

## TMA 4275 Lifetime Analysis 2015 Homework 4

### Problem 1

Consider the data (stars denote censored observations)

31.7, 39.2\*, 57.5, 65.5, 65.8\*, 70.0, 75.0\*, 75.2\*, 87.5\*, 88.3\*, 94.2, 101.7\*, 105.8\*, 109.2, 110.0, 130.0\*

- a) Calculate “manually” the Kaplan-Meier estimator  $\hat{R}(t)$ . Graph it both on paper and using MINITAB.
- b) Calculate the estimate for MTTF based on the plot. (Check that you get the same result as MINITAB).
- c) Estimate (if possible) the quartiles,  $t_{0.25}, t_{0.50}, t_{0.75}$ . Check with MINITABs results for median and IQR.
- d) Calculate the estimate for  $\widehat{SD}(\hat{R}(t))$  and check with MINITABs result.

### Problem 2

Let the data be the same as in Problem 1.

- a) Calculate “manually” the Nelson-Aalen estimator  $\hat{Z}(t)$  and draw the plot on paper. What can you conclude about the hazard rate of the underlying distribution?
- b) Use the MINITAB macro for Nelson-plot (found under the heading “MINITAB Macros for TMA4275” under Statistical Software on the course web page) to check your computation and drawing.
- c) Use also the Kaplan-Meier estimate in Problem 2 to estimate  $Z(t)$  and compare with the result obtained in (a) of this problem.

### Problem 3

An experiment has been carried out to gain information on the strength of a certain type of braided cord: 20 pieces of cord were investigated, 9 cords were damaged during the experiment, implying right-censored values (starred observations)

26.8\*, 29.6\*, 33.4\*, 35.0\*, 35.0\*, 36.3\*, 64.2, 70.8\*, 70.8\*, 85.0, 99.6, 117.5, 122.0, 137.1, 146.9, 180.5, 180.5, 180.5, 195.0, 200.0\*

- a) Calculate “manually” the Kaplan-Meier estimator  $\hat{R}(t)$ . Graph it both on paper and using MINITAB.
- b) Calculate “manually” the Nelson-Aalen estimator  $\hat{Z}(t)$  and draw the plot on paper.
- c) Discuss the effect of censoring in these data.
- d) Describe the form of the failure rate function.