

EXAMINATION

7 June 2013 (am)

Subject F103 — *General Insurance* Fellowship Principles

Time allowed: Three hours

INSTRUCTIONS TO THE CANDIDATE

1. *Use the instructions and password provided at the examination center to log in.*
2. *Submit your answers in Word format only using the template provided.*
3. *Save your work regularly throughout the examination on the supplied computers' hard drive.*
4. *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.*
5. *You must not start typing your answers until instructed to do so by the supervisor.*
6. *Mark allocations are shown in brackets on exam papers.*
7. *Attempt all seven (7) questions, beginning your answer to each question on a new page.*
8. *Candidates should show calculations where this is appropriate.*

Note: The Actuarial Society of South Africa will not be held responsible for loss of data where candidates have not followed instructions as set out above.

AT THE END OF THE EXAMINATION

Save your answers on the hard drive AND hand in 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</i></p>
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QUESTION 1

You are an actuary working for a newly established reinsurance company. Due to a recent earthquake and fears of an increase in tectonic plate movement, you have been tasked with the job of creating a catastrophe model for earthquakes that can be used to price excess of loss reinsurance.

- i. Explain why traditional approaches such as the burning cost approach are not appropriate for modelling catastrophes. [3]
- ii. Describe the basic structure of a catastrophe model and discuss the factors you would consider before developing a catastrophe model for earthquakes. [9]

[Total 12]

QUESTION 2

You are the actuary to a JSE-listed general insurer that specialises in writing motor insurance in South Africa. The company's policy has been to hold excess capital equal to two times the statutory minimum solvency margin (SMSM), although it has not established the probability of insolvency associated with this level of capital. The SMSM is calculated for the insurer as follows:

Max {R10m; 25% of net (of reinsurance) written premium in last 12 months}

- i. Outline the advantages and disadvantages of this approach to calculating the SMSM. [5]
- ii. Discuss briefly the merits of basing the SMSM on the amount of outstanding claims rather than written premiums as is currently the case. [2]

Your finance director has suggested that in light of the SMSM, the insurer should hold just enough assets to cover the liabilities and the SMSM, and no more.

- iii. Outline the reasons why the company should hold more capital than the statutory minimum. [3]

The regulator has now announced that there will be a change in the approach to calculating the SMSM. The new approach will be based on a risk-based model calibrated to a 1/200 probability of insolvency over a 1-year period.

- iv. Outline the steps and calculations needed before deciding on a suitable capital coverage level, where capital coverage is defined as:
$$\frac{\text{Assets} - \text{Liabilities}}{\text{SMSM}}$$

[5]

[Total 15]

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QUESTION 3

You recently joined the valuations team of an insurance company as reserving actuary. The company mainly insures property (including public liability) business. To date, the basic chain ladder (BCL) method (without any claim adjustments) has been used to set reserves in respect of outstanding claims. Your first assignment is to review the reserving methodology, and (where relevant) propose alternatives for setting reserves.

You have been provided with the following recent claims and premium (in R'000) experience:

Year	Written Premium	Initial Expected Loss Ratio
2002	2 800	85%
2003	3 000	85%
2004	3 000	80%
2005	3 250	75%
2006	5 000	72%
2007	3 250	80%
2008	3 500	75%
2009	3 750	75%
2010	4 000	80%
2011	4 250	85%

Accident Year	Cumulative Claims Paid					
	0	1	2	3	4	5
2002	600	2 000	2 200	2 300	2 300	2 300
2003	700	2 200	2 450	2 450	2 450	2 450
2004	650	2 150	2 150	2 150	2 150	2 150
2005	600	2 000	2 300	2 400	2 400	2 400
2006	2 300	4 000	5 000	5 750	6 000	6 050
2007	1 300	2 400	2 600	2 700	2 700	
2008	990	1 900	2 300	2 700		
2009	1 000	2 000	2 500			
2010	950	2 000				
2011	1 600					

Based on data		Development Factors				
Since 2002	2.868	1.262	1.095	1.017	1.003	
Since 2006	2.647	1.408	1.169	1.038	1.008	

Accident Year	Year-on-Year Development Ratios				
	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5
2002	3.333	1.100	1.045	1.000	1.000
2003	3.143	1.114	1.000	1.000	1.000
2004	3.308	1.000	1.000	1.000	1.000
2005	3.333	1.150	1.043	1.000	1.000
2006	1.739	1.250	1.150	1.043	1.008
2007	1.846	1.083	1.038	1.000	
2008	1.919	1.211	1.174		
2009	2.000	1.250			
2010	2.105				
2011					

i. Identify, and provide possible reasons for, two specific claims development features included in the historic data above. [5]

ii. Outline briefly adjustments which you could make to the BCL for calculating outstanding claims reserves for the insurer. [2]

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- iii. Calculate the ultimate loss ratio and outstanding claims reserve, for the 2011 accident year only, on both the BCL and Bornhuetter-Ferguson (BF) methods using development factors based on cumulative data since 2006 (as provided in the table above). [5]
 - iv. Comment on the results obtained in (iii) above, and on the appropriateness of only using the development factors from 2006 onwards. [4]
- [Total 16]

QUESTION 4

Tracksion is an insurance company writing railway insurance, covering both the insureds' trains as well as third-party liability (to passengers and members of the public). Over the past few years Tracksion's claims experience has been very low. Tracksion is now reviewing its reinsurance arrangements in light of this experience.

- i. Outline the claims characteristics of Tracksion's railway insurance. [6]
 - ii. Suggest, with reasons, what types of reinsurance may be appropriate for Tracksion. [4]
 - iii. Describe the factors that would impact the decision on how much business to reinsure. [5]
- [Total 15]

QUESTION 5

You work in the pricing team for a general insurance company specialising in household insurance. You have conducted a detailed Generalised Linear Model (GLM) analysis using the latest GLM modelling software available. The data used consisted of all policy and claims data since the inception of the insurer four years ago.

- i. Explain how a GLM is related to ordinary least squares regression and give the general structure of a GLM. [3]
 - ii. Explain briefly how a GLM can be used to determine premium rates for household insurance business. [1]
 - iii. Outline potential reasons why the rates suggested by a GLM might not be used without adjustment. [9]
- [Total 13]

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QUESTION 6

As an independent consulting actuary you have been contracted by a foreign insurance company to do an analysis of portfolio movements on its motorcycle insurance book. The company has experienced unusually large growth in the last year and would like to understand how this growth is impacting the company. Motorcycles are the main form of transport in the foreign country

Outline possible reasons for the growth experienced in the book and explain the potential impact of this growth on the insurer.

[12]

QUESTION 7

Beyond Insurance is a general insurance company which offers a broad range of commercial insurance products. In an attempt to expand its product offering Beyond Insurance is introducing a trade credit insurance product to insure against bad debts. The product will cover all amounts not recovered by the insured from debtors within 120 days. Once the claims have been paid, Beyond Insurance will attempt to make recoveries from the defaulting debtors.

- i. Define what is meant by an “exposure measure” . [1]
- ii. Suggest a suitable exposure measure for this product and discuss briefly how it meets or does not meet the desirable characteristics of an exposure measure. [4]
- iii. Discuss the insurability of this risk, and where the insurability is compromised suggest and explain ways the insurer might improve the situation. [7]
- iv. With reference to an aspect of the insurability of the risk which might not be able to be adequately overcome, explain briefly why the insurer may still decide to offer this product. [2]
- v. List three rating factors that may be used to price this product and outline how each would impact the premium. [3]

[Total 17]

END OF PAPER