Assignment 3

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1 Assignment 3: Exercise 1

The file Bleed.txt, in RSplidaAlpha\RSplida text data, contains field failure data on failures in aircraft engine bleed systems (each air- craft has one such system) from a fleet of 2256 military aircraft. Use these data to compute the Kaplan-Meier product limit estimator out to 500 hours of operation. Set this up in a table and do the computation without the aid of a computer, unless you do your own programming (e.g., in R or an Excel spreadsheet). Show the table outlining the com- putations as part of your solution. You can use available software (e.g. JMP or RSPLIDA) to check your answers.

Answer:

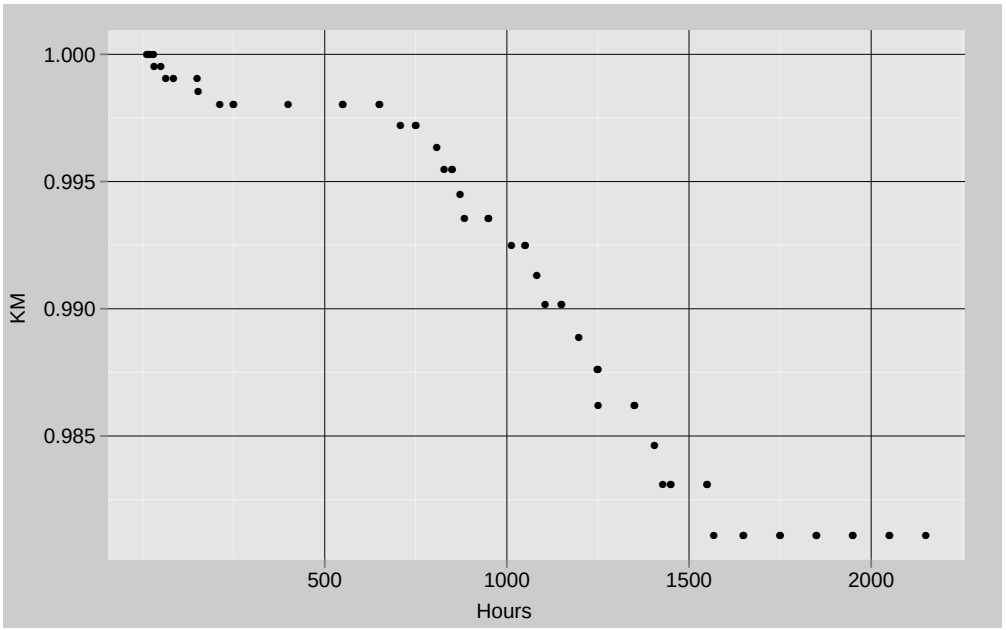

Figure 1: Figure 1: Kaplan-Meier Estimates

	Hours	Status	Weight	units.entered	d	pi	KM
1	12	Censored	39	2256	0	1.00000000	1.00000000
2	20	Censored	52	2217	0	1.00000000	1.00000000
3	30	Censored	46	2165	0	1.00000000	1.00000000
4	32	Failed	1	2119	1	0.99952808	0.99952808
5	50	Censored	31	2118	0	1.00000000	0.99952808
6	64	Failed	1	2087	1	0.99952084	0.99904915
7	85	Censored	48	2086	0	1.00000000	0.99904915
8	150	Censored	102	2038	0	1.00000000	0.99904915
9	153	Failed	1	1936	1	0.99948347	0.99853311
10	212	Failed	1	1935	1	0.99948320	0.99801707
NA							
50	1650	Censored	55	490	0	1.00000000	0.98108263
51	1650	Censored	8	435	0	1.00000000	0.98108263
52	1750	Censored	55	427	0	1.00000000	0.98108263
53	1750	Censored	4	372	0	1.00000000	0.98108263
54	1850	Censored	55	368	0	1.00000000	0.98108263
55	1850	Censored	2	313	0	1.00000000	0.98108263
56	1950	Censored	152	311	0	1.00000000	0.98108263
57	1950	Censored	3	159	0	1.00000000	0.98108263
58	2050	Censored	152	156	0	1.00000000	0.98108263
59	2050	Censored	3	4	0	1.00000000	0.98108263
60	2150	Censored	1	1	0	1.00000000	0.98108263

Table 1: Kaplan-Meier Computations

2 Assignment 3: Exercise 3

The natural logarithm of a Weibull random variable has a smallest extreme value distribution. Starting with the Weibull distribution in the traditional parametrization (η and β), show this. Note that this can be done in terms of the cdf or the pdf. Try to do it both ways.

Starting with a Weibull CDF:

$$1 - exp[(-\frac{x}{\eta})^{\beta}] \tag{1}$$

$$\text{But we're given: } \beta = \frac{1}{\sigma} \text{ and } \eta = exp(\mu) \tag{2}$$

$$1 - exp\Big[-\Big(\frac{exp(x)}{exp(\mu)}\Big)^{\frac{1}{\sigma}}\Big] \tag{3}$$

$$1 - exp\Big[-exp\Big(\frac{x-\mu}{\sigma}\Big)\Big] \tag{4}$$

$$1 - exp\Big[-exp\Big(\frac{x-\mu)}{\sigma}\Big)\Big] \longrightarrow \Phi_{SEV} \tag{5}$$