

# INSTITUTE AND FACULTY OF ACTUARIES



## EXAMINATION

7 October 2015 (am)

### **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 have 15 minutes before the start of the examination in which to read the questions. You are strongly encouraged to use this time for reading only, but notes may be made. You then have three hours to complete the paper.*
3. *You must not start writing your answers in the booklet until instructed to do so by the supervisor.*
4. *Mark allocations are shown in brackets.*
5. *Attempt all 11 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 general insurance company writing employers' liability insurance is currently reviewing its rating structure.

Outline possible changes in the external environment that may have to be considered when analysing past data. [3]

- 2** (i) Define the term "ILF". [1]

The table below shows ILFs for reinsurance contracts written on 1 January 2012:

<i>Limit</i>	<i>ILF</i>
500,000	1.00
1,000,000	1.82
2,000,000	2.78
5,000,000	4.98
10,000,000	8.24
15,000,000	11.11
20,000,000	13.29
25,000,000	14.12

- (ii) Calculate the ILF for each of the following two layers:

- (a) 1 million xs 1 million  
(b) 15 million xs 10 million

[1]

During the time since the ILF curve was produced, inflation has averaged 6% per annum. An actuary now wishes to use the ILF curve in order to price a reinsurance contract that commences on 1 October 2015.

- (iii) Calculate the ILF for a reinsurance layer of 5 million xs 5 million, showing all workings and stating any assumptions you make. [5]

[Total 7]

- 3** (i) Define the term “burning cost”. [1]
- (ii) Recommend giving reasons, whether a burning cost or frequency-severity approach would be more appropriate to price each of the following contracts:
- (a) A fleet of five luxury coaches used for a variety of holiday excursions. A full claims and exposure history is available for the last ten years.
- (b) A reinsurance company pricing a risk excess of loss contract covering a general insurance company with a large portfolio of property business with a low attachment point. The contract has individual and aggregate deductibles, with reinstatements at further cost.
- (c) Professional indemnity cover sold to dentists through the national dental association. Exposure and claims data exists for the last two years. However, there is also data available from medical negligence insurance provided by the same insurance company to doctors and surgeons for the last seven years.

[6]

[Total 7]

- 4** A general insurance company is proposing to sell a new product through a bank. The product would be sold to the bank’s customers when they take out a loan; the product would repay the loan in full if the customer were to be made unemployed.
- (i) Suggest terms and conditions that the company could put in place with the bank to control the cost of claims on this product. [4]
- (ii) Outline the risk factors that would determine the expected cost of claims. [3]
- [Total 7]

- 5** An actuary working for a general insurance company selling commercial property insurance has calculated the office premium of a policy to be £10,000.
- Outline reasons why the premium actually charged by the underwriter may not be £10,000. [7]

- 6** (i) Explain the advantages and disadvantages of using annual mileage provided by the customer, as a factor to determine the premium for private motor insurance. [4]
- (ii) Suggest sources and types of external third-party data that a general insurance company writing private motor insurance might use in determining the premium to charge. [5]
- [Total 9]

- 7
- (i) Define “experience rating”. [1]
  - (ii) Propose an appropriate method for experience rating in each of the following classes of insurance business, including the key features of its application:
    - (a) private motor
    - (b) employers’ liability
 [4]
  - (iii) Outline the advantages and disadvantages of each of the proposed methods in part (ii). [4]
- [Total 9]

- 8
- A commercial lines pricing actuary is using a deterministic frequency-severity approach to price employers’ liability insurance. The actuary is using ten years of claims and exposure data and the claims have been developed to allow for IBNR and IBNER.

Describe the considerations the actuary will have to take into account when trending the claim frequency and severity. [10]

- 9
- A liability insurance company has in place a \$15m xs \$5m excess of loss reinsurance policy, with an aggregate deductible of \$15m. The first \$1m of each claim is non-ranking towards the deductible.

- (i) Calculate the total recovery due if the insurer has the following losses in one reinsurance policy year:

Loss A: \$4m  
 Loss B: \$20m  
 Loss C: \$22m  
 Loss D: \$9m  
 Loss E: \$10m

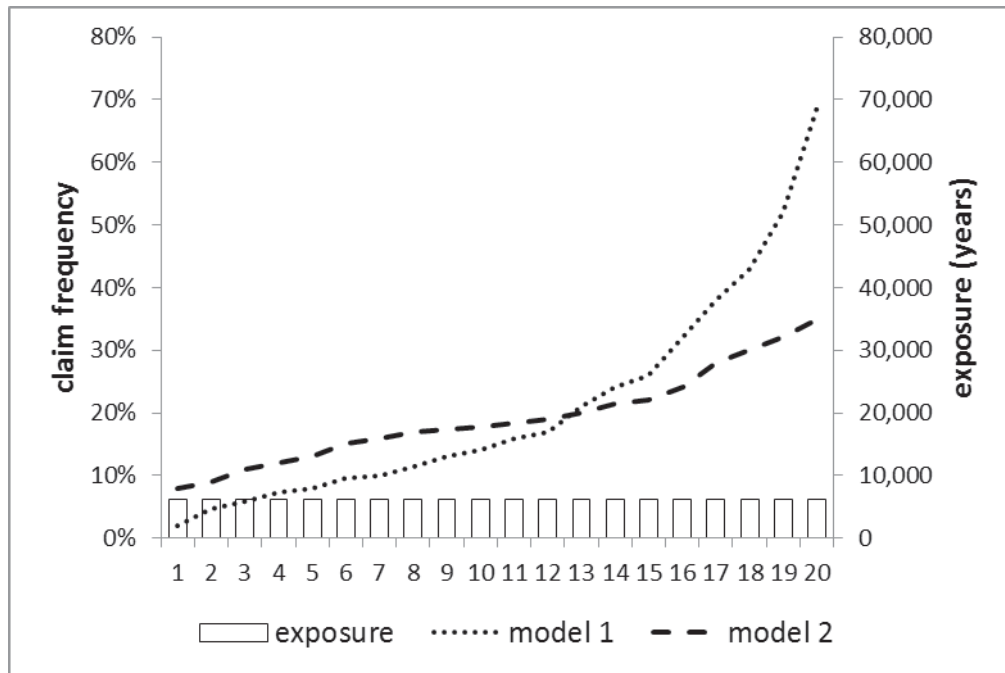
[6]

The reinsurer has proposed putting in place an indexation clause when the policy renews.

- (ii) Describe how this clause would be applied in practice when settling a claim. [2]
- (iii) State the advantages and disadvantages of the introduction of an indexation clause from the liability insurance company’s perspective. [3]

[Total 11]

- 10** The chart below shows two lift curves used for model validation purposes. The models being considered in this chart are claim frequency models.



- (i) Describe how a chart of the type shown above would be constructed. [3]
- (ii) Justify which of the two models is a better predictor of claim frequency. [2]
- (iii) Describe two other approaches to model validation. [8]

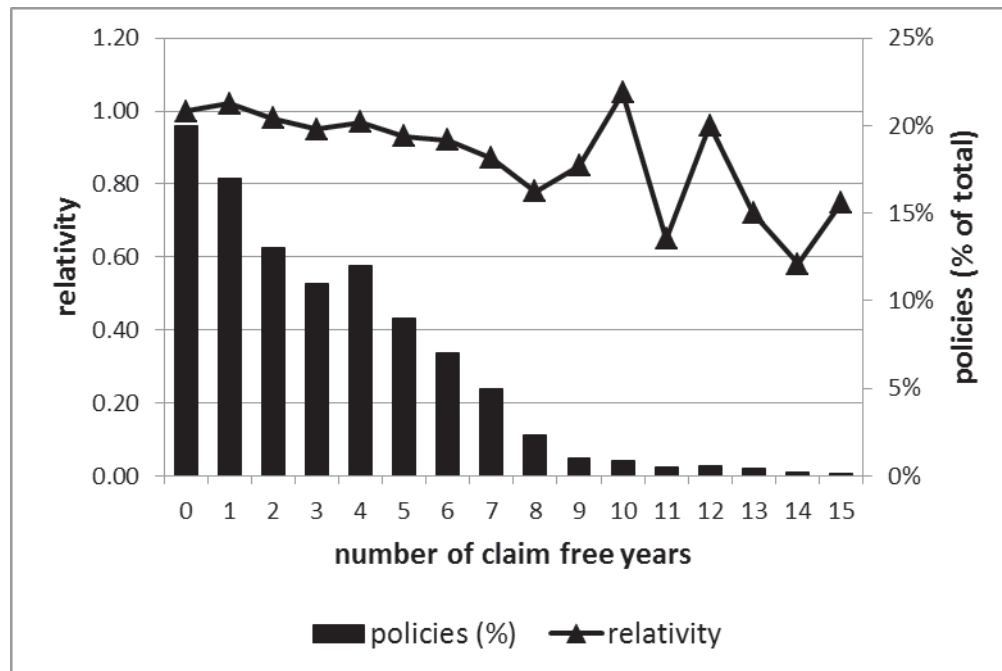
[Total 13]

- 11 (i) Describe four different approaches that may be used to determine whether or not a factor should be retained in a generalised linear model. Statistical formulae are not required. [6]

A generalised linear model is to be fitted to the risk premium of a cohort of private motor insurance policies to generate a multiplicative rating structure.

- (ii) Write down an appropriate error structure and link function for this model. [1]

A no-claims discount factor has been included in the model as an explanatory variable. The chart below shows the model relativities for the no-claims discount factor.



- (iii) (a) Explain why the relativities shown would not be used in the actual rating structure. [3]
- (b) Outline the steps that could be taken to make them useable.

The insurance governing body has stated that the customer must receive a 2% compound discount for every claim-free year.

- (iv) Suggest reasons why the insurance governing body has introduced this change. [2]
- (v) Describe how the pricing model should be changed to meet the requirement for a 2% discount. [2]
- (vi) Assess the likely impacts of the new requirement on market premiums. [3]
- [Total 17]

**END OF PAPER**