Reading: Couret.Venter
Model: 2011.Q2
Problem Type: Multi-Dimensional Credibility

Given A multi-dimensional credibility technique has been developed to predict claim frequencies for major permanent partial claims.

- Seven years of data were collected.
- The technique produced a raw predicted relativity based on the oldest five years.
- The most recent two years were used as the holdout sample.

Quintile	Holdout Sample Relativity	Prediction Based on Raw	Prediction based on Credibility Procedure
1	0.6	0.3	0.4
2	0.8	0.5	0.7
3	1.0	1.1	1.0
4	1.2	1.9	1.5
5	1.4	3.0	1.8

Find Demonstrate whether the credibility technique produces an improved estimate using the sum of squared errors.

Solution

This question is fairly straightforward. It requires you to recall how Couret & Venter calculated the various sum of squared errors.

Couret & Venter considered three approaches:
1. Predicting based on the total hazard group relativity (which is always 1.0 when the sample means are normalized within a hazard group)
2. Predicting based on the raw data from the training data set.
3. Predicting using the multi-dimensional credibility procedure.

In each case, the predictions are compared against the holdout data set.

1. Sum of squared errors = (1 - 0.6)^2 + (1 - 0.8)^2 + (1 - 1)^2 + (1 - 1.2)^2 + (1 - 1.4)^2
= 0.4

2. Sum of squared errors = (0.3 - 0.6)^2 + (0.5 - 0.8)^2 + (1.1 - 1)^2 + (1.9 - 1.2)^2 + (3 - 1.4)^2
= 3.24

3. Sum of squared errors = (0.4 - 0.6)^2 + (0.7 - 0.8)^2 + (1 - 1)^2 + (1.5 - 1.2)^2 + (1.8 - 1.4)^2
= 0.3

Since the third method produces the lowest sum of squared errors, the multi-dimensional credibility procedure is an improvement over the hazard group membership method and the method which uses the raw data.