

EXAMINATION

25 September 2008 (pm)

Subject ST3 — General Insurance 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 at 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 7 questions, beginning your answer to each question on a separate sheet.*
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.

<p><i>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.</i></p>
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1 You are the actuary for a small general insurance company with a low solvency margin. The insurer is considering purchasing excess of loss reinsurance to reduce its claim volatility and hence reduce its probability of ruin.

- (i) Explain whether the proposed course of action will have the desired effect and state the implications on the insurer's profit. [4]

You model the probability of ruin at the end of one year according to a compound Poisson process. According to your calculations the company's profit load is $0.1 \leq \theta \leq 0.2$, the reinsurer's profit load is $0.15 \leq \gamma \leq 0.25$ and the Poisson parameter is $1,000 \leq \lambda \leq 1,500$.

- (ii) State, with explanation, which combination of parameters would be worst for the insurer. [2]
[Total 6]

2 A general insurance company writes only personal lines business. It would like to build a financial model to provide checks on the business and has asked for your advice.

- (i) List the requirements that a financial model should meet. [2]

For a particular class of business, you have been told that the individual claim amounts have a Gamma distribution with parameters $\alpha = 12$ and $\lambda = 0.02$. The claim frequency has a Poisson distribution with $\lambda = 0.25$.

- (ii) Calculate a risk premium for this class of business. [2]

You are aware that there is some uncertainty surrounding the bases for calculating both the frequency and the severity and would like to give a range of possible values for the risk premium rather than the point estimate you have already calculated. You would like to add a margin of 5% of the standard deviation for the amounts and 2% of the standard deviation for the frequency.

- (iii) Calculate the acceptable range. [3]
[Total 7]

3 You are an actuary in a general insurance company that applies an excess to its motor insurance business.

- (i) Define the term “excess”. [1]
- (ii) Give reasons why the insurance company would use an excess. [3]

The motor pricing manager has estimated that the distribution of accidental damage ground up losses for the coming year will be approximately as follows:

<i>Loss (£)</i>	<i>Number of claims</i>
0	3,500
1 to 50	1,750
51 to 100	750
101 to 150	250
151 to 200	250
201 to 500	500
501 to 1,500	3,000
1,501 to 2,500	1,500
2,501 to 7,500	500

The excess is currently £100.

- (iii) Calculate the amount that the insurance company expects to pay out for accidental damage claims next year. [2]
- (iv) Recalculate the amount that the insurance company would expect to pay if inflation causes ground up losses to double but the excess remains at £100, assuming that the relative distribution of claims stays the same. [2]
- (v) Given that the losses have exactly doubled, explain why the insurance company’s liability has not doubled as well. [1]

[Total 9]

4 Describe the following characteristics of marine insurance:

- (i) Benefits [2]
- (ii) Insured perils [3]
- (iii) Exposure measures [1]
- (iv) Claim characteristics [4]
- (v) Risk factors [4]

[Total 14]

- 5 You are an actuary at a medium-sized general insurance company. One of the business units writes two annually renewable binding authorities, whereby underwriting authority is delegated to a third party and underwriting risk is 100% retained by the insurer. Contract A inception on 1 January 2004 and Contract B inception on 1 April 2004. The business unit wants to analyse its profitability over the past three years.

You have been given the following information for policies written on the 2004 binding authorities:

	<i>Contract A</i>	<i>Contract B</i>
Average premium	£265	£1,560
Acquisition costs	40.0%	32.5%

You have also been given the following information on successive rate changes that were applied to the base rates at each given date between 2004 and 2007:

	<i>Contract A</i>	<i>Contract B</i>
1 May 2005	+1.0%	+2.0%
1 November 2005	+2.0%	+3.0%
1 March 2006	+3.0%	+5.0%
1 October 2006	-2.0%	+1.5%
1 June 2007	-4.0%	+1.5%
1 September 2007	-5.0%	+1.5%

The numbers of policies written on the 2004 to 2007 binding authorities were:

	<i>Contract A</i>	<i>Contract B</i>
2004	50,000	10,000
2005	52,000	11,100
2006	53,040	11,432
2007	57,824	12,004

- (i) Calculate the earned premium (net of DAC) for 2005, 2006 and 2007, stating any assumptions that you make. [12]

You have been given the following calendar year incurred claim movement information:

	<i>Contract A</i>		<i>Contract B</i>	
	<i>Current Year</i>	<i>Prior Years</i>	<i>Current Year</i>	<i>Prior Years</i>
2004	£6,025,000	£0	£5,000,000	£0
2005	£6,625,000	£750,000	£5,937,500	£1,500,000
2006	£5,126,000	£1,593,750	£5,475,000	£2,700,000
2007	£6,100,000	£1,875,000	£5,375,000	£2,025,000

Claims paid in each year were 35% of GWP for Contract A and 31% of GWP for Contract B. Investment return was 4.5% per annum. Overheads allocated to the business unit were £1.5m in 2004. Internal per policy expenses in 2004 were £24 for Contract A and £78 for Contract B. Overheads and per policy expenses increased at 4.0% per annum.

- (ii) Calculate the pre-tax profit made by the business unit in 2005, 2006 and 2007, stating any additional assumptions that you make. [10]
- (iii) Comment on the results of your findings in (i) and (ii), paying particular attention to the impact of the two contracts on the overall results. [8]
[Total 30]

6 You are the pricing actuary for a general insurance company that writes private motor insurance. You have been contacted by a national cycling club, which is interested in selling bicycle insurance to its members.

- (i) List the two key insured perils that would be covered in a bicycle insurance policy. [1]

The cycling club wants their members to be able to obtain quotes for this insurance very quickly and easily and therefore wants the number of rating factors to be restricted to two.

- (ii) State the most important requirements of rating factors. [1]
- (iii) State two rating factors which could be used for this class of insurance. [1]
- (iv) List the non-standard add-on covers that could be included to give a potentially very comprehensive policy. [8]

Your company has not written bicycle insurance before and therefore has no data relating to this. It has been suggested that you could use industry-wide data to help you to set the prices.

- (v) Explain the difficulties you might encounter in obtaining and using industry-wide data. [4]

You have been asked to specify the future data requirements for this class of business so that a suitable management information system can be considered.

- (vi) List the data items for which you would ask in order to help you to develop sophisticated pricing for this business in the future. [8]
[Total 23]

7 For a number of years a reinsurer has written a working layer per event risk XL treaty with unlimited reinstatements. The cedant places this treaty to protect the liability element of a large book of private motor vehicle insurance. The reinsurer has recently introduced a stability clause and an aggregate deductible to the layer.

(i) Define each of these new features and explain the impact of their introduction on the expected cost of claims to the layer. [5]

(ii) State the advantages and disadvantages to both the reinsurer and the cedant of the addition of each of these new features to the layer. [6]

[Total 11]

END OF PAPER