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1911-2011
ANOS

ISEG. 100 ANOS A PENSAR NO FUTURO

Master in Actuarial Science

Loss Reserving

03-06-2011

Time allowed: 2 hours

Instructions:

1. This paper contains 7 questions and comprises 3 pages including the title page.
2. Enter all requested details on the cover sheet.
3. You must not start writing your answers until instructed to do so.
4. Number the pages of the paper where you are going to write your answers.
5. Attempt all 7 questions.
6. Begin your answer to each of the 7 questions on a new page.
7. Marks are shown in brackets. Total marks: 200.
8. Show calculations where appropriate.
9. An approved calculator may be used.

You are the actuary of a general insurance company and have received the following data showing paid claims on 31.12.2008.

Incremental	Payment delay				
Accident year	0	1	2	3	4
2004	0	13	75	555	1142
2005	4	23	894	4734	
2006	3	14	195		
2007	1	11			
2008	0				

Cumulative	Payment delay				
Accident year	0	1	2	3	4
2004	0	13	88	643	1785
2005	4	27	921	5655	
2006	3	17	212		
2007	1	12			
2008	0				

The exposure is shown in the next table.

Accident year	Exposure
2004	17050
2005	17250
2006	17200
2007	17500
2008	17200

You may assume that no claims will be paid with a delay of more than four years.

1. Bornhuetter-Ferguson method

- Estimate the delay-specific claim rates. By claim rate we mean claim payments per unit of exposure. [10 marks]
- Estimate the overall claim rate per accident year. [10 marks]
- Estimate the payment pattern. [10 marks]
- Estimate the outstanding claim payments for each accident year. [10 marks]
- Fill the missing cells in the run-off triangle with predictions. [10 marks]

2. Chain ladder method

- Estimate the development factors. [10 marks]
- Estimate the payment pattern. [10 marks]
- Estimate the overall claim rate per accident year. [10 marks]
- Estimate the outstanding claim payments for each accident year. [10 marks]
- Fill the missing cells in the run-off triangle with predictions. [10 marks]

3. Benktander's method

With claim rates and payment pattern from question 1, apply Benktander's method to estimate the outstanding claim payments for each accident year. [20 marks]

4. Choice of method

- a. Explain the properties of the Bornhuetter-Ferguson method and the chain ladder method (robustness, sensitivity). [10 marks]
- b. Which method would you choose for the portfolio shown here, and why? [10 marks]

5. Discounting

For the Bornhuetter-Ferguson method and using the predictions in 1.e:

- a. Calculate the total predicted payments per future payment year. [10 marks]
- b. Calculate the discounted value of future payments using 3% interest. [10 marks]

You may assume that payments are made at the end of each year.

6. Other models

- a. Specify the mathematical assumptions of the Bühlmann-Straub model [20 marks]
- b. Specify the mathematical assumptions of the Mack model [10 marks]

7. Claim categories

Explain the meaning of the abbreviations RBNS, IBNR and CBNI in such a way that a non-actuary understands them. You may use an illustration if you wish. [10 marks]