# INSTITUTE AND FACULTY OF ACTUARIES

# EXAMINERS' REPORT

April 2022

## SP8 - General Insurance Pricing
## Specialist Principles

**Introduction**

The Examiners' Report is written by the Chief 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 Specialist Advanced (SA) and Specialist Principles (SP) 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.

Sarah Hutchinson
Chair of the Board of Examiners
July 2022


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

The aim of this General Insurance: Pricing Principles 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.

Subject SP8 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.

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 SP8 examination.

As well as pricing techniques, SP8 also covers the workings and use of reinsurance products, so candidates should also expect the examiners to set questions on these aspects.

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.

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.

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

## B. Comments on *candidate performance in this diet of the examination.*

The paper was generally well attempted, but in some questions candidates did not perform as well as expected as did not answered the question asked or did not tailored solutions to the specific information or situation given. Responses to knowledge based questions were generally good. Questions that tested application and higher order skills proved challenging, and candidate responses to these questions often lacked the breadth and detail needed to score well. There was some evidence that candidates spent more time on shorter questions and may not have left enough time for the longer questions. A common theme that came through was candidates not paying attention to the command verbs.

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.

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## C. C. Pass Mark

The Pass Mark for this exam was 53
319 presented themselves and 138 passed.

## Solutions for Subject SP8 - April 2022

### Q1

(i)

| | |
|---|---|
| Theoretical may use factors that cannot be used in actual due to regulatory restrictions | [½] |
| or due to practical limitations | [½] |
| Theoretical may differentiate between certain levels of a rating factor that would not be possible in actual e.g., for regulatory reasons such as married vs civil partnership | [½] |
| Actual may follow published discounts (e.g. NCD) which are not the same as theoretical | [½] |
| Cross subsidies may exist between different products or channels | [½] |
| Special sales initiatives, e.g. 12 months for the price of 10 | [½] |
| Rate capping/collars at renewal may prevent theoretical premium from being charged | [½] |
| Discounts to theoretical may occur in order to target a particular segment of the market or increase market share or as a loss leader (to cross sell other products) | [½] |
| or more generally to make the rates more competitive | [½] |
| Loadings to theoretical may occur in order to reduce exposure in a particular segment of the market | [½] |
| Loadings to theoretical may occur where the actual is competitive in order to reduce "money left on the table" | [½] |
| To allow for differing price elasticity of different rating segments / theoretical price may be unacceptable to customers | [½] |
| Actual might account for softer factors like underwriter's judgement | [½] |
| Market conditions / insurance cycle e.g. may be able to charge more than the theoretical premium in a hard market | [½] |
| There may be regulatory min/max on the actual premium | [½] |
| Availability of product in the market, may be a niche product making it possible to charge more than the theoretical | [½] |
| Company brand value may enable actual to be greater than theoretical | [½] |
| Assumptions/models used to calculate theoretical premium may have changed since policy underwritten | [½] |
| Cost of reinsurance differs from assumed theoretical cost, so associated loading in premium is different | [½] |
| Margin for currency risk / Exchange rate movements (if sold internationally) | [½] |
| Random fluctuations / errors in the calculation | [½] |
| Rates altered to maintain/enhance relationship with broker | [½] |
| Inertia pricing (in countries where this is still allowed) | [½] |
| Due to difference between actual and expected exposure (e.g. in employers' liability) | [½] |

[Marks available 12, maximum 3]

(ii)

| | |
|---|---|
| Simple measure that should be easy to calculate | [½] |
| Can be monitored over time | [½] |

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Enables different products/strategies to be compared [½]
Indicates at a high level where pricing action may be required [½]
Indicates where profits may be excessive / poor value for money [½]
Assumes that the theoretical premium is "correct" [½]
Is based on estimated claims experience rather than actual experience [½]
A prospective measure - don't need to wait for actual claims experience before assessing profitability [½]
Ignores actual volume of business written [½]
Relies on assumptions/data/estimates which will need to be updated regularly, and will affect historical ratio values too [½]
May be hard to explain such changes in the assessed profitability to management or non-technical colleagues [½]
Is better at assessing whether rates are adequate rather than appropriate, e.g. it may be appropriate to have AP < TP due to competition [½]
May help to identify ethical problems with the rating approach, e.g. consistently higher AP/TP ratio for loyal elderly customers. [½]
May help in identifying trends in profitability and setting rates appropriately at different stages of the insurance cycle [½]

[Marks available 7, maximum 3]

**[Total 6]**

*Part (i) was generally very well answered and some candidates gave more points than needed to score full marks.*

*In Part (ii) those who were better prepared understood the command verb "Comment" and generated a wider breadth of points.*

**Q2**

E(N|A) = 7 [½]
E(N|B) = 5 × 0.65 = 3.25 [½]
$\beta$ = 0.5×7 + 0.5×3.25 = 5.125 [½]

Var(N|A) = 7 [½]
Var(N|B) = 5 × 0.65 × (1 - 0.65) = 1.1375 [½]

$\phi$ = 0.5×7 + 0.5×1.1375 = 4.06875 [½]
$\lambda = 0.5\times7^2 + 0.5\times3.25^2 - 5.125^2 = 3.515625$ [½]

$\phi/\lambda$ = 4.06875/3.515625 = 1.15733333333 [½]

Applying the formula for the credibility factor:

$$Z_i = \frac{V_i}{V_i + \frac{\phi}{\lambda}}$$
$$= \frac{3}{3+1.157333333333}$$ [½]
$$= 0.721616421$$ [½]

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The Bühlmann-Straub credibility estimate is

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

4.313182 = 0.721616421 × $\frac{4+5+x}{3}$ + (1 - 0.721616421) × 5.125 [1]

x = 3 [½]

**[Total 7]**

*Most candidates were able to calculate the expected values and variance but many struggled to proceed in a meaningful way with the solution. A number of candidates did get fully correct answers.*

**Q3**

(a)

Historical large losses will have to be analysed separately [½]
If there are significant numbers of large losses, a frequency-severity analysis could be carried out. [½]
However, this "small" insurer may not have sufficient large loss data to be credible [½]
Fitting a distribution to the individual losses. [½]
Outliers will have to be removed or their return period adjusted. [½]
Exposure curves (either internal or from benchmarks) might help if experience is scant [½]
though Marine industry curves are not very well established. [½]
The reinsurer could have their own benchmark large loss loading [½]
or use the loadings from another similar cedant. [½]
alternatively, could credibility-weight the cedant's large loss experience against the benchmark loading. [½]
Allow for effect on expected large loss experience of any inuring reinsurance [½]
or retrocession [½]

(Marks available 6, maximum 2)

(b)

This could be incorporated by discounting the future expected premiums and claims [½]
based on expected payment patterns [½]
using an expected investment return [½]
returns could be based on the whole portfolio or specific to the class of business and cedant country [½]
The choice of discount rate should reflect the investment return expected on the assets in which the reinsurer holds the reserves and capital required for the ceded business [½]
or a risk-free rate of interest could be used [½]
The investment return could also instead be incorporated through a higher ceding commission [½]
or by adjusting other elements in the pricing. [½]
Investment return is not expected to be a significant component for Marine Hull and Cargo. [½]
due to the short tail nature of claims. [½]
However, builder's risks and liability business could have significant returns. [½]

(Marks available 6, maximum 2)

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(c)
Business should be analysed in different segments [½]
and then the segments combined based on their expected future proportions. [½]
However, this may leave insufficient data in each segment [½]
with claims ratios being very volatile or frequency-severity analysis difficult [½]
especially because the insurer is small. [½]
If the change in mix is occurring gradually, it may appear as a trend, in which case it
may be appropriate to project the trend forward [½]
Data from prior years before the change might have to be discarded if it's difficult
to adjust [½]
Subjective and qualitative adjustments can be made [½]
or rely more on exposure based pricing. [½]
(Marks available 4½, maximum 2)

(d)
Expected profit commission is impacted by both expected claims [½]
and its volatility [½]
Fit a distribution to claims [½]
which in turn gives us a distribution of profit commission. [½]
Underwriters often use scenarios to test the impact of a profit commission [½]
or use judgement to choose a corresponding lower commission. [½]
The reinsurer will often have requirements related to:
A probability of making a loss of no more than x%
A probability of making a loss of y% or more of no more than z%
A combination of the two
and so will adjust commissions payable so that these requirements are met. [1]
[Marks available 4, maximum 2]
[**Total 20**]

*This question was reasonably well attempted, with sensible suggestions for each of the four features. Better answers were tailored to the specifics of the question - marine quota share. Those that described the features more generally, and without relating them to pricing, tended to score less well.*

**Q4**
(i)
The pricing actuary could simply take the factors out [½]
however the model will be less predictive, [½]
leading to anti-selection/unprofitable rates [½]
though may be all that is possible given short notice [½]
The actuary may want to seek alternative factors that may be used in their place [½]
or other factors in the GLM may be able to pick up some of the residual variation
explained by the removed factors [½]
The actuary should ensure that this does not lead to indirect "discrimination",
e.g. don't replace gender with title (e.g. Mr, Mrs, Miss) [½]
If not re-fitting the model will have to adjust prices so that 'market average' levels for
the disallowed factors are used. [½]
[Marks available 4, maximum 2]

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(ii)

The price comparison website will have to remove questions pertaining to the factors that can no longer be used [½]
and rating engines they use will have to be fixed so that they don't use these factors [½]
As the engines won't receive all the data they need, they may have to be recalibrated to ensure rate adequacy [½]
The engines may have to be changed so that not receiving certain data items does not result in a non-quote [½]
or will alternatives/defaults have to be provided instead? [½]
Given short notice, insurers may have to use inferior pricing models which will lead to anti-selection / mix risk [½]
this will lead to higher premiums overall (due to required margins for uncertainty), or lower profits [½]
Possible confusion around whether quotes made today but due to start in three months' time will be valid. [½]
Likewise for renewal notices already sent [½]
If not, insurers will have a huge task to contact all customers with new quotes [½]
This may result in a lot of churn [½]
May result in a lot of customer queries and high call volumes may lead to complaints if response times are slow / reputational risk [½]
Regulator will fine for no or inadequate action [½]
If fixes are required in short time, insurers may have to pay substantial IT costs which will result in higher premiums [½]
Increased expenses for motor insurers associated with changing proposal forms and possibly retraining staff [½]
Motor insurance brokers will similarly face costs, e.g. of updating systems, retraining staff, etc [½]
Removal of certain factors may attract business the insurer would previously not have accepted [½]
Some customers will pay more and some will pay less [½]
Likely to increase residual heterogeneity in rating cells. [½]
Insurers may try to address this, e.g.by greater use of experience rating, e.g. more sophisticated NCD scales [½]
or, pushing for greater take-up of telematics. [½]
Insurers may need to find other means to attract better risk customers (e.g. via marketing / distribution) [½]
May make motor less attractive to insurers which may affect strategic decisions - some may pause sales or shift to other lines of business [½]
leading to reduced competition in the market / make market less competitive [½]
Some insurers e.g. specialist/niche may need to change their target market / business model if it was based on the factors that are now not allowed. [½]

[Marks available 12½, maximum 6]

**[Total 8]**

*In Part (i) candidates performed reasonably well. Only the best prepared candidates scored better by "discussing" the actions as requested in the question.*

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*Part (ii) was largely well attempted by candidates, however in many cases answers were narrow in scope and many did not consider some of the more practical impacts, such as having to change question sets on sales systems. Those that gave a wide range of different points generally did best.*

**Q5**

(i)

Pricing issues:

| | |
|---|---|
| The aggregate limit over the full term may be less than the sum of the annual limits | [1] |
| Correlations between consecutive years | [1] |
| Underwriting or accident year coverage basis | [1] |
| A new case law, regulation or business practice might impact multiple years | [1] |
| The socio-economic environment and the way in which this might change over the term of the multi-year contract | [½] |
| Risk of reinsurer failing | [1] |
| Whether and how the exposure could change over the term | [½] |
| Uncertainty over future claims inflation | [½] |
| Whether it is possible to adjust future premiums based on loss experience to date | [½] |
| Or adjust reinsurance terms | [½] |
| Stage of the reinsurance cycle and expected rate change over the years | [½] |
| Potentially lower volatility, hence a different calculation of profit loading | [½] |
| Retrocession cover for this program/class of business | [½] |
| The appropriate development pattern to use | [½] |

[Marks available 9½, maximum 6]

(ii)

Reasons:

| | |
|---|---|
| A participation clause may be in place, with the cedant sharing the loss experience | [1] |
| There may be commercial/strategic considerations | [½] |
| e.g. the reinsurer may choose to offer a discount in order to gain a larger market share | [½] |
| In a particular reinsurer, capital allocation may favour certain features | [1] |
| Market cycle effects: | [½] |
| e.g. in a hard market, the underwriter is taking advantage and writing for super-profits | [½] |
| The lead underwriter might have made a different assessment of the risk based on their own knowledge and experience. | [½] |
| Sometimes there will be significant terms and conditions or other more qualitative features of the risk that are factored in to the market rate | [½] |
| May reduce workload as there would no longer be annual renewals | [½] |
| Availability / cost of retrocession may not be as assumed in the technical rate derivation | [½] |
| Regulations may constrain prices that can be charged (and regulators may be interested in multiyear RI contracts due to wider concerns about Financial Reinsurance) | [½] |
| Desire to maintain good relationships with reinsurance brokers / cedants may influence what is charged | [½] |
| Prudent pricing to reflect extra uncertainty associated with a longer term | [½] |

[Marks available 7½, maximum 4]

[**Total 10**]


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*Part (i) was generally well attempted but in many cases candidates found challenging to score particularly well. Candidates should consider how product features may be changed and how these could be reflected in pricing.*

*Part (ii) Candidates tended to do better in this part. Those answers that gave a wide range of different ideas generally scored well.*

**Q6**

(i)

| | | *½ per row* | | | *½ per row* | | *½ per row* | | *½ per row* |
|---|---|---|---|---|---|---|---|---|---|
| Property | Sum Insured ($) | Ground-up Loss Cost ($) | Attachment ($) | Exit ($) | Attachment | Exit | Exposure curve attachment | Exposure curve exit | Loss cost to layer ($) |
| A | 100,000 | 1,000 | 150,000 | 750,000 | 100% | 100% | 100% | 100% | 0 |
| B | 300,000 | 3,000 | 150,000 | 750,000 | 50% | 100% | 80% | 100% | 600 |
| C | 600,000 | 6,000 | 150,000 | 750,000 | 25% | 100% | 75% | 100% | 1,500 |
| *D | 1,000,000 | 10,000 | 150,000 | 750,000 | 15% | 75% | 60% | 90% | 3,000 |

[8]

**Alternative bottom row if assume $600k is an upper limit (i.e. the exit point):*

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| D | 1,000,000 | 10,000 | 150,000 | 600,000 | 15% | 60% | 60% | 84% | 2,400 |

(ii)

As the loss cost calculated above assumes unlimited free reinstatements, if only 1 reinstatement is allowed the loss cost will be lower. [1]

The exposure curves usually don't split between frequency and severity [½]

hence it will be difficult to calculate such an impact. [½]

If the events are likely to be low frequency-high severity, the impact of limiting the reinstatements will be small [½]

If the reinstatements are not free, the reinsurer will benefit from reinstatement premium which the pricing tool should account for. [½]

[Marks available 3, maximum 2]

[**Total 10**]

*Part (i) Many fully correct answers for this part. Those that made an error scored quite well if their working was clear.*

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*In Part (ii) candidates that correctly identified that the loss cost would be lower, but only very well prepared candidates gave sufficient detail to get the full 2 marks.*

**Q7**

(i)

| | |
|---|---|
| Premium rating / underwriting | [½] |
| administration | [½] |
| accounting | [½] |
| statutory returns | [½] |
| investment strategy | [½] |
| management information / financial control | [½] |
| risk management | [½] |
| reserving | [½] |
| performance monitoring / experience statistics | [½] |
| marketing | [½] |
| capital modelling | [½] |
| catastrophe modelling | [½] |
| reinsurance placement and recoveries | [½] |
| asset liability management | [½] |
| fraud detection | [½] |

[Marks available 7½, maximum 4]

(ii)(a)

| | |
|---|---|
| B may not ask the same rating questions as A | [½] |
| e.g., A may use 'gender' as a rating factor, but B may not (e.g. due to different laws applying) | [½] |
| Question responses may be captured/held at different levels of granularity | [½] |
| e.g. one company may use a larger number of vehicle groupings than the other. | [½] |
| Perils may be defined or categorised differently | [½] |
| for example, one company might separate out 'theft of vehicle' from 'theft from vehicle' and the other may not. | [½] |
| B's history may not be as complete as A's, e.g. may get deleted after a number of years | [½] |
| May need to make assumptions relating to incomplete data, which may be difficult, or turn out to be inappropriate. | [½] |
| Company B's data may contain many errors that need to be dealt with before integration, or may go unnoticed, leading to errors in the new rating models. | [½] |
| Data is likely to be coded differently, so levels will have to be mapped | [½] |
| Data may be held in different formats which are not compatible | [½] |
| e.g. dates could be number of days from a point in time, rather than actual date | [½] |
| The data may be in different file formats or structures making it difficult to combine | [½] |
| The data from company B may not comply with data protection laws applying to company A requiring it to be cleaned/amended (e.g. because they are in different jurisdictions). | [½] |
| B's data may include externally sourced 3rd party data which A has no licence to use | [½] |
| Claims data may not be held in such a way that allows development patterns to be identified | [½] |
| Claims data may be held in such a way that fees cannot be separated | [½] |

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May be inappropriate to integrate data without adjustment if level of prudence in case estimates differ [½]
or there are differences in coverage provided by the insurers [½]
Similarly, if one insurer settles claims more quickly, development patterns could be distorted if the data is integrated without adjustment. [½]
Insufficient/inaccurate documentation to enable data to be merged with confidence [½]

(ii)(b)
A may be able to start rating on factors that B used and A didn't, if it finds these are good at differentiating risk [½]
A may be able to get assistance from 3rd parties to help populate some of the data items that may be missing [½]
Where B does not ask certain rating factors, A could set the level to unknown and proceed with modelling, although this could introduce aliasing [1]
A may want to apply some form of credibility weighting whereby A's experience is given more weight than B's [½]
A should investigate if data is available on source systems at more granular levels, and incorporate this into the pricing data set where possible [½]
although would have to weigh up the time and cost of obtaining this over the benefit [½]
A will have to carry out a data mapping exercise [½]
A may be able to use its own development factors if the mix of claims is similar between A and B [½]
A may also be able to make assumptions about which claims incur fees and typical costs [½]
Due to some uncertainties arising from lower granularity of data and or incomplete claims information, a risk margin may be added to the premiums [½]
Need to check data from B for compliance with relevant data protection laws, and clean/delete/amend where necessary to ensure compliance [½]
Contact company B to request a data dictionary, to aid necessary adjustments [½]
Could adjust case estimates on policies from B if they are systematically more/less prudent. Might reassess larger claims but base adjustments for smaller claims on more broad-brush assumptions [½]
Consult with claims teams to determine adjustments required for differences in claims handling practices (e.g. affecting speed of settlement) [½]

[Marks available 18, maximum 8]
[**Total 12**]

*Part (i) was well answered overall.*

*Part (ii)(a) was generally answered well.*

*Part (ii)(b) appeared more difficult as some suggestions were not clearly enough explained to score, or simply did not address the difficulties outlined.*

**Q8**
(i)
Error distribution: Poisson [½]
Link function: Log [½]

(ii)

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Each peril will have different rating factors/drivers of frequency [½]
e.g. car security features will strongly affect theft risk but not accidental damage risk. [½]
It is easier to fit the models by splitting into different perils [½]
Frequency trends for different perils will change at different rates/times and this will be lost by modelling them together [½]
Each peril makes a different contribution to the overall frequency and so modelling separately allows them to be appropriately weighted [½]
It allows performance on individual perils to be monitored over time i.e. actual vs expected [½]
It may enable certain elements of cover to be removed or adjusted more easily if products are modified e.g. windscreen cover becomes optional [½]
If rest of market is peril rating, not doing so could very well lead to anti-selection [½]
May enable outliers (by peril) to be identified more easily, which might be hidden when all perils are modelled together. [½]
Similarly, if claims are capped before modelling (e.g. because we want to look at large losses separately), different large loss thresholds may apply to different perils, so easier to model separately [½]
Regulator may require perils to be modelled separately. [½]

[Marks available 5½, maximum 3]

(iii)
Difference in scaled deviance = 21.09 [½]
Degrees of freedom = number of levels in factor - 1 = 6 [½]
$\chi_6^2(0.5\%) = 18.55, \chi_6^2(0.1\%) = 22.46, \chi_6^2(5\%) = 12.59$ [½]
Chi-square test suggests factor is statistically significant [½]
The AIC for the model with the factor is lower than the one without, which also suggests the factor is important [1]
the chart is not totally conclusive but does suggest that "single" is lower than the other levels [½]

[Marks available 3½, maximum 3]

(iv)
It would be better to group some of the levels together [½]
for example Divorced and Married are not significantly different, similarly Divorced and Co-habiting [½]
Divorced and Separated have different relativities but are essentially the same thing - these should also be grouped [½]
The error bars indicate high uncertainty around the correct value for 'separated', probably due to the low exposure. [½]
The low exposure for 'separated' is another reason why it would be advisable to group it. [½]
How can customers distinguish their marital status between Divorced, Separated and Single? Customers may not know how to answer this question [½]
Single has a lower relativity than Married - will customers who get married mid-term be charged additional premium? [1]
this could be difficult to explain to customers [½]
There is no obvious intuitive reason why accidental damage claim frequency should be related to marital status. [½]

(maximum ½ mark from the next three points)

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possible that marital status is correlated with the number of other people typically in the car. [½]
potential for driver to be distracted by passengers leading to worse experience. [½]
on the other hand, people may drive more carefully when there are passengers in the car. [½]

Although the factor appears statistically significant in part (iii) it may be preferable not to use it in rating [½]
as it fails many of the criteria for what makes a good rating factor [½]
The actuary may want to investigate whether its main competitors are using the factor to understand the potential for anti-selection [½]
Customers may feel this question is obtrusive and choose to buy their insurance from an insurer that doesn't ask the question. [1]
Difficult to verify / open to abuse e.g. declared married, but is single [½]
High exposure in unknown category. Need to investigate and may show that it is not appropriate as a rating factor [½]

[Marks available 9, maximum 5]
[**Total 12**]

*Part (i) was mostly answered correctly, however binomial and logit link were common incorrect answers.*

*Part (ii) was well attempted although many candidates found challenging to generate a wide range of points.*

*Part (iii) was well attempted with many fully correct answers. The most common error was using 7 degrees of freedom. A number of responses did not comment on the AIC.*

*Part (iv) was generally well attempted however responses varied. The better answers considered a wide range of features of the chart and also practical aspects of the factor.*

**Q9**

(i)

Risk appetite [½]
Business strategy / plans [½]
Underwriting [½]
Pricing [½]
Capital considerations [½]
New product development (e.g. type of covers, exclusions) [½]
Considering the potential costs and benefits of mergers and acquisitions [½]
Portfolio of investments to ensure continued returns [½]
and to avoid reputational damage if investing in harmful businesses [½]
Risk management [½]
Developing a public policy engagement strategy [½]
Considering disclosure [½]
Potential adaptation measures to mitigate issues of future insurability or affordability (e.g. reduce exposure to segments with climate risks) [½]
Office location if potentially impacted by changes? [½]
Reinsurance programme [½]
Reserving [½]

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CAT loading, or large loss loading [½]
Target market / new business risk acceptance [½]
Decisions around ensuring regulatory compliance, e.g. may need to demonstrate that allowance for climate change risks is being made in capital calculations [½]
Recruitment (may need to recruit experts in this area) [½]
[Marks available 10, maximum5]

(ii)
Assets:
Loss of market value and/or investment income within investment portfolios, where investments are exposed to the risk of stranded assets [1]
Pressure from councils, regulatory authorities or rating agencies for "green" investments: [½]

e.g. (maximum 1 mark for examples below)
disinvesting from coal sector companies [½]
increasing their investments in renewable energy [½]
withdrawing insurance support from projects and companies in the coal sector (which will have a knock-on effect on matching assets) [½]

Need to consider the financial impact of policy changes, [½]

such as: (maximum 1 mark from examples below)
implementing carbon-pricing mechanisms to reduce GHG emissions [½]
shifting energy use toward lower emission sources [½]
adopting energy-efficiency solutions [½]
encouraging, greater water efficiency measures [½]
promoting more sustainable land-use practices [½]

Reduction in demand for insurance from non-sustainable businesses / increased demand from new sources, affecting premium income. [1]

Liabilities:
Changes in motor liability risks posed by a move away from fossil fuels. [1]
Changes in commercial risks from new or different manufacturing processes in a decarbonised world [1]
Insurance policies covering assets whose value may be impacted by climate change may themselves have to be re-priced [1]
A review of policy wording to understand any exposures leading to environmental liability may lead to a change in the number of claims [1]
the work involved will result in increased expenses [½]
Increased product liability due to technological changes supporting the transition to support lower-carbon economy e.g. overheating of energy storage batteries causing explosions [1]
Potential latent claims arising e.g. due to using energy saving LED devices that pose potential health concerns [1]
Discount rate applied to reserves may change due to economic impact of the transition [1]

Both:
Disruptive changes across economic sectors and industries in the near term leading to political risks [1]

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New emerging risks and increasing uncertainty as countries switch to alternatives such as wind, solar, wave, tidal, hydro, geothermal, nuclear, biofuels, etc [1]
Tax impact (incentives, levies) for insuring renewable energy companies and /or fossil fuel companies may affect value of assets or liabilities [1]
Change in amount / type of reinsurance used. [1]

[Marks available 16½, maximum 8]

[**Total 13**]

*Part (i) was generally well attempted, and many candidates scored well. Common errors were not answering the question which asked for business decisions and failing to generate a wide range of different decisions. Credit was given for points made in (i) that answered part (ii) and vice-versa.*

*In Part (ii) well-structured answered tended to score better, however many responses did not generate enough different points. Some focussed on the P&L account rather than the balance sheet which the question asked for.*

**Q10**

(i)

Paper mills are fairly heterogeneous in nature [½]
hence there are a lot of qualitative features that the underwriter should take into account to reduce the price [½]
examples include fire safety audit, sprinklers, low proximity to other buildings, strong management, etc. [½]
The internal pricing model may be new/untested/unreliable/outdated/wrong [½]
The insurance company may have a higher than average number of claims in the data. [½]
The pricing model may not be complex enough to discount for certain features of the policy [½]
- e.g. complex deductible/limits, exclusions, etc. [½]
Most insurance companies are unlikely to have enough data for their pricing model to accurately price all parameters for paper mills [½]
hence the model results are expected to be used as a guide. [½]
The underwriter might have noticed very few (or zero) losses in the client's own loss history [½]
which can be particularly credible if many mills are being insured and the client can provide many years of information. [½]
In the soft phase of the market cycle, the underwriter is likely to give further discounts [½]
the competitors discounts might also impact the quoted price. [½]
Company objectives might be to increase premium volume in this type of business / hit sales targets [½]
hence intends to cross-subsidise this business by charging more for other classes (or write as a loss-leader) [½]
or such a client may provide cross-selling opportunities with other profitable policies. [½]
Could have assessed the customer lifetime value (can make a profit from the policy in the longer term) [½]
To reflect the fact that this is niche business, so the insurer benefits from diversification. [½]
Legislation in the country concerned, e.g. a cap on the premium that can be charged. [½]
The insurer may have a poor reputation/image, and needs to discount like this to win business [½]

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May be part of maintaining a good relationship with the broker (if there is one). [½]
Bulk-buy discount because it's a 'collection' of mills. [½]
Underwriter made an error when running the model and has applied the discount instead of re-running the model correctly. [½]

[Marks available 11½, maximum 6]

(ii)
If the insurer provided a quote in the previous year, we could compare to the rates that were previously quoted [½]
using the formula: $Rate\ Change_{t_1 \to t_2} = \frac{Premium\ Rate_{t_2}}{Premium\ Rate_{t_1}} - 1$ [½]
But this needs to be risk adjusted [½]
and standardised for other changes [½]
e.g. in:
exposure [½]
commission structure [½]
period covered [½]
limits [½]
excesses [½]
The modified formula is: $Rate\ Change_{t_1 \to t_2} = \frac{Premium_{\ t_2}}{As\text{-}if\ Premium_{\ t_1}} - 1$ [½]
The pricing model can help to calculate the impact of these adjustments. [½]
We can record the underwriter's view of the rate change [½]
which can allow for more of the soft/qualitative factors [½]
or we could request the broker for last year's information about the policy. [½]
If the risk has never been insured before or previous rates charged are not available, we could estimate the rate change based on what was charged for similar risks on the book last year. [½]

[Marks available 7½, maximum 4]

(iii)
Business Interruption - indemnifies against losses made as a result of not being able to conduct business [½]
Machinery Breakdown - indemnifies cost of machinery repair/replacement [½]
Machinery Loss of Production - additional coverage for loss of revenue due to machinery breakdown [½]
Goods-in-transit - protection for raw materials or finished goods being transported [½]
Employer's Liability - legal liability to compensate an employee or his/her estate for bodily injury, disease or death suffered, owing to negligence of the employer, in the course of employment [½]
Cyber - data or property damage or loss of revenue due to a cyber-attack [½]
Public Liability - legal liabilities towards third parties [½]
Environmental Liability - third party liability as a result of unintentional pollution [½]
Fidelity Guarantee - financial losses caused by dishonest actions of employees [½]
Directors' & Officers' - indemnity against legal liability to compensate third parties for wrongful acts of a director or officer of the company [½]
Product liability - due to faulty product, design, manufacturing [½]
Employment Practices Liability in case of employment related claims, e.g. unfair dismissal. [½]

[Marks available 6, maximum 3

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[**Total 14**]

*Part (i) was generally well attempted with many candidates using specific features of paper mills.*

*In Part (ii) candidates generally did not give sufficient detail to score highly.*

*Part (iii) was well attempted, however not many considered enough different products to score full marks. Despite the question asking to "Outline", some answers only listed products. Some answers referred to products that would not be relevant to paper mills, and some also included products that had already been given in the question.*

**[Paper Total 100]**

# END OF EXAMINERS' REPORT


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