INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

September 2019 Examinations

Subject 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 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

Mike Hammer
Chair of the Board of Examiners
September 2019

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

1. 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.

2. 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.

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 SP8 examination.

4. 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.

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. Comments on *student performance in this diet of the examination*

8. The paper proved slightly more difficult than the April 2019 paper as it examined more reinsurance material which hasn't been tested in recent sittings. The general performance of candidates was similar to that seen in the last sitting. Most candidates demonstrated a fairly good knowledge of the subject areas examined and scored well in basic bookwork questions. Questions that required application of this knowledge and tested higher order skills proved more challenging, and candidate responses to these questions were generally weak. In a number of questions candidates missed marks available for writing about practical considerations. There was no evidence of time pressure in this paper.

9. Bookwork questions were generally well answered, and better prepared candidates successfully tailored their answers to the questions, and were able to generate a wide range of points. Candidates did not score so well on application and higher order skills questions, in particular parts of 3, 5 and 9. Those who did well on these parts tended to do better overall.

10. 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 57.

Solutions for Subject SP8 – September 2019

Q1

(i)

Risk groupings should be selected so that within each group:

the (ground-up) loss frequency is independent of the limit purchased [1]

the (ground-up) loss severity is independent of the number of losses and the limit purchased [1]

Jurisdiction [½]

Class or line of business / nature of coverage offered … [½]

… as liability claims depend highly on the legal and social environment [½]

The treatment of ALAE in the coverage offered [½]

The treatment of ULAE and loadings for risk [½]

The nature of limits offered (e.g. split between per-claimant limit and per-occurrence limit) [½]

Effect of trends/inflation or other (secular) changes in the claims environment [½]

Mix of business the table is based on is similar to the business for which it will be used [½]

Market practice, i.e. what tables are used by other insurers for this sort of business [½]

[Max 3]

(ii)

Loss to layer = 24,000 × [ILF(2,000,000) – ILF(1,000,000)] [1]

= 24,000 × [2.621 – 2.205] [½]

= €9,984 [½]

[Max 2]

[Total 5]

Answers to part (i) varied. Those who knew the core reading scored well. It was clear that some candidates spent a long time on this part despite only being worth 3 marks.

Many scored full marks in part (ii). Common errors were misreading the ILFs from the table, or using €100,000 instead of €24,000, or not using any loss cost at all.

Q2

(i) Advantages

Simple for customers to understand [½]

Most customers can estimate it relatively easily [½]
Used by most insurers/brokers (so customers likely to be familiar with having to provide it) [½]
Bears a relationship to the expected loss cost/defines the risk clearly … [½]
… more miles implies more time driving which implies more exposed to risk [½]
Unlikely to correlate strongly with other rating factors [½]
Easy for the insurer to record / collect / obtain [½]
Has a value / straightforward to use in analyses [½]
Could be checked if MOT records were available digitally [½]

<u>Disadvantages</u>
Cannot be easily checked/verified (open to manipulation) [½]
Annual mileage could vary a lot from year to year / future years are unknown / needs to be estimated/difficult to assess [½]
Customers may be inclined to understate mileage [½]
[Max 3]

(ii)

All else being equal, customers who purchase via brokers may be different risks to those that purchase via price comparison websites [½]

For example, those who buy through brokers may simply be more careful drivers. [½]

May attract a different mix of business, eg less profitable overall, which will affect the base level premium we need to charge. [½]

The two sales channels may ask subtly different questions / have different data [½]

Or the possible responses customers can give may differ [½]

Similarly brokers may answer questions differently to the general public given their better understanding of the market/industry [½]

The two channels are likely to have different expenses associated with them [½]

For example, commission is likely to differ [½]

And the insurance company may have different software/maintenance costs in terms of the rating/sales platform [½]

Either could have differing marketing strategies and offer discounts / aggregators may be more competitive, e.g. to encourage cross-sell or to build market share [½]

It may not be possible for both to update rates at the same time so they could get out of sync. (e.g. likely to update online system faster than broker rates) [½]

Certain brokers may have been provided preferential rates (e.g. if they are influential / have a track record of profitable business) [½]

Price elasticity of customers may be different between aggs and brokers (the customers in each channel are likely to have different expected lifetime values) [½]

Evidence of tendency to lie/underestimate/manipulate price on comparison sites and/or broker subjectivity which require different rating action [½]

[Max 5]
[Total 8]

Part (i) was generally well answered, and candidates were able to generate a good range of advantages and disadvantages. A number of candidates described rating factors more generally even though the question asked specifically about annual mileage – these did not score well.

Part (ii) was reasonably well attempted but few were able to generate the breadth of ideas needed for full marks. In many cases candidates often repeated the same, or very similar, points in an attempt to generate more marks, however marks are only awarded for distinct valid points.

Q3

The actuary should consider:
Reason for considering change, e.g. current model becoming less predictive [½]

The expertise of the other providers, … [½]
… how long they've been in the market, … [½]
… who their other clients are and/or any references from clients / their reputation / market views of provider/model [½]

How the cat model has been constructed / approach / assumptions used, and … [½]

… how the model has been validated against historical floods [½]

The level of resolution in the model – is it at property level or postcode/cresta zone level [½]

Geographic coverage of the model needs to match that of the insurer [½]

Does the flood model allow for floods from river, coast and surface water [½]

Does it allow for storm surge / demand surge / secondary uncertainty [½]

Is it forward looking e.g. allow for climate change projections [½]

How up-to-date is the model / how regularly is the model updated / refreshed with more up-to-date data [½]

How easy it is to adjust assumptions / enter data / adapt for policy conditions to fit those of the general insurer … [½]

… and/or make adjustments to the model outputs to better reflect the company's own view of the risk [½]

Or is the provider willing to adapt their model so that it aligns better to the insurance company needs [½]

Is the model compatible with the insurer's own data, systems and software – inputs and outputs [½]

Practical issues – how long does it take to run and what are the computer requirements e.g. cloud based or server based [½]

Will there be any support / training required (or provided by the provider) [½]

The provider's plans to improve/enhance the model [½]

Whether the model can also be used to help the insurer set its reinsurance programme, and … [½]
… views of the reinsurer, e.g. can it be used to help the insurer negotiate better reinsurance premiums [½]
Is it possible to use the model to help the insurer monitor and manage its exposure to flood risk, … [½]
… and can it be used to set its capital requirements / what are the capital model implications. [½]
Other functionality, e.g. data augmentation / geospatial analysis that the model can produce which could enhance the company's understanding of exposure [½]
If possible, the actuary should request some sample data from each supplier and evaluate against its own experience. [½]
Review the model outputs between providers and understand the material drivers of differences between models [½]
How much does the model cost [½]
Do the providers have good financial backing, i.e. they won't disappear in the short-medium term [½]
Views of the regulator (e.g. whether it is known that a regulator has approved the model for capital / pricing processes) [½]

[Max 8]

Responses to this question were varied. Those who looked at it from the viewpoint of the actuary were able to consider the practical aspects of model evaluation, as well as specifics about the models themselves. A number wrote in length about the different modules within the cat model and did not score well.

Q4

(i) Both are methods for removing noise by adjusting the model fit at a given location by taking into account neighbouring values [½]
They improve the predicted values by taking into account the credibility (or lack of) for the response in a single location [½]

<u>Distance-based smoothing</u> [½]
The influence of neighbouring locations varies by distance … [½]
… with the influence reducing with distance [½]
The method is not affected by natural or man-made boundaries, so … [½]
… are well suited to smoothing weather-related perils [½]
Distance based may over-smooth urban areas and under-smooth rural areas, when considering non-weather-related perils [½]
It is easy to understand and implement [½]
Can be enhanced by amending the distance metric to be influenced by other features, such as urban density although the basic model does not distinguish between rural and urban [½]

<u>Adjacency-based smoothing</u> [½]
A given location is influenced by its direct neighbours … [½]
… which in turn are influenced by their direct neighbours [½]
Distributional assumptions or prior knowledge can be incorporated into the technique, so … [½]
… can be iterative and complex to implement [½]
Natural or artificial boundaries can influence the smoothing [½]
Often more appropriate for non-weather-related perils [½]

[Max 5]

(ii)

Sales volumes alone cannot indicate a potential issue with the geographic rating area allocation … [½]
… it needs to be compared with number of quotes, as … [½]
… the number of customers may be skewed towards lower rating areas [½]

The sales manager should therefore look at quote to sale conversion rate [½]

We could look at data from renewals as well as new business in assessing whether the rating area allocation is correct. [½]

It is potentially misleading to look at one factor only – it would be better to look at a whole range of factors (e.g. two- or multi-way analysis) [½]

Depending on sales and quote volume, one month may not be sufficient to detect any problems with a single rating factor … [½]

… and doesn't allow for seasonality - the pattern of take-up rates may differ on an annual basis. [½]

Could be that risk appetite for higher risk areas is limited, so premium has been raised to deliberately keep volumes lower [½]

Consider market share of own company versus peers, and compare that share between low risk and high risk areas. If peers have a higher market share for higher risks, it could be that we are overcharging the higher risks [½]

The lower sales of insurance in the higher risk areas may just be because the areas are poorer. [½]

[Max 3]

[Total 8]

Part (i) was well answered with most scoring full marks.

In part (ii), candidates made reasonable attempts but answers were often vague or narrow in breadth so marks were generally low. Better answers considered both the issues with the sales manager's conclusion and giving alternative explanations, as well as better ways of checking the rating area allocation.

Q5

(i)

The aim is to set the ceding commission (and possibly profit commission terms) to be offered. [½]

This will depend on the reinsurer's expected loss ratio for the treaty (and the distribution thereof). [½]

Collect as many years as possible of the cedant's past data (paid, incurred and premiums). [½]

Group data into risk size bands…. [½]
… calculate expected cession percentages in each risk size band [½]
… to arrive at the historical treaty performance for structure being priced. [½]

Or use the past experience for the treaty (burning cost) if the structure hasn't changed significantly. [½]

Frequency severity approach can be used to calculate/refine the large loss loading.[½]

Catastrophe load can be added using either experience or internal/vendor models [½]

Need data on any inuring reinsurance [½]

Adjust to allow for rate changes, past and future inflation, changes in terms and conditions, IBNR, etc … [½]

… so that the data is fully developed and on-level reflecting the period of cover being priced. [½]

There are likely to be variable commissions involved (Loss Participation Clause, Sliding Scale Commissions or Profit Commission). . . [½]

. . . for which we will need to define loss distributions. [½]

We must allow for reinsurer's expenses (including brokerage and retrocession) and profit requirements. [½]

[Max 3]

(ii) Options:

Facultative reinsurance arrangement … [½]
… to operate before this surplus treaty to cap the losses at £11,000,000 (calculated as (1+10) × 1) [½]

Negotiate to increase number of lines in existing treaty [½]

Arrange a second surplus treaty … [½]
… will need 9 lines (or more) with the same maximum [½]

Cede the maximum number of lines into the surplus treaty and retain the remaining share of claims itself … [½]
… subject to the terms and conditions of the treaty [½]

Risk excess of loss arrangement [½]

[Max 3]

(iii)

With a surplus treaty, the ceding percentage varies from risk to risk [½]

The large limit risks are most likely to have disproportionately heavy large loss experience … [½]

… ie the cedant is simply passing the largest proportions of the more hazardous risks to the reinsurer and keeping the less hazardous risks themselves [½]

If the ceded loss ratio is calculated using premium net of ceding commission, it could be that the ceding commission is too generous. [½]

[Max 1]

(iv)

Options:

Reduce cession flexibility [½]
… eg by adjusting the max or min retentions [½]

Reduce surplus capacity by reducing the number of lines [½]

… the reduced capacity can be provided through non-proportional treaties [½]

Replace the surplus treaty by a different form or reinsurance [½]

Reduce reinsurance commission [½]

Decline the risk if the performance is so bad it is unprofitable (and other remediation options fail) [½]

Introduce a profit commission … [½]
… to incentivise the cedant to pass better risks and be more careful in underwriting and claims handling [½]

[Max 2]
[Total 9]

Answers varied greatly in part (i), but it was clear that many candidates were unfamiliar with this part of the syllabus.

Responses to part (ii) were similarly varied and candidates struggled to generate appropriate options. In many cases candidates appear to have taken no notice of the fact that the treaty is on a sum insured basis.

In part (iii), the majority of answers stated that the cedant is passing more of the more hazardous risks to the reinsurer, but were unable to offer anything else.

Part (iv) was answered reasonably well with many able to generate a range of options.

Q6

(i)

sum insured band ($000)	original premium ($000)	mid-point	original loss cost	attachment ($000)	exit ($000)	attachment	exit	exposure curve attachment	exposure curve exit	loss cost to layer ($000)
0-50	22500	25	12375	100	500	100.0%	100.0%	100%	100%	0
50-100	2000	75	1100	100	500	100.0%	100.0%	100%	100%	0
100-200	2500	150	1375	100	500	66.7%	100.0%	92%	100%	110
200-300	750	250	412.5	100	500	40.0%	100.0%	72%	100%	115.5
300-400	300	350	165	100	500	28.6%	100.0%	59%	100%	67.65
400-500	200	450	110	100	500	22.2%	100.0%	50%	100%	55

500-750	100	625	55	100	500	16.0%	80.0%	41%	97%	30.8
750-1000	400	875	220	100	500	11.4%	57.1%	34%	87%	116.6
	28750									495.55

Mid-point column [1]
Original Loss cost column [1]
Attachment column (%) [1]
Exit column (%) [1]
Exposure curve attachment column [1]
Exposure curve exit column [1]
Loss cost to layer column [1]

Loss cost rate = 495.55 / 28750= 1.7% [1]

(ii)

The cedant has provided original premiums by sum insured bands, however ideally we would get details on each individual risk written [1]

As a result, we've had to select an appropriate sum insured level for each band - in the above chose midpoint. [½]

This assumes that the sums insured are spread evenly across each band (which may not be true) [½]

It is important to test this assumption, as cedants may deliberately send data banded in such a way that makes the actual risk look smaller (e.g. most risks lie towards the higher end of the band). [½]

The data provided by the cedant relates to the past so we must assume that the risk profile is appropriate for the prospective period covered by the treaty. [1]

If the profile is expected to change and it is not possible to predict the impact of them, then this approach is not appropriate. [½]

As we have only been given one loss ratio, we have to assume that this applies to each band, however it is quite likely that each band will experience a different loss ratio [½]

It has to be assumed that the same exposure curve is appropriate for each size of risk, … [1]
… and the actuary should check that this is the case. [½]

there are no features of the reinsurance treaty, such as inuring reinsurance or a limited number of reinstatements, that would complicate the calculation [½]

there are no features of the original business, such as deductibles, that would

complicate the calculation [½]

[Max 3]
[Total 11]

Part (i) was generally well answered, with many candidates demonstrating good knowledge of the method and scoring high marks.

Part (ii) was well attempted. Most answers included a few key assumptions and it was good to see that many candidates commented on their appropriateness.

Q7

(i) Burning cost approach is a method of using experience data to price a contract. [½]

It is defined as the actual cost of claims paid or incurred during a past period of years expressed as an annual rate per unit of exposure [1]

Historical data is adjusted to allow for inflation / IBNR / changes in contract conditions / other example. [½]

[Max 1]

(ii) Assumptions:

Losses occur at mid-point of year on average/uniformly over each year. [½]

No additional reporting or settlement delay / or alternatively, that the incurred claim amounts in the table are ultimate values. Hence, no provision for IBNER and pure IBNR is required. [½]

The latest year (2019) is fully earned. Valuation is done after 31 December 2019. [½]

The cedant's portfolio remains similar over the years in terms of business mix/risk profile. [1]

Claims inflation of 5% is suitable for the future year. [½]

Any other valid assumption(s). [½]

[Max 2]

Calculation of Expected Recoveries

Loss Year	**Incurred Claims**	**Inflation Factor**	**Inflated Claims**	**Recovery**	**Marks**
2010	£880,000	(1+5%)^10 = 1.63	£1,433,427	£433,427	[1]
2014	£720,000	(1+5%)^6 = 1.34	£964,869	£0	[½]
2017	£1,400,000	(1+5%)^3 = 1.16	£1,620,675	£500,000	[1]
2017	£900,000	(1+5%)^3 = 1.16	£1,041,863	£0	[½]

Total	£933,427	[½]

Expected Recoveries in one year = £933,427 / 10 = £93,342.70 [½]

Premium including Profit Margin = £93,342.70 / 80% = £116,678.40 [½]
Rate on Line = Premium / Limit = 23.34% [½]

Alternative solution assuming profit load is % of risk premium:
Premium including Profit Margin = £93,342.70 × 1.2 = £112,011.24 [½]
Rate on Line = Premium / Limit = 22.40% [½]

[5]
[Total 7]

(iii)

Claim amounts will need to be projected to ultimate (i.e. adding IBNER). If claims projected to ultimate then premium rate may be understated if development factors are too low [1]

Some claims may not have been reported - pure IBNR [½]

Some loss information may be missing from the data since they are below the reporting threshold. However, they may inflate or develop (IBNER) to breach the deductible. [1]

Historical experience might be below normal. Hence, any calculation based on them could be understated. [½]

Actual inflation will vary year on year, could over or understate [½]

Future inflation may be higher than 5%. [½]

The burning cost method must account for movements in the cedant's exposure / rate will be understated if exposure has been decreasing [½]

Calculations must also account for changes in cedant's business mix [½]

Data is unlikely to be complete for 2019 since pricing is usually done some time before the inception date. Hence, we will have to adjust the 10 year assumption for the unearned business. [½]

Loading might be required for claims with return period greater than 10. [1]

This may be more important if the class of business is exposed to catastrophes [½]

The historical large losses may all have occurred towards the start of the year (so the allowance for inflation may be too low). [½]

The 20% may not fully cover all the expenses. [½]

No consideration has been given to softer factors relevant to setting the premium rate, e.g. the insurance cycle [½]

Expected changes in the cedant's coverage, T&Cs, underwriting or claims handling may result in worse experience next year than seen historically. [½]

[Max 4]
[Total 12]

In part (i), most candidates demonstrated familiarity with burning cost, but many were unable to give sufficient detail to score full marks.

Answers to part (ii) were varied. The most common errors included not applying the limits and deductibles correctly and not calculating the rate on line.

Part (iii) was generally well answered. Most got the key points about IBNR/IBNER, and that claims below the threshold could develop/inflate to become recoverable. A good number of responses gave a wide range of points.

Q8

(i) Policy Data

- **Dates of cover** – [½]
  Classify policies into different cohorts for analysis. [½]
  Calculate trends in policy data – rate change, rate of renewal, etc. [½]
  Inflation of premium and exposure information. [½]
  Analysis of written and earned premiums [½]

- **Policy limits and/or excess points** (current and historical) – [½]
  This information will help actuaries compare policies from different years even if they have different limits and deductibles [½]
  Understand the total accumulation risk from each peril or type of loss [½]
  To allow for changes in limits and excesses over time when pricing [½]

- **Company share of total risk / size of company / number of vehicles**– [½]
  Needed to calculate exposure in a pricing analysis [½]
  Understand if own share is increasing/decreasing/staying flat [½]
  It can be used to identify clients with whom we have bigger relationships [½]

While setting the budget, detailed analysis can be carried out by calculating the impact of changing shares on individual contracts [½]
Enable comparison with other fleets / cost per vehicles [½]
Use to give credibility weighting [½]

- **Rating factors, or exposure measure details** – [½]
  When re-pricing, the actuary can use historical data to perform rate analysis [½]
  The historical portfolio can be re-analysed using the new rates or a new rating factor [½]
  The exposure movements can be understood and is the underlying base for rate change calculations [½]
  Rating factor details are needed to assign exposure (and claims) data to the correct rating segment in a pricing exercise [½]

- **Details of premiums charged (including currency)** – [½]
  Used to calculate key metrics e.g. loss ratio, combined operating ratio … [½]
  Needed to generate unexpired premium reserve [½]
  Comparing market premium against technical premium – can often be different with commercial insurance [½]
  The actuary might have done an analysis on each motor fleet, details of which can be useful during renewal and for other similar fleets. [½]
  Understanding changes over time and potential value, discounts, lifetime value, elasticity modelling [½]
  Details of past premiums charged are needed to avoid imposing unacceptable price rises for certain fleets on renewal [½]
  Currency ensures appropriate inflation, and … [½]
  … financial terms / investments made [½]

- **Policy number** – [½]
  A policy number can link …
  … claims to exposure, thereby ensuring we have the correct recorded claims for each fleet (and rating segment) in an analysis of claims experience e.g. for a rating analysis [½]
  … to previous policies so that an analysis can be done on renewal statistics including rate change and probability of renewal [½]
  …. to different parts of the same policy, e.g. motor PD and BI could be classified as two policies for capturing the premiums and claims information for each. [½]

- **Policyholder name** – [½]

In the case of commercial contracts, the company might want to analyse their biggest clients across multiple lines of business. [½]
These are useful for accounting for qualitative factors like good management across multiple policies. [½]
This information can also be useful to capture cross-subsidy information [½]
To use as a linking field to attach external data to in a pricing exercise, e.g. data from prior insurers of the fleets [½]

- **Type of coverage and exclusions** – [½]
  Pooling such information across different contracts could help calculate the expected cost of each coverage and the reduction in premium for each exclusion [½]
  The information can also be useful when calculating accumulation for different perils and benefit types. [½]
  Determine as-if premiums for rate change calculation when coverage and exclusions are modified at renewal [½]
  Determine whether coverages are changing / widening over time… [½]
  … and therefore consider whether rating model needs to change in response to changes / widening [½]

[Max 6]

(ii) <u>Claims Data</u>

- **Date of loss** – [½]
  Useful for aggregation of claims into accident period cohorts [½]
  Useful for inflating of losses … [½]
  … if we have the expected date of settlement too [½]
  Aggregating losses from an event [½]
  Trending of losses [½]

- **Date reported** – [½]
  Analysing reporting delay [½]
  Grouping into reporting period cohorts (though that may not be relevant for motor fleet) [½]

- **Date paid -** [½]
  Help understand/estimate claims development patterns [½]
  Inform investment strategy [½]
  Discount projected cash flows over an appropriate period of time [½]
  Monitor settlement delays and compare with customer satisfaction/complaints [½]

- **Claim Status** (open, closed, re-opened) [½]
  … with corresponding dates of e.g. closure and reopening (where applicable) [½]
  Useful when analysing claims frequency [½]

Also useful for calculating settlement delay and reporting delay [½]
Reserving calculations can be based on this – claims severity, IBNER, pure IBNR [½]
To include all changes in status, e.g. whether there have been multiple reopenings … [½]
...this may indicate changes in claims process / environment which needs to be factored into ultimate claims estimates [½]

- **Payment type** e.g. indemnity or claims handling expenses or fees [½]

  Useful for expense analysis / allocation … [½]
  … and analysing the pure risk premium [½]
  Monitor performance of loss adjustors [½]

- **Payment Amounts** – [½]
  Recorded at different dates so that projection of paid triangles can be made [½]
  Can use it to understand cash flow [½]
  And investment strategy [½]
  Monitoring settlement delay [½]

- **Estimates of claims outstanding or case estimates** – [½]
  Useful to create incurred triangles, [½]
  … if we have the corresponding dates [½]
  Provides the claims team's estimate on expected losses [½]
  Changes in the pattern would affect the need for IBNER [½]
  An early view on the total losses expected from the fleet [½]

- **Type or cause of claims** – [½]
  This will allow us to tag the claims to different perils or benefit types [½]
  For motor fleet, the classification of PD and BI claims is important since their development is very different. [½]
  Further classification into parts like windshield, engine damage, etc. will help understand the cost of claims from each part and hence improve pricing. [½]

- **Claim or policy number** – [½]
  Links to…
  … different claims from the same policyholder [½]
  … different claims from the same event, to report aggregated figures on such events [½]
  …. Policy data to analyse the profitability of each policy [½]

- **Currency** – [½]
  To convert losses to a single currency for analysis [½]

Along with the dates of settlement, it allows us to convert based on booked exchange rates or current exchange rates [½]
Indicates the different currencies affecting claims and hence used to calculate FX rate risk [½]

- **Reinsurance recoveries** - [½]
  … together with the dates when they are made. [½]
  Useful for all the above analyses on a net basis [½]

[Max 6]
[Total 12]

Each item together with the explanation was worth a maximum 1½ marks. Markers credited up to 4 items in each part. To score well, candidates need to generate distinct points.

Candidates generally scored better in part (ii) then in part (i). The main reasons for not scoring highly were not providing sufficiently distinct points, and not giving good explanations of how they may be useful in actuarial analysis.

Q9

(i) Possible exposure measures:

- Estimated maximum loss / Probable Maximum Loss [½]

  The largest loss that is reasonably expected to arise from a single event in respect of an insured property. [½]

  This may well be less than either the market value or the replacement value of the insured property. [½]

- Sum insured (year) [½]
  The cost of rebuilding the property … [½]
  … and the value of the stock [½]

[Max 2 (Max 1 for each)]

(ii) Challenges:

- Estimated maximum loss
  The correct EML can be difficult to establish … [½]
  and would require a detailed site survey report [½]
  … where the surveyor must consider fire protections, construction material, contents of warehouse, use of warehouse, proximity to any other high-risk buildings, standard of risk management, etc [1]
  There is likely to be a cost/charge to obtain such a report [½]

An overestimate of the EML could mean that the risk is not covered if it falls above the insurance company's maximum capacity [1]
… or the unnecessary purchase of reinsurance [½]
Underestimation could lead to the risk being accepted even though it is over the insurer's maximum capacity limits [1]
… potentially leading to poor profitability [½]
… or under-insurance may require average to be applied to any claim which could involve legal costs [½]

[Max 3]

- Sum insured year
  The amount of stock held may vary considerably over the period of the insurance [½]
  … the stock may be covered on a declaration basis, so an adjustment premium needs to be determined retrospectively [1]
  There is no standard way of allowing for inflation in the policy [½]
  … coverages with different types of inflation need to be considered separately to determine the exposure [½]
  It may not be possible to verify the value of the stock held [½]
  Sum insured may be understated leading to under-insurance [½]

[Max 3]

[Total 6]

(iii)

The company's underwriting policy may enable the underwriting and acceptance considerations to be more aggressive, (e.g. widen the acceptable geographical regions in which the UW has authority to write business)… [½]
… or more relaxed in terms of cover restrictions [½]
Alternatively the company may want to tighten underwriting criteria in order to maintain profitability in a soft market [½]
Terms offered by the reinsurers in the soft market may encourage the underwriter to take on more or less risk [½]

If the rest of the market is softening its risk acceptance criteria, the underwriter may feel compelled to follow suit. [½]

The insurer may allow underwriters more flexibility to loosen risk acceptance criteria in a soft market if:

- it has a strong capital position, as it then has more of a cushion with which to absorb the larger losses that could result [½]
- it currently has a high profit margin, so there is scope to remain profitable even with looser acceptance criteria [½]

- it has a robust reinsurance programme, again mitigating the risk to the insurer of larger losses [½]
- volumes are seen as being too low, e.g. to cover fixed expenses [½]
- the line of business the underwriter works in is used as a loss leader to sell other products [½]
- it wants to maintain a good relationship with a broker or tied agent that is struggling to obtain reasonable volumes for the insurer using the current risk acceptance criteria [½]

[Max 3]

(iv) Advantages:

It will reduce losses in the soft market [½]
Reduce capital requirements [½]
By reducing exposure, rather than exiting, the insurer is in a better position to profit when the market hardens again [½]
Reducing exposure may avoid a fall in share price which could result from losses [½]
Reducing exposure may improve the solvency position, if the business is loss making [½]
May be viewed positively by reinsurers, if the business is loss making, … [½]
… and reduced exposure should reduce reinsurance spend [½]
May allow the insurer to switch focus/resources/capital to a LOB that is not in a soft market [½]

[Max 1]

Disadvantages:

This won't help if the business is still marginally profitable, as the overheads are the same [½]
The company may even fail to cover fixed expenses / or will have to cut expenses [½]
It may be costly to rebuild market share when rates harden [½]
May reduce diversification of risk and push up capital requirements per unit of exposure and/or need for greater risk management [½]
Brokers and end clients may take all their business to another insurer which offers greater capacity … [½]
… so we may miss out on profits from cross-selling other products for which rates are currently profitable [½]
Damage company reputation and/or relationship with brokers [½]
If reinsurance is currently cheap, it may still be possible to make reasonable *net* profits [½]
May be seen as a sign of weakness by analysts/the market [½]
May have to make some staff redundant, with associated costs and effect on morale [½]

[Max 1]
[Total 13]

In part (i), most were able to give one acceptable exposure measure, but not many were able to give two. In the main, the descriptions of the measures lacked detail.

Candidates appeared to struggle with part (ii). As in other questions, answers lacked practical awareness of the challenges.

Answers to part (iii) varied. In general candidates found it difficult to generate a number of different circumstances. Some candidates spent time describing soft markets or pricing approaches, but this was not asked for.

Part (iv) was generally well answered with many getting full marks.

Q10

(i)

Insurer's exposure database / policy database	[½]
Insurer's claims database	[½]
Vehicle licencing/registration agency	[½]
Insurer's trade body / e.g. ABI in UK / other insurers	[½]
Motor trade body	[½]
National/government statistics (e.g. for inflation indices / Census data)	[½]
Providers of socio-economic indicators	[½]
Legal bodies (for any changes in legislation) *(Ogden tables not relevant for TPPD)*	[½]
Fraud bureau / e.g. Claims and Underwriting Exchange (CUE)	[½]
Telematics devices	[½]
Credit score / Credit rating agencies	[½]
Reinsurers or reinsurance brokers	[½]
Academic/scientific/research institutions	[½]
	[Max 3]

(ii)

What the coverage of each one is, i.e. if 98% of the exposure is all in one level then it may not be that useful.	[½]
How easy it is to obtain.	[½]
How much it costs, if not free.	[½]
How acceptable is it to customers / brokers.	[½]
Whether acceptable to regulators/consumer bodies / law	[½]
How good it is at differentiating risk (perhaps based on statistical significance)	[½]
Correlation with other factors.	[½]
Accuracy of the factor.	[½]
Proportion of exposure in the unknown level of a factor.	[½]
Number of levels in factor – don't want too many.	[½]
If number of levels is large, can they be meaningfully grouped?	[½]
Whether there is a limit to the number factors that can be used (e.g. in the rating engine or proposal form) …	[½]
… or whether difficult/costly to include from an IT perspective	[½]
Consistency of definition of factor over time.	[½]
How much residual heterogeneity is removed by the addition of each factor	[½]
Whether a factor is open to manipulation	[½]

Whether it is used by other insurers / market practice [½]
Need to decide how many factors we want (consider credibility versus homogeneity within rating cells). [½]

[Max 5]

(iii) An interaction exists between two factors when the influence of one factor varies by the levels of the other factor. [1]
Alternatively, the pattern in the response is modelled better by including extra parameters for each combination of two factors. [1]

[Max 1]

(iv)

To answer the question we assume that engine size is strongly positively correlated with size of car (which is a reasonable assumption). [½]

It looks like there is an interaction. [1]

With younger and older drivers exhibiting much higher claim frequency as the car size increases compared with middle aged drivers [1]

However the credibility of this is questionable … [½]
… as the exposure for these categories is very low. [½]

The apparent interaction does make sense though … [1]
… young drivers are not experienced enough to handle high performance cars … [½]
… and the oldest drivers may have slower reaction times [½]

Although the chart suggests there is an interaction, it's possible that there is actually no interaction present. [1]

To see this, it would be better to view the chart if the predicted values were rescaled to base levels. [1]

[Max 5]
[Total 14]

Part (i) was generally well answered, but many answers did not have a sufficient range of different sources to score well. Some answers listed data items instead of giving sources, and so struggled to score.

In part (ii), many responses contained a number of good points. However, many also spent a lot of time writing in detail about statistical tests and did not mention some of the more practical considerations.

Answers to part (iii) were varied and it was apparent that a significant minority do not understand what an interaction is.

Part (iv) was poorly attempted in general. The better answers focussed on the differences between the frequency lines across the range of ages and also explained why these made sense in practice. Many candidates made observations about the chart that were not relevant to explaining the existence (or not) of the interaction. Credit was given to candidates who said the chart showed no interaction provided this was well argued.

END OF MARKING SCHEDULE