

TMA 4275 Lifetime analysis

Exercise 3 - solution

1 Read me

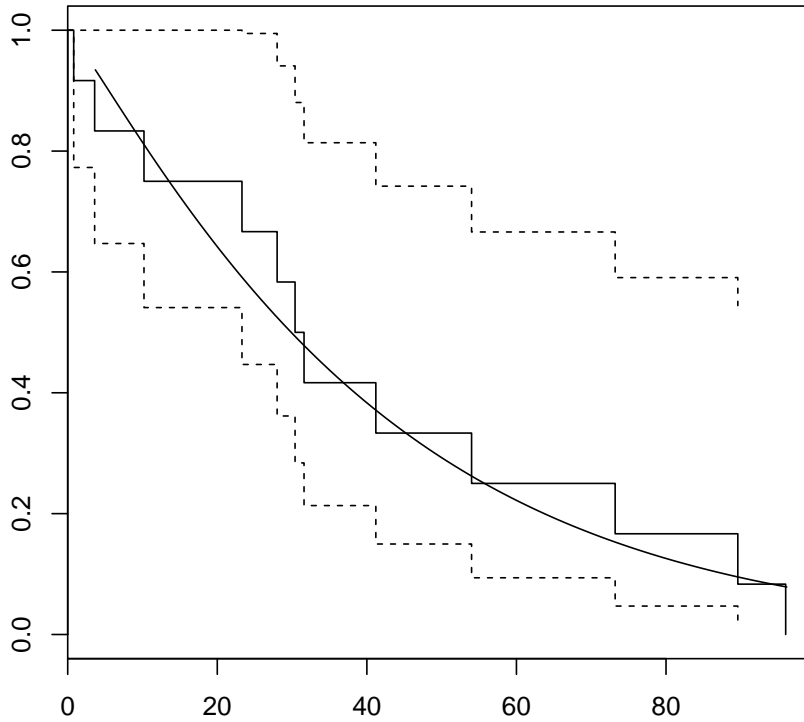
This is a solution proposal for this exercise set, I made sure that the code was available so that you can reproduce the results. It is by no means comprehensive. Should you have any questions, you have but to ask!

2 Problem 1

Weibull

```
> library(survival)
> time = c(10.2, 89.6, 54.0, 96.0, 23.3, 30.4, 41.2, 0.8, 73.2, 3.6, 28.0, 31.6)
> data = Surv(time)
> # Weibull
> weibfit = survreg(data ~ 1, dist="weibull")
> plot(survfit(data ~ 1),main= "R(t) Empirical-Weibull")
> # R(t)
> curve(1-pweibull(x,shape = 1/weibfit$scale , scale =exp(weibfit$coefficients)),
+       add= TRUE)
```

R(t) Empirical-Weibull

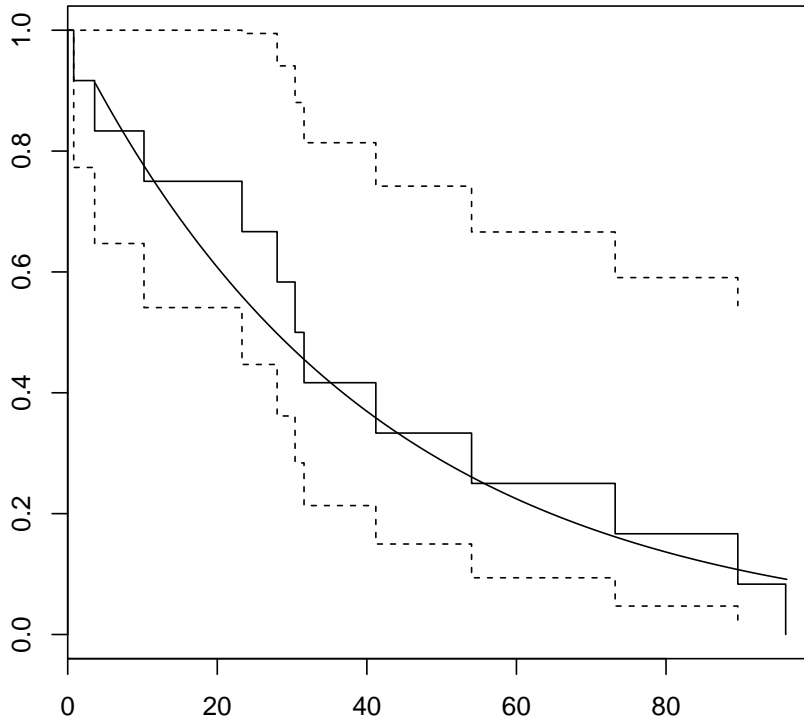


Note: Make sure you use the proper parameters.

Exponential

```
> # exponential
> expon= survreg(data ~ 1, dist="exponential")
> plot(survfit(data ~ 1),main= "R(t) Empirical-exponential")
> # R(t)
> curve(1-pexp(x,rate =exp(-(summary(expon)$table[,1]))), add= TRUE)
```

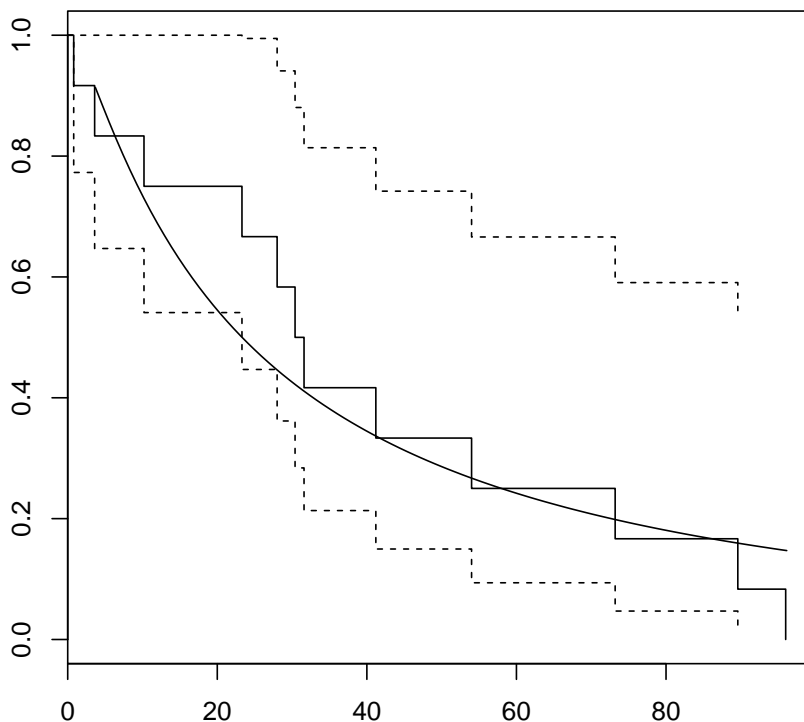
R(t) Empirical-exponential



Log normal

```
> lnormfit <- survreg(data ~ 1, dist="lognormal")
> plot(survfit(data ~ 1),main= "R(t) Empirical-lognormal")
> curve(1-plnorm(x, meanlog = lnormfit$coefficients, sdlog=lnormfit$scale ),add=TRUE)
>
```

R(t) Empirical–lognormal



It seems that the fit for the exponential is not as good as that of the other two.

3 Problem 2

```
> library(survival)
> time1=Surv(read.csv2("https://www.math.ntnu.no/~jarlet/levetid/
+                      datasett/repair.times.txt",sep=""))$Repair)
```

Log normal

For the non-censored data, the empirical survival plot obtained by the Kaplan-Meier method is 1-ecdf.

```
> ln = survreg(time1 ~ 1, dist="lognormal")
> plot(ecdf(time1))
> curve(plnorm(x, meanlog = ln$coefficients, sdlog=ln$scale ), add= TRUE)
```

Weibull

```
> wb = survreg(time1 ~ 1, dist="weibull")
> plot(ecdf(time1))
```

```
> curve(pweibull(x,shape = 1/wb$scale , scale =exp(wb$coefficients)), add= TRUE)
```

Exponential

```
> expone = survreg(time1 ~ 1, dist="exponential")  
> plot(ecdf(time1))  
> curve(pexp(x,rate =exp(-(summary(expone)$table[,1]))), add= TRUE)
```

We can use either the ecdf or the Kaplan Meier or the ecdf. The lognormal has one of the best fit as expected!

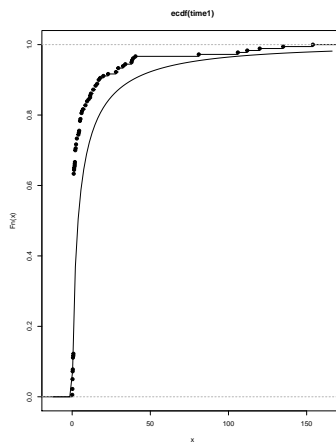


Figure 1: ECDF-Lognormal

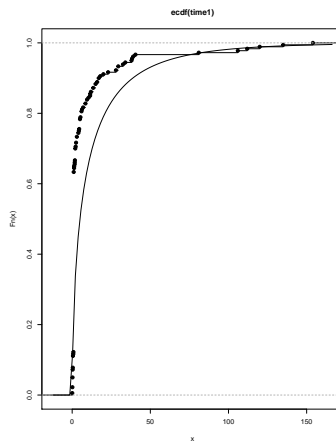


Figure 2: ECDF-Weibull

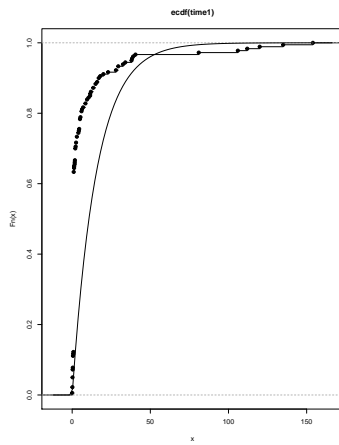


Figure 3: ECDF-Exponential