Censored Data: Bearing Example

Survivor Function: $\hat{S}_T(t_{(j)})$

j	$t_{(j)}$	d_j	a_j	$\frac{a_j - d_j}{a_j}$	$\hat{S}_T(t_{(j)})$	$\hat{F}_T(t_j))$
0			15		1.000	0.000
1	17.0	1	15	$\frac{14}{15}$	$1.000(\frac{14}{15})$=0.933	0.067
	18.6					
2	21.5	1	13	$\frac{12}{13}$	$0.933(\frac{12}{13})$=0.862	0.138
3	39.9	1	12	$\frac{11}{12}$	$0.862(\frac{11}{12})$=0.790	0.210
	45.0					
4	56.4	1	10	$\frac{9}{10}$	$0.790(\frac{9}{10})$=0.711	0.289
5	69.3	1	9	$\frac{8}{9}$	$0.711(\frac{8}{9})$=0.632	0.368
6	72.1	1	8	$\frac{7}{8}$	$0.632(\frac{7}{8})$=0.553	0.447
	75.2					
7	98.3	1	6	$\frac{5}{6}$	$0.553(\frac{5}{6})$=0.461	0.539
8	103.0	1	5	$\frac{4}{5}$	$0.461(\frac{4}{5})$=0.369	0.631
9	109.2	1	4	$\frac{3}{4}$	$0.369(\frac{3}{4})$=0.276	0.724
10	113.2	1	3	$\frac{2}{3}$	$0.276(\frac{2}{3})$=0.184	0.816
11	121.5	1	2	$\frac{1}{2}$	$0.184(\frac{1}{2})$=0.092	0.908
	180.0					

(OVER)

Standard Error, Greenwood's Formula

$$se(\hat{S}_T(t)) = \hat{S}_T(t)\sqrt{\sum_{j:t_j \le t} \frac{d_j}{a_j(a_j - d_j)}}$$

Example: What is the chance that a bearing survives 72 hours?

$$\hat{S}_T(72) = 0.632$$

$$se(\hat{S}_T(72)) = 0.632\sqrt{\left(\tfrac{1}{15(14)} + \tfrac{1}{13(12)} + \tfrac{1}{12(11)} + \tfrac{1}{10(9)} + \tfrac{1}{9(8)}\right)} = 0.132$$

Approximate 95% confidence interval on the chance of surviving 72 hours:

(0.368, 0.896).