INSTITUTE AND FACULTY OF ACTUARIES

EXAMINATION

21 September 2022 (am)

Subject SP8 – General Insurance Pricing Specialist Principles

Time allowed: Three hours and twenty minutes

In addition to this paper you should have available the 2002 edition of the Formulae and Tables and your own electronic calculator.

If you encounter any issues during the examination please contact the Assessment Team on T. 0044 (0) 1865 268 873.

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1 An insurance company has been selling motor policies exclusively through its website since inception. Recently, it has started selling some policies through motor dealerships.

Suggest reasons why the pure risk premium calculated may be different for policies sold through this new distribution channel. [3]

2 A Pricing Actuary works for a well-established general insurance company. The Pricing Director has asked the Pricing Actuary to investigate why sales of personal lines motor policies over the past 3 months have been below plan volume.

Describe the investigations the Actuary is likely to undertake. [6]

3 (i) State four reasons for setting up a captive. [2]

An employee at a captive has made the following statement: 'Because a captive issues policies to only the parent company, there is limited value in monitoring the business we write'.

(ii) Comment on the employee's statement. [6]

[Total 8]

4 (i) List the perils likely to be covered by a travel insurance policy. [4]

A general insurance company has sold single-trip insurance policies for many years. The Sales Director is keen to launch an annual policy that will provide cover for any trips taken during the policy period.

(ii) Discuss the appropriateness of using the data collected for single-trip policies to help set the premium for the annual policy. [4]

[Total 8]

5 An insurance company exclusively issues policies that protect professional athletics clubs from the non-availability of their athletes due to temporary injury or permanent sports disability.

(i) Outline the benefits that are likely to be provided under such a policy. [4]

(ii) Describe why the insurance company may purchase a quota share reinsurance for their business. [4]

[Total 8]

6 Currently in a developed country, the use of electric scooters is only legal on private land. The country's government has decided that it will trial the use of electric scooters for single riders on public roads. The scheme will work on a rental basis. Riders will require a valid driving licence and a smartphone app to unlock and lock an electric scooter and pay for their ride.

(i) State the factors that the government is likely to have considered when making this decision. [5]

The electric scooter rental provider will be responsible for organising suitable insurance for riders for the duration of the trial.

(ii) Describe the coverage that the rental provider is likely to need in its insurance policy. [5]

(iii) Suggest exclusions that the insurance policy is likely to have in place. [5]

[Total 15]

7 An Actuary working for a general insurance company in the USA wishes to calculate the complement of credibility for class X of business in state Y. The following approaches are proposed:

Method A

- Use the historical loss data of class X of business across all states that the company operates in.
- Employ Classic Bayesian credibility, where the historical loss data for class X and state Y is credibility weighted with the loss data of a larger group.

Method B

- Use the historical loss data from a larger related class of business.
- If the company writes a small portion of class X business in state Y, but writes a larger portion of class C that is similar to class X, then the historical loss data of class C can be used to calculate the complement of credibility.
- Class C loss data may or may not be adjusted to make it more applicable to class X.

(i) Compare the qualities of the complement of credibility under each of these approaches. [10]

A portfolio has 5,400 policies with the same renewal date. Each policy has a probability of 0.6 of renewing, and the likelihood of a given policy renewing is independent of whether or not any other policy renews.

(ii) Calculate the probability that the observed number of policies that renew is within ±2% of the number of policies expected to renew. [5]

[Total 15]

8 A Pricing Actuary is building a generalised linear model to predict the likelihood that an existing customer will continue their policy when invited to renew.

(i) State the error distribution and link function for this model. [1]

The Pricing Actuary has fitted the above model and has calculated the linear predictor for an existing customer. Let the calculated linear predictor value be *LP*, and the probability of renewal be *p*.

(ii) Show that $p = \frac{1}{1 + e^{-LP}}$ [2]

Having fitted the model, the Pricing Actuary has obtained the output of the linear predictor components. An extract is shown below:

Base	1.34

Policyholder age	
<30	0.00
30–49	–0.24
50–69	0.38
70+	0.76

Renewal premium/last year's premium	
<0.5	1.03
0.5–0.75	0.28
0.75–0.95	0.09
0.95–1.05	0.00
1.05–1.25	–0.84
1.25–1.5	–1.42
>1.5	–1.96

Policyholder age	*Renewal premium/last year's premium*						
	<0.5	*0.5–0.75*	*0.75–0.95*	*0.95–1.05*	*1.05–1.25*	*1.25–1.5*	*>1.5*
<30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30–49	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50–69	0.00	0.00	0.00	0.00	0.24	0.42	0.55
70+	0.00	0.00	0.00	0.00	0.29	0.49	0.62

(iii) Describe, without calculation, how the likelihood of renewing varies with policyholder age and the ratio of the renewal premium to last year's premium. [5]

(iv) Calculate the probability that a 55-year-old will renew if their premium at renewal is 30% higher than the premium paid last year, assuming that the levels of any other factors fitted are the base level. [2]

A colleague in the marketing department has built a similar model using a new software package. The new software has no user manual.

(v) Comment on the risks associated with using the model created by the marketing department. [3]

(vi) Outline steps that may be taken to mitigate the risks. [3]

[Total 16]

9 A small general insurance company started providing cyber insurance to small businesses 2 years ago. It has found that the take-up rate of this product has not increased since it was launched.

(i) Suggest reasons why the take-up rate has not increased. [4]

(ii) Describe the risks that the issuance of cyber insurance poses to the insurance company's profitability. [6]

The company's Actuary wants to understand the risk posed by a potential cyber catastrophe event, where a large number of insureds would be affected by a single cyber event. The Actuary decides to estimate the Probable Maximum Loss (PML) to determine how severe this risk may be.

(iii) State why it is difficult to identify a cyber catastrophe. [3]

(iv) Describe how the Actuary may estimate the PML using past claims. [3]

The Actuary has obtained a cyber risk catastrophe model that they will use to derive the cyber catastrophe element of the risk premium.

(v) Outline the steps the Actuary would take to derive the cyber catastrophe element of the risk premium. [5]

[Total 21]

END OF PAPER