

MS Module 24: Actuarial risk classification – homework assignment

(The attached PDF file has better formatting.)

*Homework assignment*

The mean values and the number of observations in each cell of a 2 × 2 classification table are

<i>Means</i>	<i>Column 1</i>	<i>Column 2</i>	<i>Observations</i>	<i>Column 1</i>	<i>Column 2</i>
<i>Row 1</i>	20	12	<i>Row 1</i>	5	4
<i>Row 2</i>	8	3	<i>Row 2</i>	2	3

*Illustration:* The cell in row 1 column 1 has a mean of 20 from a sample of 5 observations.

An actuary is setting class relativities for insurance pricing using a multiplicative model and a least squares bias function with

- ! a base rate of 4
- ! a starting relativity for column 1 of 2.0
- ! a starting relativity for column 2 of 1.0

We use the following notation:

- $M_{jk}$  = mean value for the cell with row  $j$  and column  $k$
- $N_{jk}$  = number of observations for the cell with row  $j$  and column  $k$
- $B$  = base rate
- $r_1$  = relativity for Row 1
- $r_2$  = relativity for Row 2
- $c_1$  = relativity for Column 1
- $c_2$  = relativity for Column 2

- A. What are the squared errors in each cell?
- B. What is the mean squared error?
- C. What is the partial derivative equation for the Row 1 relativity?
- D. What is the implied relativity for Row 1, given the starting relativities by column?
- E. What is the partial derivative equation for the Row 2 relativity?
- F. What is the implied relativity for Row 2, given the starting relativities by column?
- G. What is the partial derivative equation for the Column 1 relativity?
- H. What is the implied relativity for Column 1, given the computed relativities by row?
- I. What is the partial derivative equation for the Column 2 relativity?
- J. What is the implied relativity for Column 2, given the computed relativities by row?

(The homework assignment has a format similar to that of the practice problem for this module, though the figures in each cell differ.)