

Oblig Autumn 2013

Introduction

There are two problems making up the two obligs in the description of the course. Both must be answered. Solutions are returned on paper to Nils Haavardsson no later than Friday November 1, 2013 either in person at one of the lectures or through ordinary mail to *Matematisk Institutt Postboks 1053 Blindern, 0316 Oslo*. Each student must hand in his/her own version, written individually. Solutions may be written in Norwegian or English.

Problem 1

Download the US hurricane data hurricane.txt from the home page and determine a possible model for these losses. Use the model to compute the 5% and 1% one-year reserve when the portfolio receive 20 (small portfolio) and 1000 (large portfolio) claims on average with maximum responsibility $b = 50; 100; 1000$ per claim. Compare with the case of unlimited responsibility.

Suppose the maximum responsibility is $b = 1000$ and that part of the risk is carried by a re-inurer through a $a \times b$ contract. Compute a table which shows how the pure re-insurance premium and the cedent net reserve changes with a when $a = 0; 50; 100; 500; 1000$ and add assessments of the real re-insurance premium when the loading is 100%. Present separate tables when there are 20 and 1000 claims on average.

Problem 2

The second problem is a comparison of reserves obtained for RBNS claim amounts by three different methods; i.e. the chain ladder, the naive loss ratio method, and the Bornhuetter-Fergusson method.

The Chain ladder method:

- a) Download the data Obligdata.txt from the home page. The data file contains incremental payments for Home from 2008 to 2012.
- b) Create a run-off triangle with incremental payments.
- c) Create a run-off triangle with cumulative payments.
- d) Create CLM development factors for each development year based on the triangle in c).
- e) Estimate cumulative payments in the "red" (i.e., unfilled) triangle part of the square based on the factors in d).
- f) Fill out the "red" part of the incremental payments triangle part of the square based on e)
- g) Make a table with cash flows for the years 2013-2016 based on f)
- h) Make a table with remaining payments for the years 2008-2012 based on f) (i.e., sum the "red" cells in each row in the green and red square in f)).

The naïve loss ratio method:

- i) Based on the loss ratios in Table 1 below, estimate the remaining payments (“red” triangle) with the naïve loss ratio method

The Bornhuetter Ferguson method:

- j) Calculate the necessary F_{ij} for each claim occurrence year
- k) Calculate the Bornhuetter Ferguson estimate for remaining payments (“red” triangle) based on i), j) and Table 1 below.

Comparison:

- l) Compare the estimates obtained in h), i) and k) and comment.

Year	Loss ratio	Earned Premium
2008	95	34 689 213
2009	80	99 392 051
2010	113	178 392 051
2011	78	277 531 254
2012	72	331 404 506

Table 1: Loss ratio predictions for the years 2008-2012