Reading: Mahler.Credibility
Model: Source text
Problem Type: Calculate the accident year weights

Given You have the two most recent loss ratios for a line of insurance and want to combine them to calculate a rate level indication. Assume that it is three years from the latest year of data to the average date of loss under the proposed new rates.

The following table describes the covariance structure:

Separation in Years	Loss Ratio Covariance, C(k)
0	0.00130
1	0.00060
2	0.00055
3	0.00050
4	0.00045

Find Determine the optimal least squares weights for each of the two years, assuming no external loss ratio information is used.

Solution

This is the situation described in Mahler's ratemaking example where no weight is placed on an external "grand mean".

The equation we need to use is:

$$\sum_{j=1}^{N} Z_j \cdot C(|i-j|) = C(N+\Delta-i) + \frac{\lambda}{2}$$

Here, λ, is the Lagrange multiplier.

From the question, we know N = 2 and Δ = 3.

Writing the equations out in full:

$$Z_1 \cdot C(0) + Z_2 \cdot C(1) = C(4) + \frac{\lambda}{2}$$

$$Z_1 \cdot C(1) + Z_2 \cdot C(0) = C(3) + \frac{\lambda}{2}$$

We also recall $Z_1 + Z_2 = 1$

Substituting $Z_2 = 1 - Z_1$ and adding the two equations allows us to solve for λ.

λ = 0.00095

Substituting λ into the first equation along with $Z_2 = 1 - Z_1$ yields

$Z_1 =$ 46.4%

which then gives

$Z_2 =$ 53.6%