



MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

THIRD YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (ACTUARIAL SCIENCE)

SAC 308 GENERAL INSURANCE

DATE: 16/3/2022

TIME: 2.00-4.00 PM

INSTRUCTIONS

SECTION A: ATTEMPT ALL QUESTIONS

QUESTION ONE (30 MARKS)

- a)
 - i) State the reasons why a general insurance company might calculate IBNR reserves separately from other claims reserves. (1 mark)
 - ii) State the ways in which a general insurance company can increase its gross written premium. (2 marks)
- b)
 - i) List the types of generic policy and claims data that would be required for a premium rating exercise. (3 marks)
 - ii) List the risks that the insurance company faces in relation to claims experience from this class of business. (2 marks)
 - iii) Give examples of the measures that the insurance company could put in place to control/ reduce the variability of its claim experience. (2 marks)
- c) State the law of large numbers and state its importance to the insurance mechanism. (1 mark)
- d) You are the actuary for a general insurance company that writes motor fleet business. One of the options available to the insured is for it to take a voluntary aggregate deductible on its policy.
 - i. Define what is meant by a deductible. (1 mark)
 - ii. Define what is meant by an aggregate deductible. (1 mark)

- e) Based on an analysis of past claims, an insurance company believes that individual claims in a particular category for the coming year will have a mean size of £5,000 and a standard deviation of £7,500. Estimate the proportion of claims that will exceed £25,000, assuming that individual claim sizes conform to a lognormal distribution. (6 marks)
- f) Given:
 Earned Premium = \$ 800,000
 $E(LR) = 0.680$
 $\sum \text{Individual claim file Estimates } (\$ \text{ Paid} + \text{Reserves}) = \$ 500,000$
 $\$ \text{ Paid—to-date} = \$ 300,000$
 $\prod f_i(\text{on incurred claims}) = 1.100$
 Find the Total actuarial reserving using:
 i. The chain ladder method
 ii. Loss Ratio Method
 iii. The Bornhuetter Method (6 marks)
- g) Prove that
- $$R_{BF} = \left(1 - \frac{1}{f}\right) * R_{LR} + \left(\frac{1}{f} * R_{CL}\right) \quad (5 \text{ marks})$$

SECTION B ATTEMPT ANY TWO QUESTIONS

QUESTION TWO (20 MARKS)

The government of a small developing nation wants to encourage exports from that country. One of the measures that it has taken is to set up an export credit insurer. An exporter can buy credit insurance from the insurer for each consignment of goods that it exports. If the customer in the foreign country fails to pay for the goods, then the insurer indemnifies the exporter.

- a) Describe the characteristics of the claims that the export credit insurer is likely to receive. (5 marks)
- b) List the policy data items that the export credit insurer will need to capture when setting up a policy onto its system. (3 marks)
- c) Suggest appropriate ways to group claim development statistics for this insurer when carrying out a reserving exercise to set outstanding claim reserves. (3 marks)
- d) Describe how the unearned premium reserve would be calculated for this insurer. (3 marks)
- e) Suggest with reasons, suitable reinsurance structures for the export credit insurer. (4 marks)

QUESTION THREE (20 MARKS)

- a) You have chosen the following paid loss development factors to model the lower half of a claim paid rectangle:

$$\frac{1/0}{1.41} \frac{2/1}{1.22} \frac{3/2}{1.16} \frac{4/3}{1.08} \frac{\infty/4}{1.04}$$

You are setting reserves for the annual report as of December 31, CY7. For AY6 you have claims paid –to-date of \$420,000 at report duration 1, which is December 31, CY7. The earned premium calculated for AY6 is \$1,000,000 and the expected loss ratio is 0.600. For AY6, determine the estimated loss reserve using each of the expected loss ratio method, the chain ladder method, and the Bornhuetter Ferguson Method. (10 marks)

- b) i) State a formula for calculating ultimate claims using the Bornhuetter Ferguson (“BF”) method of reserving. (1 mark)
- ii) Explain why the paid BF ultimate is generally similar to the paid chain ladder ultimate for older accident years. (2 marks)
- iii) Discuss the advantages and disadvantages of the following approaches for deriving an estimated loss ratio for use within the paid BF method:
- I. Use market loss ratios derived from industry benchmark information. (3 marks)
 - II. Set the estimated loss ratio for year (x + 1) to the final selected ultimate loss ratio for year x. (3 marks)
 - III. Use the ultimate loss ratios implied by the paid chain ladder method (4 marks)

QUESTION FOUR (20 MARKS)

You are the Actuary to a general insurance company which started transacting household buildings and contents insurance on 1 January 1998. All business written in a year is based on the same premium rating basis. All reinsurance is on a quota share basis. The only accounting information available to you is:

Year	1998	1999	2000	2001
Net Written Premium*	25	50	100	200
Net Earned Premium*	10	35	70	140
Net Loss Ratio*	150%	130%	100%	75%

***the loss ratio is calculated on an accordance basis and premiums are net of reinsurance ceded**

- a) Calculate the gross loss ratio for each of the four underwriting years, stating any assumptions that you make. (10 marks)
- b) Explain why the figures in (i) are unlikely to occur in practice. (5 marks)
- c) Discuss the effects that such rapid premium growth may have on an insurer's balance sheet and future business plans. (5 marks)