P8110 Homework Two

Nick Williams
ntw2117

Problem 1

(a)

$$\hat{t_{0.5}} = \min\{t_j : \hat{S}(t_j) < 0.5\}$$

1: identify $\hat{t_j}$ such that $\hat{S}(t_j) < 0.5$

$\hat{t_j}$	$\hat{S}(t_j)$
t_6	0.0000
t_5	0.2667
t_4	0.4000

2: identify minimum $\hat{t_j} : \hat{t_4} = 5$

$$\begin{aligned} 95\%\text{CI} &= \text{all } t_j\text{CI} \ni 0.5 \\ &= t_1, t_2, t_3, t_4, t_5 \\ &= [0.4, 1.2), [1.2, 4.3), [4.3, 5.0), [5.0, 5.1), [5.1, 7.1) \\ &= [0.4, 7.1) \end{aligned}$$

We estimate that 50% of patients will survive for more than 5 years. Furthermore, we are 95% confident that the true median survival time is between 0.4 and 7.1 years.

(b)

$$\begin{aligned} \hat{\mu}_{t_j} &= \sum_{j=1}^{J} \hat{S}(t_{j-1})(t_j - t_{j-1}) \\ &= 1(0.4) + 0.9(1.2 - 0.4) + 0.8(4.3 - 1.2) + 0.6667(5.0 - 4.3) + 0.4(5.1 - 5.0) + 0.2667(7.1 - 5.1) \\ &= 0.4 + 0.72 + 2.48 + 0.4667 + 0.04 + 0.5334 \\ &= 4.64 \end{aligned}$$

The estimated average suvival time is 4.64 years.

(c) $\hat{\mu_1}$ will be bigger. If $\hat{\mu_2}$ is the mean survival time where all the listed points are events, then 2 more events are occuring before $\hat{\mu_1} = (4.64)$ and thus the average surivival time will decrease.

Problem 2

(a)

(b)