the number and cost of claims for catastrophes [½]

Although the fleet is large it may still not be appropriate to base the loading entirely on the fleet's own experience (i.e. consider credibility). We may want to look at catastrophe loadings for similar fleets we insure, or some other form of benchmark cat loading percentage. [½]

The data is only for weather-related catastrophe events and we should consider the possibility of other types of cat events e.g. fire, terrorism [½]

[Max 4]

(ii) Professional cat model is more appropriate [½]

Can take into account changes in coverage/T&Cs/risk management [½]

and changes/advances in weather events/global warming [½]

Cat models allow for infrequent events not in the insured's own data [½]

[Max 2]
[Total 6]

Credit was given in part (i) if the point was made by the candidate in response to part (ii), and vice-versa.

Part (i) was well attempted, with the better answers giving a wide range of features of the proposal.

Most scored well in part (ii). Some gave a detailed description of catastrophe models which was not asked for.

Q2 Using the formulae for the mean and variance of the Gamma distribution given in the Tables:

$$\mu(\theta_i) = E\,[X_i \,|\theta_i\,] = V_i\,/(V_i\,/\theta_i) = \theta_i \qquad [½]$$

$$\sigma^2(\theta_i) = V_i\,(Var\,[X_i\,|\theta_i\,]) = V_i * \left(V_i\,/\left(\frac{V_i}{\theta_i}\right)^2 \right) = \theta_i{}^2 \qquad [½]$$

Similarly, using the formulae for the mean, variance and second moment of the Normal distribution given in the Tables:

$$\beta = E\left[\,\mu(\theta_i)\right] = E\left[\theta_i\right] = 100 \qquad [½]$$

$$\lambda = \text{Var}\left[\,\mu(\theta_i)\right] = \text{Var}\left[\theta_i\right] = 50 \qquad [½]$$

$$\varphi = E[\sigma^2(\theta_i)] = E[\theta_i^2] = Var(\theta_i) + \left(E(\theta_i)\right)^2 = 50 + 100^2 = 10{,}050 \qquad [½]$$

Using the Bühlmann-Straub formula for the credibility factor:

The total number of policies V_i = 20 + 50 + 100 + 150 = 320 [½]

$$Z_i = \frac{V_i}{V_i + \frac{\varphi}{\lambda}} = \frac{320}{320 + \frac{10{,}050}{50}} = 0.6142 \qquad [1]$$

$$X_5 = \frac{S_1 + S_2 + S_3 + S_4}{V_1 + V_2 + V_3 + V_4} = \frac{1{,}000{,}000 + 5{,}000{,}000 + 2{,}500{,}000 + 1{,}200{,}000}{320} = 30{,}312.50 \qquad [½]$$

The Bühlmann-Straub credibility premium per policy is

$$C^{BE} = Z_i X_i + (1 - Z_i)\beta \qquad [½]$$

= 0.6142 * 30,312.50 + (1 – 0.6142) * 100 [½]

= 18,656.5175 [½]

Risk premium for the total losses in year 2018 is $C^{BE} * V_5$

= 18,656.5175 * 250 [½]

= \$4,664,129 [½]

[Total 7]

Many candidates did not attempt this question or only wrote down a few relevant formulae. Those who did arrive at a final answer generally scored most of the marks, though a common error was not recognising that the losses were in $000s.

Q3 Size of company: [½]

larger companies may be more complex, systems may struggle to cope with multiple products etc. [½]

smaller companies may have data systems that are unable to cope with lots of data, or they may not have the resource to manage/maintain data systems [½]

Smaller companies simply have smaller books so will have less data [½]

Age of company: [½]

older companies often rely on older systems that are difficult to amend [½]

newer entrants will have little, if any, historical data [½]

Integrity of systems: [½]

systems that are not secure and/or regularly backed-up may mean data is lost or corrupted [½]

Design of data systems... [½]

companies with weaker checks and controls on data entry will generally have greater data problems [½]

a lack of good documentation could make support difficult [½]

it may be inflexible or difficult to expand, so quality and/or quantity is compromised [½]

Quality of training given to staff inputting data may not be sufficient [½]

Whether or not it writes reinsurance [½]

as reinsurance depends on inputs from cedant insurers, which is very difficult to check [½]

and such business is often low frequency, high severity, making it difficult to build up credible amounts of data [½]

In the case of excess of loss reinsurance, a cedant may fail to notify reinsurers of claims because they don't recognise that they may exceed the retention [½]

Legacy systems: [½]

such systems may not be compatible with current systems in place, making it more difficult/manual to extract historical data [½]

Classes of business: [½]

some classes of business do not lend themselves well to large quantities of good quality data, e.g. it can be difficult to record all required data for classes that are rated using subjective factors (e.g. underwriters opinions) [½]

writing a diverse spread of product types makes it difficult to accommodate all data requirements [½]

For long-tailed classes, it can take many years to build up enough data for analysis purposes [½]

Distribution methods: [½]

selling through multiple distribution channels can make it difficult to build systems to accommodate all data requirements in a consistent manner [½]

and selling through brokers/coverholders can increase the chances of data errors [½]

Poorly designed proposal forms or claims forms could reduce the quality of the data [½]

Brokers/agents may provide bulk figures (bordereaux) for premiums and claims, making underlying policy and claims details hard to access [½]

or on paper, making it too time-consuming to enter it all into the computer system.[½]

Data protection laws applicable may limit data quality and quantity [½]

The costs of infrastructure required to store data may limit what can be stored [½]

Similarly, there may be no expertise available to build and maintain the data [½]

The culture of senior management may mean that the quality and quantity of data is not valued [½]

If the insurer is a captive it may collect less detailed data. [½]

[Max 8]

Responses to this question were varied. A noticeable number of candidates failed to spot the importance of the words "reasons why" in the question, and their answers described the problems with poor data or gave the implications for poor quality data, and therefore did not gain many marks. Better answers had a logical structure to their answer and focused only on "reasons".

Q4 Quantify the cancellation rate: [½]

and how much higher than expected it is (i.e. how outside the margin of error it is) [½]

Investigate how the cancellation rate has changed over the 5 years [½]

and see if the cancellation rate has suddenly increased - may be due to external factors such as economic factors [½]

Review the analysis on which the expected cancellation rate was based. Perhaps there was an obvious error in the method or calculation or assumptions. [½]

Check at what stage customers are cancelling their policy [½]

If policies are cancelled soon after purchase, may indicate problem with sales [½]

if policies are cancelled after 4 or 5 years, it may be because customers are replacing their vehicles and no longer need the insurance [½]

Look at whether any new policies are still being purchased [½]

Find out whether there has been any negative press regarding the product [½]

the cancellation rate could be compared with an industry benchmark if available [½]

Analyse cancellation rate for each car dealership separately [½]

May be issues with sales process in some dealerships [½]

Analyse by any other rating or risk factor [½]

e.g. value of car purchased [½]

or type of car purchased [½]

or any information about policyholder (sex, postcode, age) [½]

Analyse the loss ratio (e.g. over time, by the above rating factors, compare with cancellation rates). It may be much lower than expected, implying product is not meeting customers' needs, leading to a high cancellation rate [1]

e.g. cars have been built to a very high standard [½]

Investigate competitor action – has a competitor launched a new product, or is there a new entrant taking the business? [½]

Investigate the claim rejection rate. Perhaps the policy T&Cs are very harsh and many policyholders are having claims rejected that they expected would be covered. This could result in these policyholders cancelling, and others following suit if news of this spreads. [½]

[Max 8]

This question was reasonably well attempted, but many answers lacked the breadth of ideas required to score highly. Again, a common issue was not giving what was asked for. A number gave the reasons for high cancellation rates, rather than outlining the analyses as requested. Other answers only described general analyses, whereas the better answers focused on analyses to explain the high cancellation rate.

Q5 (i) Method gives a good proxy to a model calculated estimate [½]

It is easy to calculate [½]

Simple to understand/explain [½]

Requires no underwriting expertise [½]

All risks are charged premiums that reflect their past experience [½]

Not data intensive, e.g. only requires totals [½]

Is a form of experience rating, so has the associated advantages – encourages careful underwriting/claims handling by cedants [½]

It allows for expected volumes of business next year [½]

[Max 2]

(ii) Will be sensitive to large or unusual losses to the layer [½]

If the insurer had a number of large claims that didn't quite result in recoveries, it could select against the reinsurer [½]

Using only three years of historical data is unlikely to be adequate [½]

Doesn't work for a new customer of the reinsurer – no data [½]

Similarly doesn't work for recent customers with < 3yrs data [½]

If the insurer had unusually good experience, the premium will be inadequate [½]

Also, there is no opportunity for risk profit / no incentive for cedant to write good risks [½]

If the premium is inadequate this exposes the reinsurer to anti-selection. [½]

The calculation is based on claims paid, whereas it should be based on claims incurred [½]

There is no allowance for reopened claims or partial payments [½]

Some of the claims paid in the last 3 years may arise from policies written prior to that period, so there is a lack of correspondence between A and C [½]

There are no loadings to cover:

- Tax [½]
- Brokerage [½]
- Profit [½]
- Cost of retrocession [½]
- Investment income (negative loading) [½]
- Contingencies [½]
- Expenses [½]

There should be an adjustment for claims inflation [½]

and inflation of the excess point (otherwise the premium will probably be inadequate) [½]

The premium should be based on actual written premium not expected. Therefore an adjustment premium should be paid. (Otherwise this gives the insurer the opportunity to select against the reinsurer by mis-estimating the premium) [1]

The formula uses premium as the exposure measure however a better exposure measure may be available [½]

There is no allowance for any changes that make the past data irrelevant. [½]

E.g. Changes :

- to the insurer's target market [½]
- to underwriting and policy conditions [½]
- to the cedant's business such as geographical mix, perils, exclusions [½]

- in the external claims environment, e.g. economic changes, changes in propensity to claim (on underlying business) [½]
- in RI cover such as attachment points, upper limits etc. [½]
- in the claims handling of the cedant or reinsurer [½]
- in exchange rates [½]
- in risk management of the cedant [½]
- Does not allow for competition/market forces [½]
- Makes no allowance for inuring reinsurance or reinstatements or aggregate features such as deductibles [½]
- Does not allow for other "soft" factors such as relationship with insured/brokers [½]

[Max 6]
[Total 8]

In part (i), most gave that it was easy to calculate and simple to explain/understand, but failed to mention anything else.

Part (ii) was generally well attempted. Those that considered a wide range of different aspects of the formula scored well.

Q6 (i)

With experience rating, the premium depends (at least in part) on the actual claims experience of that risk [1]

... usually in an earlier period, but sometimes in the period covered [½]

Whereas with exposure rating, the premium is based on benchmarks of data that is external to the insured [1]

[Max 2]

(ii) Calculate exposure curve values

A	*B*	*C*	*D = B + C*	*E = D / (max B)*
% of risk MPL (x)	*Total value of losses ≤ (x% of MPL) £000s*	*Total of x% * MPL for all losses > x% of MPL £000s*	*Total accumulated loss cost 1st x%*	*Empirical exposure curve*
10%	5,800	5,000	10,800	43.2%
20%	8,700	5,700	14,400	57.6%
30%	10,900	5,500	16,400	65.6%
40%	13,600	5,200	18,800	75.2%
50%	15,700	5,000	20,700	82.8%
60%	18,600	3,500	22,100	88.4%
70%	19,800	3,200	23,000	92.0%
80%	21,100	2,600	23,700	94.8%
90%	22,400	2,300	24,700	98.8%
100%	25,000	0	25,000	100.0%
110%	25,000	0	25,000	100.0%

Calculating column D [1]
Calculating column E [1]

(iii) Assumptions:

- Sums insured are distributed evenly within each sum insured band, so that each band is represented by the average sum insured for the band [½]
- The same loss ratio applies to each band [½]
- The same relative risk profile (i.e. distribution of SIs) will apply in Year 2 [½]
- The data given is for the middle of Year 1, and hence exactly one year's inflation can be applied [½]
- The (single) exposure curve given can be applied to all the business to be reinsured [½]
- The same relative claim distribution (as represented by the exposure curve) will apply in Year 2 [½]
- The same inflation figure (6%) can be applied to all policies (e.g. irrespective of size) [½]
- There are no features, such as deductibles or stacked limits or reinstatements, that would complicate the calculation [½]
- Immediate points on the exposure curve can be obtained by linear interpolation [½]

[Max 2]

(iv) Appropriateness of assumptions:

Assumption 1 may not be realistic [½]

E.g. for most bands, we might expect more policies with lower than average SIs, because the volume of business in each (equal width) band is decreasing with the size of SI [½]

On the other hand, there may be a significant number of policies at the very top of each band e.g. £200k or £300k, because "round" SI amounts may be popular [½]

We have excluded the £150k to £200k band in the calculation, although some policies above £189k will contribute to the cost of the layer [½]

Also the result may be very sensitive to this assumption. Particularly as the band widths here are quite large [½]

Assumption 2 may not be true if:

- Claims experience varies by SI [½]
- e.g. SI may be a proxy to socio economic group and hence the tendency to claim [½]
- The insurer's pricing basis has cross subsidies by policy size (e.g. large policies subsidising smaller ones) [½]

For assumption 3, the distribution of SI by premium may be affected by the insurance cycle, or any other valid suggestion [1]

For assumption 4, even if the data is not mid-year, it is probably reasonable to assume one year's inflation, but we should check how the dates of the treaty compare with the data we have [1]

Assumption 5 is unlikely to be realistic, unless the business being ceded is quite homogeneous [½]

Ideally we should split the data by risk groups and apply different exposure curves (and loss ratios) to each [½]

However the approach we've used may be the best we can do with the (limited) data we have [½]

Assumption 6 may be rather simplistic [½]

We should investigate whether large claims are affected by inflation differently from small claims. [½]

This may be the case because different types of claims will be affected by different types of inflation by varying extents [½]

Assumption 7 may be rather simplistic [½]

Similarly for assumption 7, large policies may be affected by inflation to a different extent than small ones [½]

However the inflation adjustment may have a relatively small impact as it is only for one year [½]

If there are features of the business or reinsurance that have not been allowed for, this would invalidate assumption 8 [½]

Adjustments would have to be made for such features [½]

E.g. original deductibles have a proportionately greater impact on the original insurer's loss cost than the reinsurer's. So we would expect the presence of original deductibles to increase the reinsurance rate when expressed as a percentage of the original premium [1]

Assumption 9 is probably an oversimplification [½]

Using a straight interpolation could make a difference to the estimated cost because we only have a few values on the exposure curve table [½]

It may be better to fit a parametric curve to the points (or obtain values in more detail) [½]

[Max 4]

(v) Adjustments:

- Profit / ROE / cost of capital loading [½]
- Commission and brokerage [½]
- Cost of retrocession [½]
- Expenses (e.g. admin, claims handling, overheads, levies) [½]
- Allowance for contingencies [½]
- Investment income [½]
- Insurance premium tax, or other sales tax [½]
- Regulatory restrictions on the premium that can be charged [½]
- Allowance for 'softer' factors – e.g. competition, strategy etc. [½]

[Max 2]
[Total 12]

The calculation in the question paper before part (iii) contains an error. The exit point has been taken to be £500k, but this should be £700k deflated to allow for 6% inflation. This error however should not change the answer to part (iii).

Part (i) was quite well answered, although a common problem was not making it clear that experience rating for a risk depends on the experience of that particular risk.

Most of those who attempted part (ii) scored full marks, but a large proportion either did not attempt it or gave no workings for their solution.

In part (iii) most candidates gave one or two valid assumptions but the others they gave were either not valid or important enough to score.

Part (iv) was poorly answered, however most scored well in part (v).

Q7 (i) Sudden and unforeseen accidental phone damage [½]

e.g. cracked screens if mobile phones are dropped [½]

including liquid damage [½]

Electrical or mechanical breakdown of the phone [½]

which occurs outside of the manufacturer's guarantee period [½]

Repair costs (technical)… [½]

not covered by warranty [½]

Temporary phone replacement while phone is repaired [½]

Theft [½]

if the phone or part(s) or accessories are stolen, they will be replaced [½]

within a reasonable time frame e.g. 24 hours [½]

Loss of phone [½]

if the phone disappears in circumstances that do not involve theft and its whereabouts remain unknown [½]

Costs incurred due to unauthorised use of the phone [½]

e.g. calls, messages, downloads and uploads with airtime capability [½]

whilst not barred by the airtime provider [½]

provided the claim for theft is valid [½]

Cover likely to include phone accessories such as charging device [½]

Third party liability cover may also be included [½]

Cover for protection of data due to accident/theft/hacking etc. [½]

[Max 5]

(ii) Personal liability cover [½]

this covers the costs for which the insured is legally liable [½]

if they caused a loss or damage to another's property due to their negligence (going to extreme lengths to catch virtual monsters) [1]

for injuries to others due to playing the game, e.g. stepping into the road while looking at your phone and causing a cyclist to swerve into a bus [½]

this may be covered under a home insurance policy [½]

Identity theft cover [½]

since a huge amount of personal data is stored in the game, players are at risk of being hacked [½]

this provides reimbursement to crime victims for the cost of restoring their identity and repairing credit reports [1]

Personal accident / Bodily injury cover [½]

provides compensation in case of death or disability following accidental injury solely as a result of playing the game [½]

Similarly medical cove [½]

for when player is injured playing the game [½]

e.g. incurring injuries while hunting for virtual monsters [½]

Compensation for the loss of any virtual monsters / playing credits (e.g. in case of a hacking) [½]

The extra cover should be available worldwide [½]

Cover for fines for unintentional civil trespassing or legal costs relating to disputes over trespassing [½]

[Max 4]

(iii)

A form of live-advice that helps claims adjusters know where to point their phone's camera to take photos and videos of car or home damage [1]

giving a real-time comparison to the "before" and "after" state [½]

Can be used to help explain to claimants how their claim will be handled/resolved [½]

May also be used to help prevent accidents [½]

... e.g. by scanning a home or workplace and alerting the user to potential risks [½]

Insurer can team up with a third party to devise gamification methods of encouraging safer behaviour [½]

Marketing policies by engaging with policyholders [½]

e.g. showing policyholders what risks they face in real time [½]

Encourage policyholders to turn over automotive telematics data in exchange for rate adjustment by ensuring the reward is attractive enough [1]

or insurers could simply purchase user data en masse from providers who have developed games and other tools to sweep it up [½]

Could be used to assess flood risk at property level by overlaying flood maps/ models at particular properties (modelling catastrophes), or other example [½]

[Max 3]
[Total 12]

Parts (i) and (ii) were generally well answered. Better answers gave a wide range of different, valid benefits.

Part (iii) was well attempted and candidates generated a wide variety of possible uses.

Q8 (i) Assumptions:

Claims are made evenly through the year [½]

Exposure changes evenly through the year [½]

Inflation continues at 2% p.a. [½]

No change in policy terms over the period [½]

The development %s given are for paid claims, not reported incurred [½]

The table below shows annual burning costs inflated to year 6 figures

Year	*Exposure*	*Mid-year*	*Paid*	*% developed*	*Ultimate*	*Inflation*	*Inflated*	*Annual BC*
1	99	112	6,959	0.98	7,101.02	1.02^5	7,840.10	70.00
2	125	139	9,038	0.92	9,823.91	1.02^4	10,633.72	76.50
3	153	180	12,111	0.85	14,248.24	1.02^3	15,120.34	84.00
4	207	216	14,481	0.75	19,308.00	1.02^2	20,088.04	93.00
5	225	235	15,350	0.65	23,615.38	1.02	24,087.69	102.50

Mid-year exposure [1]

Ultimate [1]

Inflated [1]

Annual BC [1]

Annual BC has increased steadily over last 5 years [½]

At a rate of roughly 10% p.a. [½]

Assumption:

Assume this continues into year 6 [½]

Year 6 burning cost (risk) premium = ½ × (245 + 275) × 102.50 × 1.1 = 29,315€ [1]

Other variations are possible but need to be clearly justified.

[Max 7]

(ii) Existence and amount of large/catastrophe claims [½]

Useful to have a breakdown of the claims by peril/heads of damage [½]

Information about changes the insured may have made that could affect the risk [½]

e.g.

- Experience of drivers [½]
- Nature of items delivered [½]
- Increased driver training etc. [½]
- Changes in risk management [½]

Territories or countries covered, [½]

and claims and exposure split by these [½]

Information about any changes in T&Cs/excesses/limits in the past [½]

and how these might differ in the future period of cover [½]

Whether the same insurer has covered the fleet over the past 5 years, as different insurers could have different T&Cs, and different levels of scrutiny in underwriting and claims handling [½]

Regulatory or legislative changes that may have impacted past experience [½]

or likely to impact future experience [½]

Given the large year-on-year increase in burning cost would want to thoroughly check data and assumptions [1]

and compare with similar books of business and/or industry data, [½]

including for example changes in economic conditions over time, … [½]

and gaining insight from experienced underwriters in the market [½]

Changes to claims handling processes/controls that may impact the ultimate cost of claims [½]

Whether the insurance contract contains any non-standard terms [½]

Changes in propensity to claim / social trends. [½]

[Max 5]

(iii) A decision needs to be made as to whether the large claim should be included and the calculation repeated [½]

or whether it should be excluded and treated separately [½]

It may be decided to ignore it completely if the loss is not expected to recur in year 6 [½]

… e.g. for a change in contract terms or other legislation [½]

If the claim is included, it needs to be decided whether to truncate at a certain cap … [½]

and spread the excess over the cap … [½]

with an assumption about how frequently such losses are likely to occur … [½]

which may require external data as own experience unlikely to be sufficient [½]

Large claims are likely to take longer to settle … [½]

and may incur higher rates of inflation … [½]

than that assumed in part (ii) so adjustments will probably be needed for this [½]

[Max 4]
[Total 16]

Part (i) was generally well attempted, with a good number scoring most or all of the marks. Those that did not look for a trend in the annual burning cost did not score as well.

Answers to part (ii) were mixed. Many missed the fact that the question was about the risk premium and gave lots of points that were not relevant.

Part (iii) was quite well attempted, although only a few gave a sufficient number of different ideas to approach full marks.

Q9 (i) Most questions asked at point of sale do not directly measure the true risk [1]

as the true risk cannot readily be quantified, [½]

e.g. how safely does the insured drive, [½]

can change over time, [½]

e.g. the times of the day when the car is usually used [½]

and may be impossible for the insured to define at point of sale [½]

e.g. annual mileage for the forthcoming period of insurance. [½]

The proxies used may be poor measures of the actual risk [½]

for example, vehicle value is likely to represent the amount the insured paid for the car [½]

and only loosely relates to the cost of repairs or replacement. [½]

The effectiveness also depends on whether the proxy is a known factual quantity / is measurable / verifiable [½]

for example, address of the insured … [½]

however, may have little relationship with where the car spends most of the time on the road. [½]

Proxies may also be manipulated by the insured in order to reduce their insurance premium [1]

for example, understanding the estimated number of miles [½]

for example, giving an experienced driver as the main driver even if the car is mostly used by younger, less experienced drivers. [½]

The effectiveness of a proxy will also depend on the extent to which it overlaps with other existing factors [½]

for example, the factor "years held licence" is strongly correlated to "driver age" and "no claims discount" for younger drivers [½]

so is only effective in identifying older, less experienced drivers. [½]

Some factors may not be acceptable to policyholders/regulators e.g. gender [½]

Telematics may be considered more effective as a proxy than many others [½]

[Max 6]

(ii) An allowance will have to be made for claims incurred but not reported [½]

The data needs to be adjusted for changes in the mix of business over time [1]

and put onto the same mix as that expected to be written in six months' time [½]

for example, the insurer could expand into other territories or take on risks that it previously avoided [½]

Adjustments are required for any changes in the insured policy [1]

e.g. changes to what is covered [½]

changes in any limits [½]

introduction or change in compulsory excess (accept ground up) [½]

and this may require inflationary adjustments to the excess [½]

and/or knowledge of claims that previously would not have incurred a cost but now would (and vice-versa) [½]

Adjustments will be needed for any regulatory changes that may have been brought in over time [½]

for example, introduction of or changes to knock-for-knock agreements [½]

or changes to speed limits, seat-belt rules, or how strictly existing rules are enforced [½]

Large claims will probably be removed and treated separately [½]

Changes in the claims handling process will also lead to adjustments in the claim frequency estimates [½]

for example, changing loss-adjustors used may cause a greater number of claims to be paid [½]

Any changes in the insurer's internal rules governing when a claim record should be set up following an alleged loss by a policyholder [½]

Adjustments will also be required if the insurer has modified its approach to detecting fraudulent claims [½]

Adjustments for underlying trends over time [½]

e.g. in propensity to claim, or attitudes towards drink driving or crime rates [½]

Consider treatment of nil claims [½]

Unusually heavy (or light) experience e.g. due to unusually bad weather causing high claim frequency [½]

[Max 5]

(iii) The main purpose of offsetting is to fix the relativities (or the levels) of a factor [1]

to a set of values [½]

that are different to those that would be obtained were the factor not offset. [½]

This is typically needed when predefined or published levels of a factor are used [1]

e.g. no claims discounts. [½]

Offsetting of certain rating factors may be needed to comply with regulation [½]

Offsetting may also be used to set the relativities of a factor where there is little or no historical data available [1]

for example introducing a new rating factor [½]

using external data or personal judgement to determine the relativities. [½]

It can also be used to remove aliasing from the data. [½]

Offsetting may be used to override counter-intuitive model results on behavioural factors that policyholders self-select such as protected NCD status [½]

Offsetting is also used when a hierarchy of models is required. [½]

This is achieved by fitting an initial model, offsetting all the values [½]

and fitting a second model using these offsets to understand residual patterns in the data. [½]

Model assessment is also possible with the use of offsets. [½]

A model is fitted to a training sample of the data and the model offset. [½]

A model is then fitted to the test sample, applying the offsets from the first model. [½]

This second model can be checked to see whether the offsets are applicable to the test data [½]

and whether other non-offset factors are statistically significant. [½]

[Max 7]

(iv) **First chart:**

Average proposed premiums are lower for geographic rating areas 13 and below [½]

whereas they are higher for rating areas 19 and above [½]

with the exception of rating areas 22 and 24, but there is little exposure for these areas [½]

This suggests that rates have been reduced for lower rating areas (and vice-versa for higher rating areas) [½]

but this is a one-way plot and these plots should be considered for every rating factor. [½]

The reduction in premium occurs where most of the exposure is [½]

so the proposed premiums will be more competitive on average than the current premiums [1]

possibly reducing the overall profitability [½]

and we would expect to grow exposure in the lower geographic rating areas [½]

and reduce exposure in the higher rating areas. [½]

This however depends on the distribution of geographic rating area in the market. [½]

For greater insight it would be useful to plot average competitor premiums too (subject to competition legislation). [½]

It would also be useful to analyse elasticity of demand by geographical area to assess how volumes are likely to be affected in the different geographical rating area by the proposed changes. [½]

Second chart:

The distribution is fairly symmetric [½]

However more than 50% of the policies are to the left of the category 0.95 – 1 [½]

which means that on average the proposed premiums are more competitive / reduced [½]

and so agrees with that observed in the first chart. [½]

It is clear that the change in premium depends on the vehicle grouping – [1]

Lower vehicle groupings are more likely to have lower proposed premiums than current premiums [½]

Higher vehicle groupings are more likely to have higher proposed premiums than current premiums [½]

General comments:

Increases in rates are proposed for groupings with lowest exposure – this may be valid but due to potential lack of credibility, it may be worth additional investigation [½]

given how large some of the proposed premium changes are, we might want to implement them in stages. [½]

[Max 5]
[Total 23]

Part (i) was poorly answered. Most answers talked about how good the rating factors might be as risk proxies and mentioned nothing else about their effectiveness.

In part (ii), the question was about claim frequency but many spent time discussing the cost of the claims. The question also asked for adjustments, whereas many candidates went into detail describing various analyses that could be carried out.

Part (iii) was not well answered. Only a very high level of knowledge and understanding was displayed by a few candidates.

Part (iv) was reasonably well attempted. Those that scored well considered both charts together and discussed the overall impact. A few candidates appeared to confuse the first chart for a lift curve.

END OF EXAMINERS' REPORT