EXAM C QUESTIONS OF THE WEEK

S. Broverman, 2007

Week of August 27/07

A random sample of eight times until failure has the following Nelson-Aalen estimates for the cumulative hazard function:

t	$\widehat{H}(t)$
$t < 3$	0
$3 \le t < 5$	0.125
$5 \le t < 6$	0.4107
$6 \le t < 8$	0.6107
$8 \le t < 9$	0.8607
$9 \le t < 10$	1.1940
$10 \le$	2.1940

There is no censoring or truncation of the data.

Find the empirical estimate of the variance of the time until failure.

The solution can be found below.

Week of August 27/07 - Solution

The sample values can be reconstructed from the Nelson-Aalen estimate.
The first failure time is time 3, and $\widehat{H}(3) = \frac{s_1}{8} = .125$, from which we get $s_1 = 1$.
Therefore, there is one failure at time 3.

Then, $\widehat{H}(5) = \frac{1}{8} + \frac{s_2}{7} = .4107$, from which we get $s_2 = 2$.
There are two failures at time 5.

$\widehat{H}(6) = \frac{1}{8} + \frac{2}{7} + \frac{s_3}{5} = .6107$, so $s_3 = 1$; there is one failure at time 6.

$\widehat{H}(8) = \frac{1}{8} + \frac{2}{7} + \frac{1}{5} + \frac{s_4}{4} = .8607$, so $s_4 = 1$; there is one failure at time 8.

$\widehat{H}(9) = \frac{1}{8} + \frac{2}{7} + \frac{1}{5} + \frac{1}{4} + \frac{s_5}{3} = 1.1940$, so $s_5 = 1$; there is one failure at time 9.

$\widehat{H}(10) = \frac{1}{8} + \frac{2}{7} + \frac{1}{5} + \frac{1}{4} + \frac{1}{3} + \frac{s_6}{2} = 2.1940$, so $s_6 = 2$; there are two failures at time 10.

The random sample values are 3 , 5 , 5 , 6 , 8 , 9 , 10 , 10 .

The empirical estimate of the variance is $\frac{1}{8}[\Sigma x_i^2 - 8\overline{x}^2] = \frac{1}{8}[440 - 8(7^2)] = 6$.