

Parametric

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1/30/2017

Ovarian Cancer Survival Analysis

```
library(survival)
data(ovarian)
head(ovarian)
```

```
##      ftime fustat      age resid.ds rx ecog.ps
## 1      59      1 72.3315         2  1      1
## 2     115      1 74.4932         2  1      1
## 3     156      1 66.4658         2  1      2
## 4     421      0 53.3644         2  2      1
## 5     431      1 50.3397         2  1      1
## 6     448      0 56.4301         1  1      2
```

```
S1 <- Surv(ovarian$ftime, ovarian$fustat)
ovarian.surv<- survfit(S1~1, ovarian)
summary(ovarian.surv)
```

```
## Call: survfit(formula = S1 ~ 1, data = ovarian)
##
##      time n.risk n.event survival std.err lower 95% CI upper 95% CI
##      59      26      1    0.962  0.0377    0.890    1.000
##     115      25      1    0.923  0.0523    0.826    1.000
##     156      24      1    0.885  0.0627    0.770    1.000
##     268      23      1    0.846  0.0708    0.718    0.997
##     329      22      1    0.808  0.0773    0.670    0.974
##     353      21      1    0.769  0.0826    0.623    0.949
##     365      20      1    0.731  0.0870    0.579    0.923
##     431      17      1    0.688  0.0919    0.529    0.894
##     464      15      1    0.642  0.0965    0.478    0.862
##     475      14      1    0.596  0.0999    0.429    0.828
##     563      12      1    0.546  0.1032    0.377    0.791
##     638      11      1    0.497  0.1051    0.328    0.752
```

```
plot(ovarian.surv,xlab="t",ylab=expression(hat(S)*(t))), lty=2:3)
```

```
##Exponential
#h(t) = l, S(t) = exp(-lt)
#l = exp(-(intercept))
ovarian.exp<-survreg(S1~1 , ovarian, dist='exponential')
summary(ovarian.exp)
```

```
##
## Call:
## survreg(formula = S1 ~ 1, data = ovarian, dist = "exponential")
##              Value Std. Error      z      p
## (Intercept)  7.17      0.289 24.8 3.72e-136
##
```

```
## Scale fixed at 1
##
## Exponential distribution
## Loglik(model)= -98   Loglik(intercept only)= -98
## Number of Newton-Raphson Iterations: 4
## n= 26

intercept <- coefficients(ovarian.exp)[['(Intercept)']]
lambda <- exp(-intercept)
T_survival <- seq(0, 1210, by=0.1)
lines(T_survival, 1-pexp(T_survival, lambda), xlab="t", ylab=expression(hat(S)*"(t)"), col='blue')

##Weibull
#h(t) = a*y*t^(y-1), S(t) = exp(-at^y)
#a = exp(-(intercept)y)
#y = 1/scale
ovarian.wei<-survreg(S1~1, ovarian, dist='weibull', scale=0)
summary(ovarian.wei)

##
## Call:
## survreg(formula = S1 ~ 1, data = ovarian, dist = "weibull", scale = 0)
##              Value Std. Error      z      p
## (Intercept)  7.111      0.293 24.292 2.36e-130
## Log(scale)   -0.103      0.254 -0.405  6.86e-01
##
## Scale= 0.902
##
## Weibull distribution
## Loglik(model)= -98   Loglik(intercept only)= -98
## Number of Newton-Raphson Iterations: 5
## n= 26

intercept <- coefficients(ovarian.wei)[['(Intercept)']]
scale <- ovarian.wei$scale
gamma <- 1/scale
T_survival <- seq(0, 1210, by=0.1)
lines(T_survival, 1-pweibull(T_survival, gamma, exp(intercept)), xlab="t", ylab=expression(hat(S)*"(t)"), col='blue')
legend(0, 0.4, legend=c("KaplanMeier", "Exponential", "Weibull"), lty = c(1,1,1), col = c('black', 'blue', 'blue'))
```

