

EXAM C QUESTION OF THE WEEK

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Week of April 7/08

The Cox proportional hazard model is applied to a two-variate model.

Both variates are 0-1 variates (Z_1 is 0 or 1, and Z_2 is 0 or 1).

You are given the following data set of death and right-censoring (+) times of 16 individuals, with 4 in each classification:

Z_1, Z_2	Times
0, 0	1, 1, 2 ⁺ , 3
1, 0	2, 3, 4 ⁺ , 5
0, 1	1, 3, 3, 3 ⁺
1, 1	3, 4, 4 ⁺ , 6

The partial maximum likelihood estimates of β_1 and β_2 are $\hat{\beta}_1 = -1.05$ and $\hat{\beta}_2 = -.60$.

Using the Nelson-Aalen type estimate for $H_0(t)$, find the estimated probability of survival to at least time 3 of someone with covariate values $Z_1 = 0$ and $Z_2 = 1$.

The solution can be found below.

Week of April 7/08 - Solution

The estimated survival probability is $[\widehat{S}_0(3)]^{e^{\widehat{\beta}_2}}$.

From the given data, we get

$$\widehat{H}_0(3) = \frac{3}{4+4e^{\widehat{\beta}_1}+4e^{\widehat{\beta}_2}+4e^{\widehat{\beta}_1+\widehat{\beta}_2}} + \frac{1}{2+4e^{\widehat{\beta}_1}+3e^{\widehat{\beta}_2}+4e^{\widehat{\beta}_1+\widehat{\beta}_2}} + \frac{5}{1+3e^{\widehat{\beta}_1}+3e^{\widehat{\beta}_2}+4e^{\widehat{\beta}_1+\widehat{\beta}_2}}$$

Also, $e^{\widehat{\beta}_1} = e^{-1.05} = .3499$, and $e^{\widehat{\beta}_2} = e^{-60} = .5488$, so that

$$\widehat{H}_0(3) = 1.65 , \text{ and } \widehat{S}_0(3) = e^{-\widehat{H}_0(3)} = .192 , \text{ and } [\widehat{S}_0(3)]^{e^{\widehat{\beta}_2}} = (.192)^{.5488} = .40 .$$