

## visualization

Visualization: survival probability vs. time

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##### Generate Exp or Weib dist data #####
cov <- data.frame(id = 1:500,
                  trt = rbinom(500, 1, 0.5))

# Simulate the event times

dat.weib0.5 <- simsurv(lambdas = 0.1,
                      gammas = 0.5, #change gamma, or use lognormal simulation
                      betas = c(trt = -0.5),
                      x = cov)

dat.weib0.5 <- merge(cov, dat.weib0.5)

dat.exp <- simsurv(lambdas = 0.1,
                  gammas = 1, #change gamma, or use lognormal simulation
                  betas = c(trt = -0.5),
                  x = cov)

dat.exp <- merge(cov, dat.exp)

dat.weib2 <- simsurv(lambdas = 0.1,
                    gammas = 2, #change gamma, or use lognormal simulation
                    betas = c(trt = -0.5),
                    x = cov)

dat.weib2 <- merge(cov, dat.weib2)

dat.weib5 <- simsurv(lambdas = 0.1,
                    gammas = 5, #change gamma, or use lognormal simulation
                    betas = c(trt = -0.5),
                    x = cov)

dat.weib5 <- merge(cov, dat.weib5)

##### Generate lognormal dist data #####
# log-norm hazard fn
haz <- function(t, x, betas, mu, sigma) {
  exp(betas * (x)) * ((1/t*sigma)*dnorm(log(t)/sigma, mean=mu, sd=sigma))/
  (pnorm(-log(t)/sigma, mean=mu, sd=sigma))
}
# sim log-norm data
cov <- data.frame(trt = rbinom(100, 1, 0.5))
dat.lognorm <- cbind(simsurv(hazard = haz,
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        x = cov,
        mu = 0,
        sigma = 0.5,
        betas = c(trt = -0.5)),
        cov)

##### Generate piece-wise dist data #####
set.seed(1729)
ncuts <- 19
cuts <- sort(rexp(ncuts, rate = 0.1))
pw_times <- c(0, cuts)
N <- length(pw_times)
pw_haz <- sort(abs(rnorm(N)))
pw_haz <- abs(pw_haz - median(pw_haz))

haz <- function(t, x, betas, lb_interval, haz_interval, ...) {
  exp(betas * (x)) * haz_interval[findInterval(t, lb_interval)]
}

cov <- data.frame(trt = rbinom(100, 1, 0.5))
dat.piecewise <- cbind(simsurv(hazard = haz,
  x = cov,
  lb_interval = pw_times,
  haz_interval = pw_haz,
  betas = c(trt = -0.5)),
  cov)

# Merge the simulated event times onto covariate data frame
# No parameters need to be changed
s.weib0.5 <- with(dat.weib0.5, Surv(eventtime, status))
s.exp <- with(dat.exp, Surv(eventtime, status))
s.weib2 <- with(dat.weib2, Surv(eventtime, status))
s.weib5 <- with(dat.weib5, Surv(eventtime, status))
s.lognorm <- with(dat.lognorm, Surv(eventtime, status))
s.piecewise <- with(dat.piecewise, Surv(eventtime, status))

sExp1 <- survreg(s.weib0.5 ~ as.factor(trt), dist='exp', data=dat.weib0.5)
sExp2 <- survreg(s.exp ~ as.factor(trt), dist='exp', data=dat.exp)
sExp3 <- survreg(s.weib2 ~ as.factor(trt), dist='exp', data=dat.weib2)
sExp4 <- survreg(s.weib5 ~ as.factor(trt), dist='exp', data=dat.weib5)
sExp5 <- survreg(s.lognorm ~ as.factor(trt), dist='exp', data=dat.lognorm)
sExp6 <- survreg(s.piecewise ~ as.factor(trt), dist='exp', data=dat.piecewise)

sWei1 <- survreg(s.weib0.5 ~ as.factor(trt), dist='weibull', data=dat.weib0.5)
sWei2 <- survreg(s.exp ~ as.factor(trt), dist='weibull', data=dat.exp)
sWei3 <- survreg(s.weib2 ~ as.factor(trt), dist='weibull', data=dat.weib2)
sWei4 <- survreg(s.weib5 ~ as.factor(trt), dist='weibull', data=dat.weib5)
sWei5 <- survreg(s.lognorm ~ as.factor(trt), dist='weibull', data=dat.lognorm)
sWei6 <- survreg(s.piecewise ~ as.factor(trt), dist='weibull', data=dat.piecewise)

sCox1 <- coxph(s.weib0.5 ~ trt, data=dat.weib0.5)
sCox2 <- coxph(s.exp ~ trt, data=dat.exp)
sCox3 <- coxph(s.weib2 ~ trt, data=dat.weib2)

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sCox4 <- coxph(s.weib5 ~ trt,data=dat.weib5)
sCox5 <- coxph(s.lognorm ~ trt,data=dat.lognorm)
sCox6 <- coxph(s.piecewise~ trt,data=dat.piecewise)
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#fKM <- survfit(s ~ trt,data=dat) # fit the data using survfit() method in black line as reference.
#baseline <- basehaz(sCox)

par(mfrow=c(6,3),pty="m")
par(mar = c(6, 6, 3, 0), oma = c(1, 1, 1, 1))

plot(survfit(s.exp ~ trt,data=dat.exp),ylab = 'Exponential',main="Exponential",cex.axis=1.8,cex.lab=2)
lines(predict(sExp2, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sExp2, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.exp ~ trt,data=dat.exp),main = 'Weibull',cex.main = 2,cex.axis=1.8,cex.lab=2)
lines(predict(sWei2, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sWei2, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.exp ~ trt,data=dat.exp),main = 'Cox',cex.main = 2,cex.axis=1.8,cex.lab=2)
lines(survfit(sCox2,newdata=data.frame(trt=1),conf.int = F),col='green')
lines(survfit(sCox2,newdata=data.frame(trt=0),conf.int = F),col='green')

plot(survfit(s.weib0.5 ~ trt,data=dat.weib0.5),ylab = 'Weibull (0.5)',cex.axis=1.8,cex.lab=2)
lines(predict(sExp1, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sExp1, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.weib0.5 ~ trt,data=dat.weib0.5),cex.axis=1.8,cex.lab=2)
lines(predict(sWei1, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sWei1, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.weib0.5 ~ trt,data=dat.weib0.5),cex.axis=1.8,cex.lab=2)
lines(survfit(sCox1,newdata=data.frame(trt=1),conf.int = F),col='green')
lines(survfit(sCox1,newdata=data.frame(trt=0),conf.int = F),col='green')

plot(survfit(s.weib2 ~ trt,data=dat.weib2),ylab = 'Weibull (2)',cex.axis=1.8,cex.lab=2)
lines(predict(sExp3, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sExp3, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.weib2 ~ trt,data=dat.weib2),cex.axis=1.8)
lines(predict(sWei3, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sWei3, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.weib2 ~ trt,data=dat.weib2),cex.axis=1.8)
lines(survfit(sCox3,newdata=data.frame(trt=1),conf.int = F),col='green')
lines(survfit(sCox3,newdata=data.frame(trt=0),conf.int = F),col='green')

plot(survfit(s.weib5 ~ trt,data=dat.weib5),ylab = 'Weibull (5)',cex.axis=1.8,cex.lab=2)
lines(predict(sExp4, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sExp4, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.weib5 ~ trt,data=dat.weib5),cex.axis=1.8)
lines(predict(sWei4, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sWei4, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.weib5 ~ trt,data=dat.weib5),cex.axis=1.8)
lines(survfit(sCox4,newdata=data.frame(trt=1),conf.int = F),col='green')
lines(survfit(sCox4,newdata=data.frame(trt=0),conf.int = F),col='green')

plot(survfit(s.lognorm ~ trt,data=dat.lognorm),ylab = 'Lognormal',cex.axis=1.8,cex.lab=2)
lines(predict(sExp5, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sExp5, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.lognorm ~ trt,data=dat.lognorm),cex.axis=1.8)
lines(predict(sWei5, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sWei5, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.lognorm ~ trt,data=dat.lognorm),cex.axis=1.8)

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lines(survfit(sCox5,newdata=data.frame(trt=1),conf.int = F),col='green')
lines(survfit(sCox5,newdata=data.frame(trt=0),conf.int = F),col='green')

plot(survfit(s.piecewise ~ trt,data=dat.piecewise),xlab = "t",ylab = 'Piecewise',cex.axis=1.8,cex.lab=2)
lines(predict(sExp6, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sExp6, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.piecewise ~ trt,data=dat.piecewise),xlab = "t",cex.axis=1.8,cex.lab=2)
lines(predict(sWei6, newdata=list(trt=0),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
lines(predict(sWei6, newdata=list(trt=1),type="quantile",p=seq(.01,.99,by=.01)),seq(.99,.01,by=-.01))
plot(survfit(s.piecewise ~ trt,data=dat.piecewise),xlab = "t",cex.axis=1.8,cex.lab=2)
lines(survfit(sCox6,newdata=data.frame(trt=1),conf.int = F),col='green')
lines(survfit(sCox6,newdata=data.frame(trt=0),conf.int = F),col='green')

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