

# INSTITUTE AND FACULTY OF ACTUARIES



## EXAMINATION

26 September 2018 (pm)

### **Subject ST8 – General Insurance: Pricing Specialist Technical**

*Time allowed: Three hours*

#### **INSTRUCTIONS TO THE CANDIDATE**

1. *Enter all the candidate and examination details as requested on the front of your answer booklet.*
2. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*
3. *You have 15 minutes of planning and reading time before the start of this examination. You may make separate notes or write on the exam paper but not in your answer booklet. Calculators are not to be used during the reading time. You will then have three hours to complete the paper.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all eleven questions, beginning your answer to each question on a new page.*
6. *Candidates should show calculations where this is appropriate.*

#### **AT THE END OF THE EXAMINATION**

*Hand in BOTH your answer booklet, with any additional sheets firmly attached, and this question paper.*

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

- 1** A bank has approached a general insurance company to underwrite a creditor insurance product which the bank intends to offer to customers who take out a loan. If the customer became unable to repay the loan due to redundancy or illness, the insurance company would cover the repayments for up to 12 months.

The bank has specified that it wants to charge a flat fee for the product, i.e. all customers pay the same premium.

Discuss the advantages and disadvantages of a flat fee from the viewpoint of both the bank and the insurance company. [5]

- 2** A large general insurance company sells various insurance products. It collects a range of premium and claims data.

Set out how the various users of the data are likely to use the data. [6]

- 3** Motor insurers in a well developed market have raised concerns about increasing levels of fraud. The industry body representing motor insurance companies has proposed creating a central database containing policyholders' claims histories. The purpose of the database is to enable insurers to take into account past fraudulent activity when insuring new customers.

Discuss the factors the industry body should take into account when planning the database. [7]

- 4 An actuary is pricing a risk excess of loss policy for a large property with a sum insured of \$400m. The cover requested is for \$100m in excess of \$50m. She has made the following assumptions:

- The expected annual number of losses (ground up) is 5.
- The expected size of a loss (ground up) is \$25m.
- It is appropriate to use the following exposure curve.

<i>Size of loss (as a proportion of sum insured)</i>	<i>Exposure Curve value</i>
0.125	0.62
0.25	0.84
0.375	0.92
0.5	0.94
0.625	0.96
0.75	0.98
0.875	0.99

- (i) Determine the expected annual loss cost for the policy. [4]

The actuary has revised her calculation using a new exposure curve. All other elements remained the same. As a result, the expected annual loss cost has increased.

- (ii) Explain whether the new exposure curve used is more or less steep than the original one. [1]

A second actuary is concerned about inflation and whether it has been properly allowed for in the calculations.

- (iii) Comment on the actuary's concerns, with specific reference to how claims inflation might have been used in the exposure curves. [2]  
[Total 7]

**5** Describe how each of the following approaches can be used to price an excess of loss reinsurance treaty:

- (i) Burning cost method.
- (ii) Original loss curves.

[8]

**6** “Insurance Co” is a large general insurance company selling both commercial and personal motor insurance. The board of the company has decided to review its reinsurance coverage.

Discuss the factors the board is likely to take into account when deciding on its future reinsurance coverage. [8]

**7** (i) Describe the following models of aggregate claim distributions, stating, for each, the model assumptions:

- (a) Individual risk model.
- (b) Collective risk model.

[6]

(ii) Outline how simulation error can be reduced when a stochastic method is used.

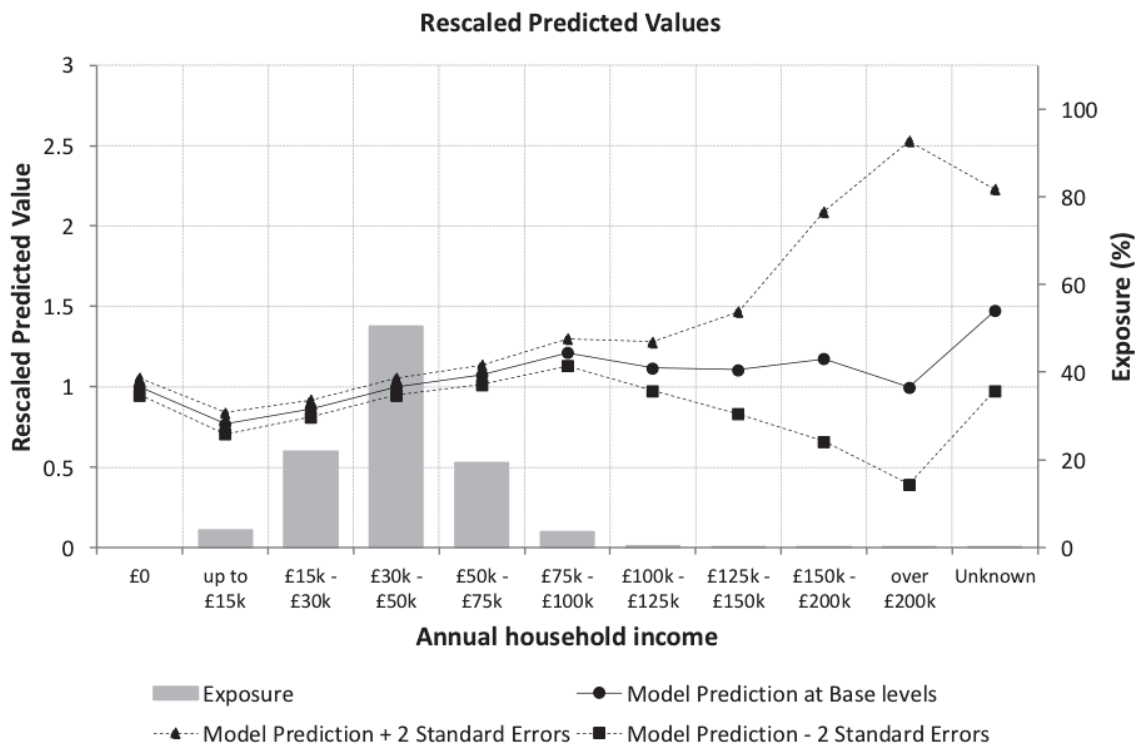
[3]

[Total 9]

- 8 An actuary is fitting a GLM to some claims data captured on a personal lines household portfolio. He is building a model to predict the likelihood of a claim on the buildings section. A colleague has suggested it may be better to build separate models for each peril.

(i) Explain the reasoning behind the colleague's suggestion. [2]

The actuary has fitted a model, with several factors, to the claims for one of the perils. He is considering whether to include annual household income as a factor, and has obtained the following output.



	<i>Model with annual household income fitted</i>	<i>Model without annual household income fitted</i>
Scaled deviance	275,066.0605	275,112.042
Log-likelihood	-165,787.9	-165,892.45
Number of parameters	70	61
Degrees of freedom	2,004,664	2,004,673

(ii) Evaluate whether annual household income should be included as a factor in the model, based on the information provided. [5]

(iii) Outline further ways in which annual household income could be assessed as a factor for inclusion in the model. [3]

[Total 10]

- 9 (i) Set out the reasons why exposure curves are not appropriate for casualty business. [3]

An actuary has been using increased limit factors (ILFs) to price excess of loss treaties for professional indemnity cover.

- (ii) Describe the benefits and perils insured under professional indemnity cover. [3]

The actuary is using the table of ILFs shown below. The expected loss cost for a treaty with \$500,000 limit is \$17,000.

<i>Limit (\$m)</i>	<i>ILF</i>
0.5	1
1	1.360
2	1.631
5	1.987
10	2.470
20	2.905
30	3.124
40	3.259
50	3.354

- (iii) Calculate the expected loss cost for a \$15m XS \$5m treaty. [1]

The actuary has been using the table of ILFs above to price contracts written in respect of professionals working in a developed country. She is proposing to use the same table to price contracts in respect of professionals working outside the developed country.

- (iv) Explain why the actuary's proposal may not be appropriate. [4]  
[Total 11]

- 10** Three years ago, a general insurance company launched a new insurance product for small- and medium-sized companies; the product covers Employers' Liability, Public Liability and Property. A pricing actuary has been asked to comment on the profitability of the product, and has been given the following:

<i>Underwriting Year</i>	<i>Gross Written Premium (\$m)</i>	<i>Gross Incurred Claims (\$m)</i>
2015	12.1	6.5
2016	23.9	13.1
2017	34.1	16.7

- (i) Discuss the factors the pricing actuary should consider in their analysis. [9]

The product is relatively new and there is limited historical data. The sales director of the company has therefore proposed increasing the premiums by 10% in 2018 to minimise the risk of making a loss.

- (ii) Discuss the sales director's proposal. [3]

[Total 12]

- 11** (i) List the reasons for setting up a captive insurance company. [3]

In the country of Actuarialia, personal accident products are available that pay out a one-off lump sum if the insured suffers permanent total disability following an accident. In order to ensure that claimants are not under or over-compensated, the government has decided to introduce a single discount rate which adjusts the lump sum to take into account the return expected over time when that lump sum is invested.

The industry body representing the insurers is responding to this government decision.

- (ii) Discuss the issues the industry body would consider in their response. [9]

- (iii) Describe how this discount rate introduction is likely to affect captive insurers. [5]

[Total 17]

**END OF PAPER**