

TMA 4275 Lifetime Analysis 2017

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/R.
- b) Calculate the estimate for MTTF based on the plot. (Check that you get the same result as MINITAB/R).
- c) Estimate (if possible) the quartiles, $t_{0.25}, t_{0.50}, t_{0.75}$. Check with MINITAB/Rs results for median and IQR.
- d) Calculate the estimate for $\widehat{SD}(\hat{R}(t))$ and check with MINITAB/Rs 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/R Macros for TMA4275” under Statistical Software on the course web page) or code in the file `demo.R` (for R) to check your computation and drawing.
- c) Use also the Kaplan-Meier estimate in Problem 1 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/R.
- 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.