EXAM C QUESTIONS OF THE WEEK

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Week of September 4/06

A study of loss amounts in two separate geographical regions is being made. A one-parameter proportional hazards model is being used to compare the losses in the two regions. Region A corresponds to variate value $z = 0$, and Region B to $z = 1$. The following loss amounts are observed for the two regions: A: $1, 4, 6^+$,   B: $4, 5, 8$

(+ indicates a right-censored observation)

Maximum likelihood estimation of the partial likelihood function results in an estimated value for β of $\widehat{\beta} = -.3765$.

Using the standard estimate of the baseline hazard rate $H_0(t)$, find the estimated probability that a loss from region B is less than or equal to 6.

Solution can be found below.

Week of September 4/06 - Solution

The probability is $1 - S_B(6) = 1 - e^{-H_B(6)} = 1 - e^{-e^\beta \cdot H_0(6)}$.

We estimate $H_0(6)$ using the standard Nelson-Aalen-like estimate.

There are 4 losses less than or equal to 6. The first is amount 2 from region A, Then there are 2 losses at amount 4 each, one from each region. Then there is a loss of amount 5 from Region B. We start off with 3 potential losses from each region.

From the estimate of β, we have $e^{\widehat\beta} = .6863$

$$\widehat{H}_0(6) = \frac{1}{3+3e^{\widehat\beta}} + \frac{2}{2+3e^{\widehat\beta}} + \frac{1}{1+2e^{\widehat\beta}} = 1.11 \; ,$$

so that $1 - S_B(6)$ is estimated to be $1 - e^{-(.6863)(1.11)} = .53$.