INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 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
July 2019

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*

1. Most candidates demonstrated a good knowledge of the subject areas examined and scored well in knowledge based 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. There was no evidence of time pressure in this paper.

2. Knowledge based 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 5, 6 and 7. Those who did well on these parts tended to do better overall.

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 60.

Solutions for Subject SP8 – April 2019

Q1

How the capital requirements in the two countries compare, [½]
For example…

- Would foreign insurers have an advantage over domestic insurers if they're required to hold less capital [½]
- Lower capital requirements could also mean less protection for policyholders [½]
- Are there more restrictions on the types of assets or the amount of a particular asset that a general insurer can take into account for the purposes of demonstrating solvency in country A? [½]
- Would foreign insurers be using different bases for valuing assets and liabilities? [½]
- Allowance for any increased currency risk. [½]

What happens if a foreign insurer goes bankrupt; how would policyholders in Country A be protected? [½]
Would foreign insurers have to pay into central funds, e.g. to protect victims of uninsured drivers or policyholders of bankrupt insurers [½]
Should foreign insurers be required to have a local presence and employ local people in Country A [½]
Are there potential language barriers, [½]
For example…

- between policyholders in Country A and claim handlers in Company B… [½]
- or in translating or interpreting policy wordings. [½]

Would foreign insurers be subject to Country A's consumer protection laws and legal system? [½]
Should foreign insurers pay tax in Country A or Country B [½]
How robust and reputable is the regulator of Country B [½]
What happens if the regulations change dramatically in country B, e.g. due to a new government (political risk)? If regulations become far more relaxed as a result, consumers may lose confidence in the insurance industry, e.g. to protect their data or pay claims. [½]
If country B doesn't require licensing of agents to sell insurance, there may be a risk of customers in country A being sold inappropriate insurance (ie mis-selling risk). [½]
Would foreign insurers be subject to Country A's data protection laws? [½]
How onerous is the regulation in both countries… [½]
…e.g. could insurers from Country A choose to move to Country B to benefit from less regulation [½]
Potential for the two countries to unify regulations in future / reduce regulatory differences. [½]
Are the insurance needs of consumers in both countries similar, e.g. Country A could be a lot more rural, or have a much younger population [½]
Are there other important aspects of regulation that differ between the two countries, e.g.:

- Statutory requirement to buy / provide certain cover in Country A that may not be reflected in policy wordings in Country B [½]

- Requirement to cover certain policyholders [½]
- Limits or other restrictions on premiums / rating factors [½]
- Restrictions on selling certain products, e.g. payment protection insurance [½]
- Limits on commissions [½]

Potential positives e.g. increased choice for customers, if more insurers enter the market in country A as a result. [½]

[Max 6]

Responses to this question were mixed. Scores were generally low because candidates focused on a limited number of factors. Those who considered a wide range of issues scored better. In some cases responses did not answer the precise question asked, and many gave suggestions that were not relevant.

Q2

The extent to which the recommended rates were implemented [1]

Reasons for differences between actual and expected:

- Individual underwriters may have over-ridden the recommendations [½]
- Or the company may have decided some or all of the proposed rates weren't feasible [½]
- Or some policies may be entitled to renew on pre-agreed rates that can't be changed every year [½]
- Or some policies may be sold through third parties who have some capacity to determine the rates [½]

Can compare claims from 2018 policies to where they were at the same stage of development from previous underwriting years [1]

Very long-tailed class of business, so will be very difficult to see at this stage how much of an impact the rates have had … [1]

… as very few claims from 2018 policies will have been reported yet [½]

Although reporting delay may not be significant if on claims made basis… [½]

… however 2018 policies are likely to still be on risk depending on when the policies incept [½]

And those that will have been reported are unlikely to have accurate case reserves or be settled yet... [½]

… and there will be claims on policies written in 2018 that have not yet occurred [½]

Should be able to see the impact of business mix [½]

i.e. have the rating changes succeeded in attracting more business from sectors they want to attract [½]

e.g. more policies from a certain profession [½]

Can also check if the new rates have resulted in any anti-selection [½]

Review whether new business volumes and/or lapse rates are as expected [½]

Policies may not incept evenly over the year, e.g. bulk of policies may incept at the end of the year, so impact to date may be very limited [½]

Should revisit 2017 analysis in light of updated claims development in prior 12 months [½]
e.g. have case reserves on old claims changed as expected [½]
and have reported claims been as expected [½]
Have there been any unexpected external developments in prior 12 months that could change the results [½]
e.g. unexpected economic downturn or upturn [½]
or any regulatory changes that could not have been allowed for [½]
What has happened in the market / competition – have rates hardened or softened? [½]
Have other assumptions (e.g. expense loadings/reinsurance/allowance for large losses) been under or over stated? [½]
Check for any errors in the previous analysis / results of peer review of calculations [½]
[Max 7]

As with question 1, responses were mixed and again often narrow in scope. Those who scored well related their answers to the specific situation given in the question, and were able to generate a wide range of points.

Q3

(i) Inflation [½]
- both at home e.g. cost of replacing lost luggage [½]
- and abroad e.g. medical cost inflation [½]
- limits and excesses not being changed in line with inflation could cause changes in severity over time. [½]

Changes in legislation [½]
- e.g. certain costs may become mandatory, or specified by a certain formula [½]

Changes in court awards/legal fees [½]
- e.g. legal precedents set higher levels of settlement in certain situations [½]

Economic conditions [½]
- e.g. some costs will be incurred abroad and will be affected by currency movements [½]
- e.g. in bad times airlines may go out of business [½]

Exchange rates [½]
- e.g. some costs will be incurred abroad and will be affected by currency movements [½]

Social conditions [½]
- e.g. there may be a trend towards exaggerating the size of any claim. [½]

Changes to the structure of the policy [½]
- e.g. changes in limits and or compulsory excesses [½]

Changes in the mix of business [½]
- demographic changes in the book, e.g. a trend towards more older policyholders, who may be more likely to suffer illness / accidents / medical

emergencies while travelling, and which may involve repatriation. These claims will tend to be larger than other claim types. [½]

- a trend towards more policyholders with cover for skiing or other winter sports. This again could lead to more large claims, e.g. if the skier is injured or if they injure someone else while skiing. [½]
- or change in mix of destinations, e.g. more US holidays where medical costs may be higher. [½]

<u>New perils emerging with larger than average (or smaller than average) associated claims</u>

- e.g. ash cloud from volcanoes/climate change causing claims for holiday cancellations. [½]

[Max 4]

(ii) <u>Problems with the data</u>

Recent claims not fully developed [½]
Suitability of 5 year period/sufficient data [½]
Better to split by peril as different perils will have different trends [½]
Allow for changes in mix of claims [½]
Could also split by currency or country [½]
as there will be fluctuations in exchange rates to consider [½]
Allowance for large losses – trends may differ to that for attritional claims [½]
Changes in distribution channel mix may significantly impact severity e.g.travel insurance sold / bundled with credit cards may have higher limits [½]
No allowance for changes in mix of business – has the book changed over the five years? [½]
… and is it likely to be materially different in the next year? [½]
Some payments will relate to claims opened more than five years ago so won't reflect full cost of claims [½]
No allowance for known or assumed future changes not reflected in the data [½]
e.g. changes in compensation awards [½]
Nothing has been done to put the claims on-level / allow for changes in excesses, limits, etc. [½]
Claims handling or underwriting practices may have changed over time [½]
e.g. the claims team may have set up small offices in the most popular tourist resorts [½]
There will be volatility in the observed trends [½]
Ignores any external information, e.g. published inflation indices [½]
Older years not so relevant / method does not allow for year-on-year changes in claims [½]
Taking an average of all 5 years doesn't allow well for step changes in inflation, or for rising inflation, e.g. if claims inflation was much higher in the last two years than in the previous three. [½]
It's also not appropriate if we don't expect the trend to continue [½]

[Max 5]

[Total 9]

Part (i) was generally well answered, with most generating a good range of points and examples.

Part (ii) was generally quite well answered, and again those who generated a wider variety of points scored highly.

Q4

(i) The profits of its competitors may not have deteriorated [½]

- e.g. if they have a different mix of business by industries/occupations covered/ better underwriting / operating in different territories [½]

Other insurers may specialise in certain niche areas, which are more profitable [½]
Even after a deterioration, the product may still be profitable for a lot of insurers, so they're willing to keep rates constant [½]
Other insurers may be willing to make a loss… [1]

- if they use it to cross-sell other products, or [½]
- if they have cross-subsidies from other profit-making lines of business [½]
- or if they believe the claims experience in recent years is exceptional and will improve [½]
- or if they believe future legislation will improve claims experience [½]
- or if they believe other insurers will withdraw from the market, giving them a dominant position, which would justify short-term losses [½]
- or their primary short-term goal is to build up market share [½]
- or to retain customers / market share [½]

They may have competitive reinsurance arrangements, meaning their net position is better than their gross position [½]
Other insurers may sell policies through 3rd parties or renew policies on guaranteed rates, making it more difficult to increase rates quickly [½]
Their brand names may not be strong enough to support premium increases [½]
Other insurers may have very different development curves/claims reserving philosophy, so take a different view on the profitability of the product (as EL is quite long-tailed and so subjective) [1]
Other insurers may have similar claims experience, but much lower expense base, so still making healthy profits [½]

- or have lower commissions [½]
- or higher investment returns [½]
- or they may gain more diversification benefit from writing EL [½]
- or be more tax efficient [½]
- or bigger risk appetite/more willing to make small profits/higher target loss ratio [½]

The competitors may adopt alternative approaches rather than increasing premium rates, e.g. … [½]

- tightening underwriting controls to select better risks [½]
- different/stronger policy terms and conditions [½]

- reducing expenses, e.g. through cost-cutting initiatives [½]
- changing their rating structure. [½]

Other insurers may put less emphasis on the technical price in determining rates, e.g. may just follow what the market does or determine prices more based on supply and demand (possible if data available in the market is poor). [½]

Profitability may not be the most important factor to the competitor, e.g. if it is a captive. [½]
Some competitors may not realise that they are writing unprofitable business, e.g. because: [½]

- they have allocated indirect expenses or capital to product lines inappropriately [½]
- they have inaccurate or insufficient data for assessing profitability accurately. [½]

Increasing premium rates may cause capital required to rise under some capital regimes, so competitors may avoid increasing rates for this reason. [½]

[Max 7]

(ii) If their existing rates are below those of other insurers, impact might be positive, as rate increases will be sustainable in the market and profits will increase [½]
Impact depends on how targeted the rate increases are; if all rates are increased by same amount, impact likely to be negative… [½]
Likely to lose business as rates become uncompetitive [½]
Which will increase expense strain [½]
And likely to make less profit [½]
If rate increases mainly penalise good risks then anti-selection may well occur [½]
…as good performing risks are likely to be able to find cheaper policies [½]
… leaving the insurer with under-performing risks, worsening its position [½]
Alternatively, if rate increases are targeted mainly/solely at under-performing risks, impact might be positive [½]
The insurer could earn a bad reputation in the market (amongst customers/brokers) [½]
Could be forced to leave the EL market or suffer regulatory intervention. [½]

[Max 3]

[Total 10]

Part (i) was reasonably well answered, although many failed to recognise that the company may be prepared to make a loss.

Part (ii) was generally well answered.

Q5

(i) Damage and parts costs [½]
Repair times [½]
New car values / replacement cost / scrap value [½]
Body shell / materials used [½]
Performance / engine size / top speed [½]
Car security [½]
Vehicle size / weight / no of seats [½]
No of doors [½]
Safety features, e.g. anti-lock braking systems [½]
Transmission (manual/automatic) [½]
Electric/hybrid power [½]
4-wheel drive or 2-wheel drive [½]
[Max 3]

(ii) Pros:
Every insurer using the same classification ensures consistency [½]
And may make it easier for policyholders to know roughly the effect on premium of replacing their car with a different one [½]
Good for new entrants to the market / those with little data, as they don't need to build their own [½]
Also good for existing market players as there is a lower overhead on maintenance – resource and cost [½]
May be easier/cheaper for industry body to do as individual insurers may not have the technical expertise (or have to each incur the costs of finding such expertise) [½]
Brokers of the insurer may be happier, if their own rating engines are based on the industry body classification. [½]
Avoids the risk that errors may be made by the insurer when constructing its own classification (which could lead to anti-selection) [½]
May make it easier for an insurer to compare the performance of specific segments of its business with equivalent segments from the market as a whole [½]
Makes it easier for an insurer to find benchmarks to aid the pricing of specific segments. [½]
Avoids the ongoing need for insurers to classify brand new makes / models as they appear [½]
Likely to be based on a large data set, which may be more credible than a classification made by an insurer with a small book of business. [½]
Cons:
The classification may not suit their target audience (e.g if niche market) [½]
The classification may not match their experience [½]
The classification may be wrong [½]
Or may not be at a suitable level of granularity / groupings too broad [½]
… which may lead to less accurate rates … [½]
... resulting in poorer profits as rates reflect the risk covered less well. [½]
May also be selected against if other insurers use their own more detailed system. [½]
It may take a long time for the classification to get updated [½]

This could lead to issues with new models/brands [½]
Less opportunity for an insurer to gain competitive advantage over pricing [½]
If insurers have their own classification system, they can arrange for changes in it to coincide with scheduled rate changes. Changes in the industry vehicle classification system are unlikely to coincide with each insurer's scheduled rate changes. [½]
[Max 4]

(iii) Compare with last time to see what has changed [½]
Investigate any large movements in vehicle classification [½]
Are they justified by the data [½]
Perform sense checks [½]
Ask insurers for claims data by vehicle grouping and test whether level of differentiation has improved [½]
Ask insurers to fit a model to some historical claims experience where one model has the existing classification and another model has the new classification [1]
Actual experience vs that predicted by the two models should be compared [½]
On a holdout sample [½]
To see which has the smallest prediction error [½]
The two models could be compared using gains curve/Gini coefficient [½]
Or a Lift curve [½]
The two models could also be compared using the AIC (as the models aren't nested). [½]
Could look at the time consistency of the new and old classifications in the model. [½]
[Max 3]
[Total 10]

Part (i) was well answered, with most getting all or most of the marks available. In questions like these, examiners look for a variety of factors which describe distinct features.

Part (ii) was reasonably well answered. Better prepared candidates included the practicalities of using the classification in their response.

Part (iii) was not well answered. Candidates demonstrate an awareness of model assessment, but appear to lack sufficient understanding to describe in detail how this may be achieved in practice.

Q6

(i) This may be too simplistic [½]
...future experience is volatile/ subject to large losses, etc [½]
...the frequency and severity of claims can vary significantly [½]
Claims may not be fully developed [½]
...credibility weighting helps to balance stability and responsiveness [½]
The credibility we want to assign to the latest underwriting year will depend, amongst other things, on the volume of data we have for that underwriting year, as well as how mature it is. [½]
Need to apply claims inflation / trending [½]
1 year may be too little data to base pricing on, would be better to use more years of data if available [½]
Allow for changes in business mix, policy conditions, etc [½]
[Max 2]

(ii) Let W denote the claims for an individual in a single year.

Then $\mu(\theta) = E(W|\Phi = \theta) = 3\theta$ [½]
And $\sigma^2(\theta) = Var(W|\Phi = \theta) = 3\theta(1-\theta)$ [½]
(binomial mean and variance with 3 trials)

Then using the distribution of Φ, we have:
$\beta = E\left(\mu(\Phi)\right) = E(3\Phi) = \int_0^1 3\,\theta\,(6\,\theta(1-\theta))\,d\theta$ [½]
= 18 $(\frac{\theta^3}{3} - \frac{\theta^4}{4})$ and substituting $\theta = 1$ gives $\frac{3}{2}$ [1]

Similarly
$\phi = E\left(\sigma^2(\Phi)\right) = E\left(3\Phi(1-\Phi)\right) = \int_0^1 3\theta(1-\theta)\cdot 6\theta(1-\theta)d\theta$ [½]
= 18 $(\frac{\theta^3}{3} - \frac{2\theta^4}{4} + \frac{\theta^5}{5})$ and substituting $\theta = 1$ gives $\frac{3}{5}$ [1]
$\lambda = Var\left(\mu(\Phi)\right) = Var(3\Phi) = 3^2\,Var(\Phi) = 9(\mathrm{E}(\Phi^2) - \left(E(\Phi)\right)^2)$ [½]
= 9 [$\int_0^1 \theta^2\,(6\,\theta(1-\theta))\,d\theta$ - $(\frac{1}{2})^2$] [½]
= $\frac{9}{20}$ [½]

Applying the formula for the credibility factor:
$= \frac{V_i}{V_i + \frac{\varphi}{\lambda}} = \frac{10+12+15}{10+12+15+\frac{3/5}{9/20}} = 0.965$ [1]
$= \frac{S_1+S_2+S_3}{V_1+V_2+V_3} = \frac{18+20+27}{10+12+15} = 1.757$ [½]

The Bühlmann-Straub credibility estimate per individual in the risk class is
$C^{BE} = Z_i X_i + (1 - Z_i)\beta$ [½]
$= 0.965 * 1.757 + (1 - 0.965) * \frac{3}{2}$ [½]
$= 1.748$ [½]
With 20 individuals in the risk class in 2019, the credibility estimate is 20 * 1.748 = 34.96 [½]
[Max 9]
[Total 11]

Part (i) was reasonably well answered.

Attempts at part (ii) were very mixed with many missing it out, or only writing down the standard formulae. Equally, many did very well, either getting full marks or only making one or two errors. There is no substitute for good preparation with these types of questions.

Q7

(i)

Advantages

- Mirrors the actual underlying process [½]
- It's Risk XL so we will want to model individual claim amounts hitting the layer. FS method allows us to do this. [½]
- It's EL. Large losses are a feature of EL, so again this implies that we will want to model individual claim amounts. FS method allows us to do this [½]
- Helps in studying the number of claims and amount of claims separately [½]
- May be easier to spot outliers e.g. exceptionally large losses or years with exceptionally high or low numbers of claims. [½]
- Expenses that relate primarily to frequency or severity can be dealt with more accurately in pricing. [½]
- Is more helpful than the burning cost method in modelling complex reinsurance structures such as deductibles and limits [½]
- Can gain insight into aggregate loss amounts [½]
- Helps identify trends … [½]
- …specifically helps identify separate trends in frequency and severity that might otherwise be hidden in the aggregate loss data (e.g. if they offset each other). [½]

Disadvantages

- Assessing the compound frequency-severity loss distribution has more onerous data requirements than assessing the aggregate amounts [½]
- Requires a high level of expertise/resource [½]
- More data is required e.g. to estimate the development factors and to estimate the severity distribution and parameters [½]

- May be more difficult to develop individual claims to ultimate and may be a judgmental process [1]
- More time consuming / harder to calculate [½]
- More complicated / harder to explain. [½]

[Max 4]

(ii) General issues:

- Trend frequency and severity separately [½]
- Past experience for e.g. inflation, may not be a good predictor of future experience [½]
- Project historical frequencies and severities in line with assumed trends to current values [½]
- ...and then project them to the mid-point of the future exposure period [½]
- Applying an index is more realistic than a constant past annual trend rate [½]
- Trends can increase or decrease over time [½]
- Choice of base periods and the period of projection should be considered carefully [1]
- Could be a long delay until claims are eventually paid (hence uncertainty) [½]
- Allow for / investigate any "anomalies" or one-off changes [½]

Frequency issues

Causes of frequency trends include changes in:

- accident frequency [½]
- propensity to make claims and other changes in the social and economic environment [½]
- legislation [½]
- structure of the risk (e.g. changes to excess/limits) [½]
- coverage (e.g. perils, exclusions) [½]
- underwriting or claims handling [½]
- mix of business by industry/occupation [½]

Consider benchmark trends based on combined data of similar cedants or market statistics or underwriters views [½]

If the exposure measure is in monetary terms, then apply trends to historical frequencies and allow for inflation of this exposure measure [1]

Severity issues

Drivers of severity trends include:

- economic inflation [½]
- changes in court awards and legislation [½]
- economic conditions [½]
- changes to the structure of the risk [½]
- changes in coverage (e.g. perils, exclusions) [½]
- changes in business mix to more/less risky occupations that are likely to trigger larger/smaller claims under common law [½]

Trending is usually applied on the ground-up individual loss amounts [½]

...but it can be useful to review the pattern of past severity values by policy year [½]

Different trends can be applied to different sizes of claims as there may be different underlying factors behind low and high claims [1]
Or could trend different claim types separately. [½]
Very large losses should be treated separately [½]
Likewise latent claims (relevant for EL) and cat claims could be excluded and analysed separately. [½]
[Max 7]

(iii) <u>Methods:</u>
Could apply an incurred development factor to each ground-up individual loss to estimate its ultimate settlement value [½]
...used for both open and closed claims … [½]
…before applying the treaty structure for the coming year [½]
A more realistic approach is to develop open claims using "case estimate" development factors [½]
These development factors will usually be higher than incurred factors at the same maturity [½]
...to offset the effect of not developing closed claims [½]
Could use stochastic development methods [½]
...to allow for the variation that may occur in individual ultimate loss amounts around each of their expected values [½]
[Max 2]
[Total 13]

This was largely a knowledge based question.

Part (i) was well answered with most showing good knowledge of the relevant book-work.

Part (ii) was quite well answered. Better scoring candidates structured their answer as in the solution above, which helped them generate more points.

Part (iii) was not well answered. Many candidates did not tailor their answers to the frequency-severity approach and the development of individual losses, and so struggled to score. Those that did were often unable to describe the methods in sufficient detail.

Q8

(i)
Need to develop Hull claims:

UWY	Incurred Claims (Hull, £m)	Incurred %	Ultimate Claims-Chain Ladder	Ultimate Claims-BF	Selected	Ultimate Loss Ratio
2014	0.40	100%	0.40		.40	36%
2015	0.42	102%	0.41		.41	34%
2016	0.40	95%	0.42		.42	32%
2017	0.30	74%	0.41		.41	34%
2018	0.10	10%	1.00	0.53*	.53	38%

**calculated using an IELR of 34%*
½ mark for developing each year
½ mark for not selecting chain ladder for most recent year/using appropriate alternative
½ mark for checking year-on-year loss ratios

Need to develop Liability claims:

UWY	Incurred Claims (Liability, £m)	Incurred %	Ultimate Claims-Chain Ladder	Ultimate Claims-BF	Selected	Ultimate Loss Ratio
2014	0.15	100%	0.15		0.15	14%
2015	0.21	94%	0.22		0.22	19%
2016	0.22	70%	0.31		0.31	24%
2017	0.11	35%	0.31	0.26*	0.26	22%
2018	0.05	8%	0.63	0.29*	0.29	21%

**calculated using an IELR of 19%*
½ mark for developing each year
½ mark for not selecting chain ladder for most recent year/using appropriate alternative
½ mark for checking year-on-year loss ratios

Take average of Hull over last 5 years: 0.43 [½]
Take average of Liability over last 5 years: 0.25 [½]
However, clear upwards trend in Liability claims, so average over 5 years probably underestimating 2019 claims. Use judgement/average over more recent years to select 0.30. [1]
Add a large loss loading: total incurred large losses = 2.1; average incurred large loss per year = 0.42 [1]
Total Risk Premium = 0.43 + 0.30 + 0.42 = 1.15 [1]
[Max 11]

(ii)

- What years of account the large losses happened, to check if there's a trend [½]
- Would be better to obtain frequency and severity data, and apply a frequency-severity approach, e.g. to capture trends in either that might be hidden in the aggregate loss info. The actuary could investigate if this is possible, (eg if the data needed is available). [½]
- How much potential there is for existing claims to develop to be large, or for new large claims to be reported; likely to be underestimating large loss loading [½]
- Why are those 2 large losses "exceptional"/how likely is it for them to reoccur [½]
- What's the definition of a "large" claim [½]
- Are the incurred large losses settled/is it possible or likely that the case reserves could increase or decrease [½]
- Whether the incurred claims figures are prudent or best estimate etc [½]
- What's included in the incurred claims figures. e.g. do they include CHE? [½]
- Ideally would have a benchmark inflation for each of hull and liability [½]
- Investigate other trends not already accounted for, such as increasing propensity to claim, weather etc. [½]
- Also need premium rate changes as well as claim inflation. [½]
- 2018 incurred Hull claims already look very high; why is this? [1]
- Clear upwards trend in Liability claims; why is this? [½]
- How competitive/acceptable is the proposed premium [½]
- What the final office premium will be once allowance is made for commissions, profit etc. / assess overall profitability of the premiums [½]
- How do the benchmark development curves compare to the development of claims from this risk / consider other development factors … [½]
- And do we have info on where they come from, e.g. are they based on the same coverage, type of vessels, region of operation in the world, etc [½]
- What measure of exposure is being used [½]
- Although broker says exposure has not changed over the last 5 years, this should be confirmed – if nothing else the vessels will have aged. [½]
- Mix of vessel types could have changed even if exposure (e.g. number of vessels) hasn't altered. [½]
- Are there any external factors that are changing which could impact the future cost of claims, e.g. new regulatory or legal requirements on ship operators [½]
- Also consider if there have been or will be any internal changes, e.g. changes in strictness of underwriting or claims handling or T&Cs. [½]
- Whether there is additional insight from underwriter or claims team input [½]
- Inclusion of reinsurance and other recoveries, and will this change [½]
- Investigate exposure to future catastrophes or emerging risks (e.g. climate change)[½]
- The BF ultimate in 2018 could be on the high side as it is influenced by the higher premium. (compared with the prior UWYRs) but we are told exposure is unchanged. [½]

[Max 6]

[Total 17]

Part (i) was generally well answered. The above solution is only one proposed solution, and the examiners recognised that many different solutions were possible depending on the assumptions/choices made by the candidates. Credit was given where candidates explained what they were doing and their explanations were reasonable. There was an expectation however that the uncertain development in the most recent year(s) and examining the trends should not be ignored.

Part (ii) was reasonably well answered, although again many were unable to generate a wide range of points. Better prepared candidates related their answer to specific details given in the question.

Q9

(i)

Public liability coverage or third-party liability [½]
...indemnifies the insured (helicopter owner) against legal liability [½]
…for death or bodily injury to a third party [½]
...or for damage to property belonging to a third party [½]
…including costs of clearing debris / environmental damage [½]
...whilst operating the helicopter [½]
Personal accident cover for the pilot [½]
Passenger liability [½]
...cover legal responsibility in the event that passengers are injured or killed [½]
Hull insurance or property damage [½]
...indemnifies the insured (helicopter owner) against loss of or damage to the helicopter [½]
...perils covered include theft, fire, vandalism, damage from severe weather, damage or total loss due to an accident [½]
Extended warranty on the helicopter [½]
[Max 4]

(ii) Equipment coverage [½]
...if the work involves the use of specialty equipment or medical supplies [½]
...this would cover against loss of or damage to the equipment [½]
Business interruption coverage [½]
...indemnifies the insured against losses made as a result of not being able to conduct business [½]
...a fixed sum insured per day would normally be specified in the policy [½]
… provision of temporary replacement helicopter if it is unusable due to damage (i.e. courtesy helicopter) [½]
Employers liability (if there are employees) [½]
...indemnifies the insured against legal liability to compensate an employee or their estate for bodily injury, disease or death suffered [½]

...owing to negligence of the employer in the course of employment [½]
Likely to involve an increase in passengers/cargo – so scale up of the existing insurance purchased, or limits/excesses [½]
International cover more likely [½]
Professional indemnity for the pilot(s) [½]
Cover for any cargo [½]
Cover against war risks/hi-jacking/terrorism [½]
[Max 3]

(iii) (a) Helicopter information

- Make and model [½]
- Size of engine [½]
- Registration and year of manufacture [½]
- Helicopter value [½]
- Maximum number of crew and passenger seats / cargo space/size of helicopter/weight [½]
- Estimated usage (hours per annum) [½]
- What the helicopter will be used for [½]
- Where the helicopter will operate [½]
- Where it is parked – hangar or outdoors [½]
- Mileage [½]
- Service history [½]
- Claims history [½]
- Safety and security features, e.g. anti-stall system [½]
- Limit / excess [½]

[Max 3]

(b) Pilot information

- Age [½]
- Total flying hours [½]
- Total flying hours in the last 12 months [½]
- Licence type (including any endorsements) [½]
- Membership of any flying club [½]
- Details of any losses in the last 5 years / time since last claim [½]
- Pilot health check-ups/review [½]
- Named pilot(s) or open [½]
- Gender (if allowed) [½]
- Years for which licence held [½]
- Level of cover [½]

[Max 6]

(iv)

Helicopter insurance is likely to be more expensive because:

- Pooling of risk: With helicopters, there are a smaller number of units with which to spread the risk [1]

- Exposure: Helicopters are more versatile and this presents a much larger exposure [1]
- Location/use: Helicopters more likely to work in difficult terrain and perform complex tasks [½]
- Helicopters are more likely than jets to get close to people while the aircraft is moving (or its blades are moving), e.g in rescue missions or evacuations or crowd control or police work. So there is possibly more risk of causing injury to third parties. [½]
- Conversely, jets probably have greater capacity than helicopters on average (ie hold more passengers/crew), which would tend to increase premiums for jets relative to helicopters [½]
- Accident rate: Helicopters have a higher accident rate [½]
- Because they fly low where they are exposed to perils of hitting trees, power lines, etc [½]
- Number of pilots: Helicopters often only have one pilot (unlike jets where a second pilot may be able to take over / assist in an emergency) [½]
- Emergency procedure: Helicopters have more moving parts and an engine or part failure will likely necessitate an immediate autorotation or diversionary landing [1]
- Once an emergency starts in a helicopter, it usually develops very quickly with limited time for the pilot to react [½]
- Duration of journey: Helicopters have shorter trips, so land and take-off more frequently [½]
- Other reasons for differing premiums include:
- Safety and/or training requirements may be different between the two [½]
- International travel: Most helicopters cannot travel transatlantic, so there may be different legislations applying [½]

[Max 4]

[Total 17]

Examiners gave appropriate credit for points made in part (i) that may also answer part (ii), and vice-versa.

Parts (i) and (iii) were well answered.

Part (ii) was reasonably well answered although candidates struggled to generate sufficient points to score well, or were unfamiliar with the different types of cover available.

In parts (i) and (ii) a common error was not giving sufficient detail in terms of what the cover provided.

Part (iv) was not well answered. The solution above argues the case for the helicopter insurance being more expensive, however examiners gave credit to the opposite case

provided the arguments for it were well made. Equally, the examiners accepted answers that explained how the two might be different (e.g. it might be more expensive for one reason, but less expensive for another). In general however, candidates struggled to make convincing and distinct points worthy of scoring.

[Paper Total 100]

END OF EXAMINERS' REPORT