EXAM C QUESTIONS OF THE WEEK

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Week of February 12/07

Suppose a 3-year data set is divided into a year-by-year count of new entrants, deaths and right-censored observations:

$d_0 = 1000$, $x_0 = 20$, $u_0 = 30$, $d_1 = 200$, $x_1 = 10$, $u_1 = 20$,

$d_2 = 200$, $x_2 = 15$, $u_2 = 30$.

Find estimates of $S(1)$, $S(2)$, and $S(3)$ using the approximation for large data sets for the following two cases:

(a) $\alpha = 1$ and $\beta = 1$ and (b) $\alpha = .5$ and $\beta = 0$.

The solution can be found below.

Week of February 5/07 - Solution

(a) The numbers at risk are

$r_0 = d_0 - u_0 = 970$, $r_1 = (d_0 + d_1) - (x_0 + u_0) - u_1 = 1130$,

$r_2 = (d_0 + d_1 + d_2) - (x_0 + u_0 + x_1 + u_1) - u_2 = 1290$.

The estimates of the survival probability to times 1, 2 and 3 are

$\left(1 - \frac{20}{970}\right) = .979381$, $\left(1 - \frac{20}{970}\right)\left(1 - \frac{10}{1130}\right) = .970714$, and

$\left(1 - \frac{20}{970}\right)\left(1 - \frac{10}{1130}\right)\left(1 - \frac{15}{1290}\right) = .959427$.

(b) $P_0 = 0$, $P_1 = 0 + 1000 - 20 - 30 = 950$, $P_2 = 950 + 200 - 10 - 20 = 1120$,

$P_3 = 1120 + 200 - 15 - 30 = 1275$, and

$r_0 = .5d_0 - (0)u_0 = (.5)(1000) = 500$,

$r_1 = d_0 - (x_0 + u_0) + .5d_1 - (0)u_1 = 950 + (.5)(200) = 1050$, and

$r_2 = d_0 + d_1 - (x_0 + u_0 + x_1 + u_1) + .5d_2 - (0)u_2 = 1220$.

The estimates of the survival probability to times 1, 2 and 3 are

$\left(1 - \frac{20}{500}\right) = .9600$, $\left(1 - \frac{20}{500}\right)\left(1 - \frac{10}{1050}\right) = .950857$, and

$\left(1 - \frac{20}{500}\right)\left(1 - \frac{10}{1050}\right)\left(1 - \frac{15}{1220}\right) = .939166$.