

EXAMINATION

8 November 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 six (6) 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 list.</i></p>
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QUESTION 1

Company X, a general insurer, writes commercial property insurance. It has in place three reinsurance treaties with Companies A, B and C, which operate in the order given below, and with commission as indicated:

- 25% Quota Share treaty with Company A.
Profit Commission on the treaty calculated at the end of the year as:
 $20\% \times (70\% \times \text{Gross reinsurance premiums} - \text{Reinsurance recoveries})$
- Individual Surplus with Company B, having 5 lines.
The maximum retention limit is R75m and Company X cedes as little risk to Company B as the treaty permits.
- Individual Risk Excess of Loss with Company C, which covers 90% of losses in excess of R100m.
The reinsurance premium for each policy on this element of the cover is set at 1% of the potential maximum recovery from Company C.

During the year Company X wrote gross premiums of R2000m. The total EML written during the year was R140 000m, which was 80% of the total sums insured. Total claims for the year were R1200m.

You have been advised that the above figures include the policies below which are the only policies that were large enough to possibly have been covered under the treaties with Companies B or C:

<u>Policy</u>	<u>Sum Insured</u>	<u>EML</u>	<u>Policy Premium</u>	<u>Claim Amount</u>
1	R200m	R100m	R2m	0
2	R160m	R120m	R2m	0
3	R400m	R200m	R4m	R250m
4	R800m	R600m	R6m	R200m

- Determine the profit commission that will be received from Company A. [2]
- Determine the reinsurance premium paid by Company X to Company B. [4]
- Determine the reinsurance premium paid by Company X to Company C. [4]
- Comment on whether the insured and the surplus reinsurer are likely to have the same experience (proportionally) on the reinsured portfolio. [2]
- Explain how a surplus reinsurer is likely to respond to the situation where several claims in a year exceed the EML. [2]

[Total 14]

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QUESTION 2

You are an actuary working for a small, general insurance company that specialises in private motor insurance. The company has just conducted a lapse/renewal experience investigation on its internal data by means of a generalised linear model.

- i. List 8 data items that may have been required for the generalised linear model that was used to analyse policyholder retention and, for each data item you suggest, outline the benefit of including it in the investigation.

[4]

The company is now considering alternative methods for pricing its motor insurance policies.

- ii. Explain, and illustrate by means of a suitable example, the difference between a risk factor and a rating factor.
- iii. List 8 rating factors common in private motor insurance, and for each factor outline how it provides an indication of the risk.
- iv. Compare and contrast the use of the Tweedie distribution to the traditional members of the exponential family of distributions (such as the gamma or inverse Gaussian distributions) when directly modelling the pure premium or incurred loss data.
- v. Discuss the advantages and disadvantages of using the Tweedie distribution to directly model the pure premium or incurred loss data rather than fitting generalised linear models separately to the frequency and severity of the claim experience.

[3]

[3]

[Total 17]

QUESTION 3

A personal lines insurance company has launched a new niche private motor insurance product, aimed at university graduates and young professionals between the ages of 22 and 28, following a large marketing campaign. Since the company had no directly relevant internal data, pricing was based largely on an in-depth study of market premium rates and target volumes.

- i. Outline briefly the likely rationale for launching this product.
- ii. Describe briefly, with reasons, the investigations the company is likely to carry out in the first year after launch to monitor profitability.

[2]

[8]

[Total 10]

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QUESTION 4

Aeros is a large general insurer, traditionally specialising in aviation insurance, and since 2012 has also been writing commercial property insurance. The company has a well-established stochastic simulation capital model, which has been used in recent years to inform the company's investment and reinsurance purchasing decisions. The model is currently in the process of being updated to include the commercial property class of business.

- i. Discuss the importance of using sensitivity tests as part of the model parameterisation process. As part of your answer, outline two key sensitivity tests that would be relevant for this company. [3]
- ii. Discuss the relative advantages of each of the following options for informing the decision of how much capital Aeros should hold:
 - scenario tests using a deterministic model
 - the output of a stochastic model [4]
- iii. Outline how Aeros could use its internal capital model to optimise the purchasing of risk excess of loss reinsurance. [7]

[Total 14]

QUESTION 5

It is the 2013 year end and you are the new reserving actuary for a small-sized general insurance company. The company started selling insurance in 2003 and writes primarily personal accident insurance with a very small amount of liability business. Two years ago the company started writing commercial property insurance, but to date has only written two contracts (both fairly large).

The previous reserving actuary calculated claims reserves by aggregating all classes of business together and using the following methodology applied to the last five accident years (AYs):

Latest AY	Latest AY – 1	Latest AY – 2	All prior AYs
Prior Loss Ratio	Bornhuetter -Ferguson (BF)	BF	Basic Chain Ladder

Prior Loss Ratios are derived using the 2009 accident year as the base Loss Ratio, and adjusting for changes in premium rates and claims experience.

You have been given the following cumulative paid claims triangle with annual development periods and accident year cohorts. The claims triangle does not allow for salvages or claims expenses. The earned premiums (by accident year) are also shown (all amounts in R'000s).

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Accident Year	Earned Premium	Development Year				
		0	1	2	3	4
2009	1200	293	418	536	626	690
2010	1350	291	449	589	658	
2011	1250	370	556	670		
2012	2500	399	602			
2013	4500	925				

You have been given the following additional information:

- The company's financial year end is 31 December.
- You can ignore reinsurance for any calculations.
- The triangle above includes a claim payment of R0.5m in the 2013 accident year on a commercial property policy. The claims department expects another payment of R0.5m to be made early next year to close this claim. This is the first commercial property claim to date.
- Premiums charged are calculated as a percentage of the sum insured. The average level of increase in the incidence of personal accident claims has been 5% p.a. since the company started.
- The written premium amounts for 2008-2009 are shown below (amounts in R'000s). The average change in premium rate per unit sum insured, between successive years, is also given:

Calendar Year	2008	2009	2010	2011	2012	2013
Written Premium	1200	1200	1500	1000	4000	5000
Rate Change	n/a	5%	7%	8%	-5%	-2%

- Outline briefly 6 actuarial reserves you would expect to see in your company's financial statements. [3]
- Outline the advantages and disadvantages of the previous actuary's approach to setting the company's claims reserves and, where relevant, suggest how you could improve on that approach. [6]
- Calculate a possible set of Prior Loss Ratios for each accident year (2009-13) using the methodology and additional information above. Clearly state any assumptions you make. [5]
- Calculate the company's best estimate claims reserves at the 2013 year end, based on the previous reserving actuary's methodology incorporating the following selected Prior Loss Ratios.

Accident Year	2009	2010	2011	2012	2013
Prior Loss Ratio	50%	55%	60%	65%	70%

[5]
[Total 19]

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QUESTION 6

An extract of the financial accounts of a short-term Non-London Market insurer specialising in large commercial property insurance is provided below:

Income Statement

	2010	2011	2012
	R mill	R mill	R mill
Net written premium	1 200	1 350	1 500
Net claims paid	1 000	1 050	1 650
Expenses paid	100	115	125
Investment income (on reserves)	80	92	101
Investment income (on shareholder funds)	18	27	26
Interest expense on loans	5	6	7
Tax	13	22	0

Balance Sheet

At 31 December	2009	2010	2011	2012
	R mill	R mill	R mill	R mill
Assets				
Investments				
Equities	920	825	1020	1150
Fixed interest	350	430	550	610
Cash	550	680	780	510
Funds held by brokers	13	14	14	15
Net deferred acquisition costs	31	33	35	40
Liabilities				
Outstanding claims reserve	750	800	850	1050
Net unearned premium reserve	610	650	700	790
Other liabilities	97	103	110	122
Shareholder funds				
Share capital	50	50	50	50
Profit and loss account (retained earnings)	150	238	412	-38
Revaluation reserve	207	137	269	333

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- i. Outline briefly, with reasons, the most appropriate distribution channels for this insurer. [4]
- ii. Define and calculate the following ratios for each year presented: [6]
- a. Claims ratio.
 - b. Combined ratio.
 - c. Insurance profit margin.
 - d. Solvency margin.
- iii. Using the information from the ratios calculated in part (ii), comment on the main causes of the volatility of the insurance profit and of the solvency margin for this insurer. You should assume that there have been no changes to the reinsurance arrangements over the period. [5]
- iv. The minimum solvency margin required by the regulator is 25% of net premiums written in the prior 12 months. Fixed interest assets comprise risk-free government bonds with outstanding duration of 9 years. The equities portfolio is a well-diversified portfolio of shares listed on the local stock market.
- Discuss the suitability of the insurer's investments. [5]
- v. During 2012 the insurer experienced fire damage to one of its largest insured properties. The CFO has heard that the insurer can transfer some risk to capital markets via a contingent capital arrangement and insurance-linked securities. [4]
- a. Define these arrangements and explain how they reduce the volatility of the insurer's financial results. [4]
 - b. Explain why the insurer might opt to use these arrangements instead of traditional reinsurance arrangements. [2]
- [Total 26]

END OF PAPER