INSTITUTE AND FACULTY OF ACTUARIES

EXAMINERS' REPORT

April 2017

Subject ST8 – General Insurance: Pricing Specialist Technical

Introduction

The Examiners' Report is written by the Principal Examiner with the aim of helping candidates, both those who are sitting the examination for the first time and using past papers as a revision aid and also those who have previously failed the subject.

The Examiners are charged by Council with examining the published syllabus. The Examiners have access to the Core Reading, which is designed to interpret the syllabus, and will generally base questions around it but are not required to examine the content of Core Reading specifically or exclusively.

For numerical questions the Examiners' preferred approach to the solution is reproduced in this report; other valid approaches are given appropriate credit. For essay-style questions, particularly the open-ended questions in the later subjects, the report may contain more points than the Examiners will expect from a solution that scores full marks.

The report is written based on the legislative and regulatory context pertaining to the date that the examination was set. Candidates should take into account the possibility that circumstances may have changed if using these reports for revision.

Luke Hatter
Chair of the Board of Examiners
July 2017

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

1. The aim of this General Insurance: Pricing Specialist Technical subject is to instil in successful candidates the ability to apply, in simple pricing analysis situations, the mathematical and economic techniques and the principles of actuarial planning and control needed for the operation on sound financial lines of general insurers.

2. Subject ST8 deals with applications of general insurance pricing techniques across many different types of product. Candidates should expect the examiners to draw these applications from all parts of the syllabus in order to test as wide as possible a range of skills and, in particular, to achieve a fair balance between personal and commercial lines.

3. Examiners will sometimes require the use of standard general insurance actuarial and statistical techniques that are covered in earlier subjects. Candidates should ensure that they are familiar with these when preparing for the ST8 examination.

4. As well as pricing techniques, ST8 also covers the workings and use of reinsurance products, so candidates should also expect the examiners to set questions on these aspects.

5. In questions with an element of calculation, different numerical answers may be obtained from those shown in these solutions depending on whether figures obtained from tables or from calculators are used in the calculations. Candidates are not penalised for this. However, candidates may lose marks where excessive rounding has been used or where insufficient working is shown. Where questions require looking up values in tables, candidates are expected to interpolate between two values if reasonable to do so, even when this is not stated in the question.

6. Where examples are given in the solution to illustrate the points made, marks were awarded to candidates who gave these particular examples or an equally valid alternative.

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

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

1. The level of difficulty of the paper and the general performance of candidates were similar to recent sittings. Most candidates demonstrated a good knowledge of the subject areas examined; however questions which require application of this knowledge and test higher order skills proved more challenging. There was no evidence of time pressure in this paper for well-prepared candidates.

2. Yet again, a number of candidates displayed poor handwriting at this sitting, which made it difficult for examiners to award full credit. Candidates who struggle with the legibility of their handwriting are asked to contact the Examinations Team well in advance of the sitting for advice on what support may be available.

3. Bookwork questions were generally well answered, and better prepared candidates successfully tailored the answers to the questions, instead of making more general comments. Candidates did not score well on questions 6, 9 and 11. Answers to these questions generally lacked breadth and depth.

4. The comments that follow the questions concentrate on areas where candidates could have improved their performance. Candidates approaching the subject for the first time are advised to concentrate their revision in these areas.

C. Pass Mark

The Pass Mark for this exam was 55.

Solutions

Q1

- Both are a commonly used form of original loss curves [½]
- They are useful where historical data for a risk are sparse, so experience-based rates are not credible. [½]
- First loss scales are usually seen in property business [½]
- These curves give the proportion of the full value premium (expected losses) allocated to primary layers limited at different values [1]
- They may be defined as $G(x) = \frac{LEV_Y(x)}{E(Y)}$ [½]
- Where Y represents the size of loss as a proportion of the size of the risk. [½]
- An alternative way of looking at this is that they give the value (expressed as a percentage of the full value premium) of imposing deductibles at different levels [½]
- We usually express the limits as a fraction of the sum insured or maximum probable loss or EML [½]
- These curves are sometimes referred to as loss elimination functions [½]
- For Increased Limit Factors, we choose a "basic limit" [½]

- This is usually a relatively low primary limit [½]
- We construct a table of multiplicative factors (ILFs) giving the ratio of the premium for higher limits to the basic limit premium [1]

- This may be defined as $ILF(x) = \frac{LEV_X(x)}{LEV_X(b)}$ [½]

- Where b is the basic limit [½]

- We usually use this terminology and format for casualty business [½]

[Max 4]

Generally well answered but some answers lacked detail and so did not score highly.

Q2 (i) Reinstatement premium is:

- The premium payable to a reinsurer for the restoration of full cover following a claim [½]

- It is applicable to XOL reinsurance arrangements [½]

- It may be more or less than the original premium, usually expressed as a % of the original premium [½]

- It may be scaled down for the unexpired risk term or cover [½]

- There are usually a limited number of reinstatements allowable [½]

- There may be a limited number of free reinstatements [½]

- Working layers are likely to have unlimited free reinstatements [½]

- Normally the number of reinstatements and the terms would be agreed at outset [½]

- Once agreed the reinstatement will be obligatory [½]

- Reinstatment premium is normally payable as and when a recovery is made [½]

[Max 3]

(ii) (a) Expected cost with unlimited free reinstatements with $1,000,000 annual aggregate deductible:

- = expected cost with no limits with \$1,000,000 excess – expected cost with \$1,000,000 limit with \$1,000,000 excess [½]

- = 1,289,000 – 350,000
- = \$939,000 [½]

(b) Expected cost with one free reinstatement:

- = expected cost with limit \$2,000,000 with \$1,000,000 excess [½]

- = \$525,000 [½]

(c) Expected cost with one free reinstatement and \$1,000,000 annual aggregate deductible:

- = aggregate cost with limit \$3,000,000– aggregate cost with limit \$1,000,000 [½]

- = 976,000 – 350,000

- = \$626,000 [½]

ALTERNATIVE for (c)

(c) Expected cost with one free reinstatement and \$1,000,000 annual aggregate deductible:

- = aggregate cost with limit \$2,000,000– aggregate cost with limit \$1,000,000 [½]

- = 525,000 – 350,000

- = \$175,000 [½]

[Max 3]
[Total Max 6]

Part (i) was answered well although many focused on describing reinstatements even though the question was about reinstatement premiums.

Part (ii) proved difficult to a large number of candidates. It seems that many treated it as risk XOL rather than aggregate.

Q3 (i) The claim may not be covered / doesn't meet terms and conditions of policy, e.g. a claim for own damage on a third party fire and theft policy [½]

the claim is found to be fraudulent / not valid, e.g. the driver had committed an offence such as drink driving [½]

the amount of the loss turns out to be no greater than the excess [½]

the policyholder has reported a claim in order to comply with the conditions of the policy, but has elected to meet the cost in order to preserve any entitlement to no-claim discount. [½]
there may be a court decision that there is no liability [½]

the cost of claim is recovered from a third party [½]

e.g. salvage/subrogation [½]

other suitable and distinct examples were credited

[Max 2]

(ii) **Advantages**

The presence of nil claims can distort the average claim size [½]

Especially if there is a trend in nil claims [½]

e.g. increased fraud detection increases probability of claim being rejected [½]

or above-inflation increases in excess [½]

This could lead to incorrect pricing [½]

Excluding nil claims can make it easier to compare results with competitors or industry benchmarks [½]

May take some time to reject a claim, so may be very few recorded nil claims in more recent experience [½]

Having to adjust for this will be subjective/difficult [½]

Easier to fit distribution when point mass at zero is removed e.g. gamma for claim severity [½]

other suitable and distinct examples were credited

Disadvantages

There is no standard definition for a nil claim so may not be easy/quick to do [½]

and the definition could also vary over time, adding to the complexity [½]

The definition of a nil claim could vary between insurers [½]

Making comparisons to industry benchmarks difficult [½]

If nil claims are more prevalent in certain classes of business then ignoring them means valid trends could be missed [½]

Useful to retain cases where the claim is below the excess so that insurer can model potential reductions in excess – these would now be non-nil (i.e. we want to know the distribution of losses below the excess). [½]

other suitable and distinct examples were credited [Max 4]

[Total Max 6]

Part (i) was well answered.

Candidates struggled to generate sufficient points in part (ii) to score well.

Q4 Check whether each variable contains enough information to be included in any model by looking at the one-way distribution of exposure and claims across the levels of each variable, … [1]

… for example, a variable where 99.5% of the exposure is in one level may not be suitable for modelling. [½]

Consideration should be given to levels of variables containing very low exposure and claim count. [½]

Failure to group these is likely to lead to convergence problems in the model fitting routine. [½]

It may also be necessary to investigate groupings of other factors, such as vehicle classifications in motor [½]

A query of one-way statistics of severity by factor will give a preliminary indication of the effect of each factor. [½]

Sense check expectations with output from one-way analysis … [½]

… and where appropriate use external data to help with benchmarking [½]

Two-way analyses should also be considered which summarise key statistics by each combination of a pair of factors. [½]

This helps understand the structure of the data and can help identify important relationships in the data. [½]

Correlations between factors should also be understood … [½]

… including looking at Cramer's V statistic for categorical factors… [½]

… and will help to interpret the results of the model. [½]

In particular it can explain why the multivariate results for a particular factor differ from the univariate results, … [½]
… and can indicate which factors may be affected by the removal or inclusion of any other factor in the model. [½]

The distribution of key data items should also be considered. [½]

This helps identify any unusual features, or outliers or data problems that should be investigated prior to modelling. [½]

Mainly this concerns the distribution of claim amounts which can identify unusually large claims or distortions arising from default claim reserves on recent claims. [½]

Understanding of the data is enhanced by examining how the distribution of the response varies by different levels of a factor. [½]
[Total 6]

Most gave a high-level response to this question and did not demonstrate a clear understanding of the bookwork being tested here. A number also gave details about analyses to perform after the GLM is fitted which was not asked for.

Q5 Risk premium calculation:

- Expected pure risk premium = 20% * 20000 = 4000 [½]
- Expected number of claims = 20% * 1000 = 200 [½]
- $\Phi(y)$ = [½] * (1 + 90%) = 0.95 [½]
- y = 1.645 [½]
- Number of claims for full credibility
- $N_S = \left(\frac{y}{k}\right)^2 \left(\frac{\sigma_N^2}{\mu_N} + \frac{\sigma_X^2}{\mu_X^2}\right)$ [½]
- Since N~Po and X~Exp, $\sigma_N^2 = \mu_N$ and $\sigma_X^2 = \mu_X^2$ [½]
- Hence $N_S = 2(1.645/0.1)^2 = 541.205$ [½]
- Using the square root rule
- The credibility factor, $Z = (200 / 541.205)^{0.5} = 0.6079$ [½]

- Credibility weighted risk premium = 0.6079 * 3200 + (1 – 0.6079) * 4000 [½]
- = £3,513.68 per vehicle year, or £3,513,680 for the fleet [½]

Assumptions:

- Estimated number of claims for IBNR has been included in the actual number of claims reported [½]
- Any open claim at the time of submitting the data has been assumed to be settled at the same amount [½]
- There will be no change in the mix of vehicles in the next coverage year [½]
- There is no loading for unusually large claims or a catastrophe [½]
- No inflation adjustment is needed on the past year risk premium [½]
- No changes in T&C/underwriting/claims handling [½]
- No changes in the external claims environment [½]

[Max 6]

Most candidates had a reasonable attempt at the calculation, however a common error was to use the actual number of claims (100) rather than the expected number (200) to calculate Z. Few gave assumptions, and some of those who did gave standard credibility theory assumptions which the question did not ask for.

Q6 Maximum limit on size of fleet [½]

To ensure risk is still within risk appetite of insurer [½]

Minimum floor on size of fleet [½]

The premium should be in proportion to the size of the fleet [½]

Maximum rate decreases … [½]

… to ensure risk can still cover expenses [½]

Requirement to report claims within a defined period … [½]

… so that the insurer can make informed decisions on the rate increases at renewal [½]

Some kind of retrospective experience rating to encourage better experience [½]

Rate increases should be on cumulative claims experience to date, not just experience in the prior 12 months [½]

May take some time to be certain how bad claims experience is, as some claims will take a long time to develop [½]

Requirement to maintain minimum risk management standards [½]

e.g. training of new drivers... [½]

...upkeep of cars [½]

… exclude those with unspent driving convictions [½]

… limit on the number of hours/miles driven in a day [½]

… secured overnight parking [½]

… limit on the number of passengers per trip [½]

(or other acceptable examples)

Any changes in tax should be passed on to the insured. [½]

May want to be able to revisit agreement if there is significant new legislation [½]

Requirement for insured to place risk with the insurer … [½]

… to avoid anti-selection [½]

Require all taxis to be fitted with telematics devices [½]

As drivers may be more careful if they are aware that how they drive is being monitored [½]

Details of how fraud and breaches of terms and conditions will be dealt with … [½]

… may reduce the number who might consider it and help limit costs if it does occur [½]

Apply exclusions, such as war/terrorism [½]

Apply limits on non-compulsory claim types [½]

Restrict geographical areas where the fleet may operate [½]

Requirement for the insured to use approved garages for repairs [½]
[Max 8]

Candidates tended to score poorly on this question. The better performing candidates were those that generated a wide range of different ideas, rather than focussing mainly on risk management measures.

Q7 Check the data for any errors or anomalies and adjust if necessary [½]

Data should be split into homogeneous groups as appropriate [½]

Project the number of historic claims to get an ultimate number per year [½]

To allow for claims not yet reported (IBNR) [½]

e.g. using chain ladder or similar technique [½]

Adjust for outliers [½]

or any unusual experience [½]

e.g. due to a cat event [½]

and remove anything you don't expect to happen in the future, … [½]

and make allowance for anything not in the data that you would expect in future [½]

Depending on the line of business, four years of data may not be long enough [½]

Estimate the parameter of the Poisson distribution based on past numbers [½]

Similarly project the severity of historic claims to ultimate … [½]

… to allow for development of claim sizes (IBNER) [½]

And estimate the parameters of the Gamma distribution [½]

Using Method of Moments [½]

Or Maximum Likelihood [½]

Projecting claim numbers and severity will have to allow for:

changes in historic size of portfolio [½]

changes in mix of business [½]

changes in policy terms/coverage/limits/deductibles [½]

changes in external claims/legal/regulatory environment / propensity to claim [½]

Change in reserving / claims handling philosophy [½]

inflation [½]

Simulate the number of claims, n, from the Poisson distribution [½]
For each simulation of n, generate $x_1, x_2, x_3, \ldots, x_n$ at random from the fitted Gamma distribution [½]

Apply the policy terms and conditions as appropriate to each x_i, for example, limits and deductibles [½]

Sum the x_i's together [½]

Apply further policy terms and conditions as appropriate, for example, aggregate deductibles and reinstatements [½]

Repeat this process a large number of times to reach satisfactory convergence [½]
[Max 10]

Candidates demonstrated a good knowledge and understanding of how Monte Carlo simulation could be used here, however many missed out on the steps that need to be considered before simulation is carried out.

Q8 (i) Employers' liability indemnifies the insured (the employer) ... [½]

… against legal liability to compensate an employee, or his or her estate … [½]

… for bodily injury, disease or death suffered … [½]

… owing to the negligence of the employer, in the course of employment. [½]

Loss of or damage to employees' property is also usually covered. [½]

Legal costs will also be covered. [½]

Other costs such as care costs can also be included. [½]

Benefit may be in the form of regular payments or lump sum [½]

Policies are written on a losses incurring basis [½]
[Max 2]

(ii) The data need to be projected to current values … [½]

… to remove any inflationary effects … [½]

… and then to the mid-point of the future exposure period … [½]

… as this is the average time that a claim will occur. [½]

Frequency and severity need to be trended separately [½]

Different claim types should be considered separately [½]
Consider whether nil claims should be included or removed, and analyse any trends in nil claims [½]

Need to make an adjustment for claims incurred but not reported. [½]

Employers' liability claims tend to be long-tailed … [½]

… so many of the claims may be under developed. [½]

Development patterns therefore rely on a suitably long period … [½]

… and changes to claims handling or settlement processes need to be considered. [½]

Current values will also have to reflect existing legislation, and therefore changes in the legal environment need to be allowed for. [½]

Other changes, e.g. to health and safety training and precautions at the factory, will also have to be reflected in the data. [½]

Allowance for changes in the propensity to make claims [½]

This may be considered against any changes in the economy and/or other external factors [½]

Any changes in terms and conditions of the policy/cover, e.g. excesses or limits. [½]

Adjustment for any changes in the underlying risk, such as staff training, age of employees, staff shortages [½]

Changes in volume and/or types of paint manufactured. [½]

Employers' liability can have some extremely large claims … [½]

… so choices need to be made as to how adjustments will be made for these:

- Cap large losses [½]

- Assess large losses separately [½]

If claims arise in different countries it may be advisable to convert all into the same currency. [½]

Claims from different countries will be subject to the legal jurisdiction there, so it may be more appropriate to analyse claims from each country separately. [½]

Trends may vary by size of claim as larger losses are likely to incur greater legal costs. [½]
Get expert advice on the paints and manufacturing process to see whether, and to what extent, a load should be applied for latent toxicity claims or other events not in the data [½]

Remove any historical claims that are not likely to be repeated in the future [½]
[Max 5]

(iii) Estimate the risk premium based on a €5,000 excess:

Where appropriate, split the data into homogeneous groups [½]

- Generate the number of claims from the frequency distribution [½]

- Generate a claim cost for each claim from the severity distribution and deduct €5,000 [½]

- Any resulting claim cost that is less than €0 should be set to €0. [½]
- Sum the resulting claims to get the risk premium net of the €5,000 excess [½]

Repeat the above using the €10,000 excess. [½]

Repeat a large number of times and determine the average risk premium with the €5,000 excess and the €10,000 excess [½]

The difference gives the expected reduction if the higher excess is used. [½]

For both the €5,000 and €10,000 excesses, it may be that amounts just over the excess will also result in €0 claims because: [½]

- An experience rating system might be in place [½]

- The policyholder considers making the claim more bothersome than it's worth [½]

The actual impact on what the paint manufacturer pays will also depend on how expenses and other loads are applied. [½]

If available, the results of the analysis should be compared to some benchmark or external data [½]

[Max 3]

[Total Max 10]

Parts (i) and (ii) were well answered, although candidates should ensure descriptions are not ambiguous – e.g. "provides indemnity against" does not make it clear which party is indemnified.

Part (iii) was not answered well and candidates did not give sufficient detail in their responses.

Q9 (i) $\mathbf{Y} = g^{-1}(\mathbf{X\beta} + \boldsymbol{\xi}) + \boldsymbol{\varepsilon}$ [1]

Term	*Definition*	
$\mathbf{Y}$	Vector of the responses being modelled	[½]
$g(\ )$	Link function	[½]
$\mathbf{X}$	Design matrix of factors	[½]
$\boldsymbol{\beta}$	Vector of parameters to be estimated	[½]
$\boldsymbol{\xi}$	Vector of offsets or known effects	[½]
$\mathbf{X\beta} + \boldsymbol{\xi}$	Linear predictor	[½]
$\boldsymbol{\varepsilon}$	Error term appropriate to $\mathbf{Y}$	[½]

[Max 4]

(ii) A factor with three levels only requires two parameters to completely define it. [½]

For example, for geographical area, (1,0) might represent A, (0,1) represent B, and (0,0) represent C. [½]

So one of the three levels does not need a parameter and will be known as the "base" level. [½]

Each factor will have a base level, and the set of base levels gives the base risk. [½]

The GLM can then be configured to determine how the predicted values vary relative to the base risk. [½]

In this example the base levels for the two factors are premium change $\geq -5\%$ and $\leq +5\%$, and geographical area A [½]

The base levels are usually chosen to be those with the greatest exposure [½]

[Max 1]

(iii) $p = g^{-1}(\eta)$ [½]

For a binomial error structure, the link function is the logit.

$$\eta = \ln\left(\frac{p}{1-p}\right)$$ [½]

$$\frac{p}{1-p} = e^{\eta}$$

$$p = \frac{e^{\eta}}{1+e^{\eta}}$$ [½]

$$\eta = 1.9465 + 0.9734 - 1.5277 = 1.3922$$ [1]

$$\therefore p = \frac{e^{1.3922}}{1+e^{1.3922}} = 0.8$$ [½]

[Max 3]

(iv) The model can be used to understand the characteristics of those more or less likely to renew. [½]

Knowing those most likely to lapse means the insurance company can target any retention activity towards them. [½]

Knowing those least likely to lapse may mean there is potential for the insurance company to up-sell or cross-sell to the customer. [½]

Being able to predict the likelihood of a customer renewing allows the insurance company to estimate the likely length of time a customer will remain with the insurer. [1]

This may make business planning easier, … [½]

… allows the insurer to spread acquisition costs over the lifetime of the policy, … [½]

… may also be used to set capital requirements, … [½]

… and resource planning (claims handlers, service advisors) [½]

The model can be used to estimate the lifetime value of a customer, … [½]

… and the company should try to maximise the lifetime value of business sold per unit of marketing spend. [½]

If premium change and a measure of competitiveness is built into the model, the impact of premium changes at renewal can be modelled before deployed. [1]

Customer retention models are a key ingredient to optimised pricing algorithms. [½]

[Max 4]

[Total Max 12]

Most answered part (i) well and in part (ii) most could identify the base level in the example, but explanations suggested no real understanding.

Part (iii) was poorly answered, and in part (iv) most mentioned how the retention model may be used in pricing but were unable to generate wider points.

Q10 (i) Develop claims to year 6:

Accident year	*Third party death or bodily injury*	*Third party property damage*	*Legal expenses*	*Product recall*
Year 1	1,250 / 0.95 = 1,315.8	15 / 0.95 = 15.8	10 / 1 = 10	0 / 1 = 0
Year 2	1,040 / 0.8 = 1,300	13 / 0.8 = 16.3	9 / 0.95 = 9.5	0 / 1.05 = 0
Year 3	1,120 / 0.65 = 1,723.1	11 / 0.65 = 16.9	17 / 0.85 = 20	24 / 0.98 = 24.5
Year 4	820 / 0.5 = 1,640	8 / 0.5 = 16	9 / 0.7 = 12.9	0 / 0.92 = 0
Year 5	760 / 0.45 = 1,688.9	8 / 0.45 = 17.8	11 / 0.6 = 18.3	0 / 0.85 = 0

½ mark for each column [2]

Inflation adjustments to year 6: (*examiners recognised that as product recall inflation hadn't been the same for the past five years, the alternative shown below was also accepted*)

Accident year	*Third party death or bodily injury*	*Third party property damage*	*Legal expenses*	*Product recall*	*Product recall alternative*
Year 1	1.06^5	1.025	1.06^5	0.98^2	$0.98^{2.5}$
Year 2	1.06^4	1.025	1.06^4	0.98^2	$0.98^{2.5}$
Year 3	1.06^3	1.025	1.06^3	0.98^2	$0.98^{2.5}$
Year 4	1.06^2	1	1.06^2	0.98^2	0.98^2
Year 5	1.06	1	1.06	0.98	0.98

½ mark for each column [2]

Developed and inflated claims in year 6 money terms:

Accident year	*Third party death or bodily injury*	*Third party property damage*	*Legal expenses*	*Product recall*	*Product recall alternative*
Year 1	1,760.8	16.2	13.4	0	*0*
Year 2	1,641.2	16.7	12	0	*0*
Year 3	2,052.2	17.3	23.8	23.5	*23.3*
Year 4	1,842.7	16	14.4	0	*0*
Year 5	1,790.2	17.8	19.4	0	*0*

½ mark for each column [2]

Exposure, and burning cost by peril in each year:

Accident year	*Turnover*	*Third party death or bodily injury*	*Third party property damage*	*Legal expenses*	*Product recall*	*Product recall alternative*
Year 1	30,000	0.058694	0.000539	0.000446	0	*0*
Year 2	31,500	0.052102	0.000529	0.000380	0	*0*
Year 3	33,075	0.062047	0.000524	0.000720	0.000711	*0.000704*
Year 4	33,075	0.055713	0.000484	0.000437	0	*0*
Year 5	34,728.75	0.051549	0.000512	0.000560	0	*0*

No obvious pattern in burning cost so acceptable to use average of history. [2]

Accident year	*Turnover*	*Third party death or bodily injury*	*Third party property damage*	*Legal expenses*	*Product recall*	*Product recall alternative*
Total	162,378.75	9,087.2	84	83	23.5	*23.3*

Burning cost =

$$\frac{\text{Total claims cost}}{\text{Total exposure}} = \frac{9,087.2+84+83+23.5}{162,378.75} = \frac{9,277.7}{162,378.75} = 0.05714$$

OR

$$\frac{9087.2+84+83+23.3}{162,378.75} = \frac{9,277.5}{162,378.75} = 0.05713$$ [1]

The estimated expected claims cost in year 6 is:

$$34,728.75 \times 1.05 \times 0.05714 \times 1,000 = £2,083,483$$ *(£2,083,430)* [1]

Candidates should use a weighted average.

Assumptions:

- Turnover continues growing at 5% p.a. [½]
- Inflation in future years continues at the same levels as in year 5 [½]
- There are no material changes to the risks being written or cover provided [½]
- There are no material changes to claims handling that could affect future settlement cost [½]
- No changes to the external environment. [½]
- All events are in the data at the appropriate level of frequency, .i.e. no need for large loads for example [½]
- Assumes product recall will repeat at same frequency and magnitude [½]
- *Any other acceptable and distinct assumptions*

[Max 12]

(ii) Profit = NP – RP – 0.2NP – 0.125RP

= 0.8NP – 1.125RP [1]

$$0.95 = \frac{RP + 0.2NP + 0.125RP}{NP}$$

0.95NP = RP+0.2NP+0.125RP

$$NP = \frac{1.125}{0.75} RP$$ [1]

$$\text{Profit} = 0.8 \times \frac{1.125}{0.75} RP - 1.125RP$$

= 0.075RP [½]

$= 0.075 \times 2,083,483 = 156,261$ *(156,257)* [½]

[Total 3]

[Total Max 15]

In part (i) most candidates were able to calculate the developed and inflated claims and turnover. A not insignificant number made no attempt to look for trends in the burning cost(s) over time, and many calculated an unweighted

average burning cost. Candidates appeared to struggle to state assumptions that scored.

Part (ii) was well answered by those who attempted it.
There was some evidence of excessive rounding in answers, particularly in part (i). This did not lose marks here, however candidates should not compromise accuracy be rounding too early in calculations.

Q11 (i) A reinsurance arrangement covering a single risk as opposed to a treaty reinsurance arrangement [½]

commonly used for very large (one-off) risks or portions of risks written by a single insurer [½]

or to risks that fall outside the scope of any treaty reinsurance arrangements available to the primary insurer [½]
There is no obligation for the ceding company to offer the business, … [½]

… nor is the reinsurer obliged to accept it [½]

Each case is considered on its own merits and the reinsurer is free to quote whatever terms and conditions it sees fit to impose for that risk [½]

Facultative arrangement is applicable to proportional and non-proportional forms of reinsurance [½]
[Max 2]

(ii) Likely to have risk excess of loss in place [1]

To limit its exposure in the event of any one loss [½]

Likely to have multiple layers with different reinsurers [½]

May have to retain some interest above attachment point, e.g. profit share etc. [½]

May have overall ceiling on cover, i.e. a max limit above which the insurer retains the risk [½]

A stability clause is likely to be used to maintain the real value of the attachment point and limit [½]

Given that it is a large company, may use facultative for specific risks rather than treaty cover for all risks [½]

As it may be able to absorb a reasonably high amount of losses [½]

Or may use treaty with high attachment points [½]
Likely to have catastrophe excess of loss [1]

As it will be exposed to natural catastrophes (floods, storms etc.) [½]

This will have an hours clause, limiting the recoveries to claim events within a defined period of time [½]

Surplus reinsurance may also be used … [1]

… allowing the insurer to choose for each risk how much to retain [½]

For commercial property the EML is used as the measure of the risk [½]

The contract will specify the number of lines of cover which is used to determine the maximum cover available [½]

Aggregate excess of loss … [1]
… which covers the aggregate of losses above an excess and subject to a limit … [½]

… sustained from a single event … [½]

… or from a defined peril (or perils) [½]

reciprocal business may be appropriate to diversify the book [½]
[Max 6]

(iii) May have different risk appetite [½]

May write business in different geographic areas [½]

e.g. one company may have a lot of exposure to a country exposed to cats [½]

May write different sizes of risk [½]

e.g. one company may write lots of small risks rather than a smaller number of larger risks [½]

May have different levels of diversification [½]

e.g. one company writes business that is spread across multiple areas/countries [½]

or properties are very different in nature e.g. offices and shops and factories [½]

One of the companies may have much more capital, so less need for reinsurance [½]

e.g. it may be part of a larger group with a parent company [½]

One company may have better claims history [½]

...or write lower risk business/have stricter underwriting standards [½]

e.g. may be better at risk management with its clients, thus preventing claims [½]

The policies each insurer writes may cover different perils [½]

One company may have lower limits on its cover, so less exposed to large risks [½]

Or higher attachment points, so less exposed to small low-value claims [½]

They may have different local legislation/regulation if companies domiciled in different countries... [½]
One may buy more reinsurance because it can do so at cheaper rates than the other or availability is simply different [½]

e.g. due to strong brand, good claims history or discount due to being part of a bigger company *(or other suitable example)* [½]

One of the companies may own a captive, and be able to place reinsurance through that [½]

One company may not need reinsurance if it has a lot less uncertainty about claims projections [½]

e.g. as it has been writing business for a lot longer... [½]

...or has a more stable book of business … [½]

… or has more data. [½]

One might have other methods of transferring the risk, e.g. Cat bonds [½]

One might purchase more reinsurance to improve their credit-rating if that is important for them [½]

One might have a greater desire to maintain a good relationship with the reinsurer [½]

The companies may have different strategies, e.g. one could be trying to grow market share [½]

B might have more diversification than A which only writes commercial property insurance [½]

[Max 9]

[Total Max 17]

All three parts were generally well answered. Well prepared candidates were able to give good justifications in part (ii) and generated a wide variety of reasons in part (iii).

END OF EXAMINERS' REPORT