

## Supplement 12.2. R code for simulations presented in Chapter 12

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The simulation study conducted in this chapter used the following R program to generate simulated data and to plot the data as in Fig. 12.2:

```
x1 <- sort(runif(100))
## figure 12.2 (simulated data)
par(mfrow=c(2,2), mar=c(3,3,0.5,0.5), mgp=c(1.5,0.5,0), tck=-0.01)
## data set 1: x0=c(0, 0.5), x1=c(0.5,1),
##             y0=c(0.25, 0.7), y1=c(0.5, 0.3))
## segment 1: y=0.2+0.25x, segment 2: y=0.4+0.75x
y1 <- c(rnorm(sum(x1< 0.5), 0.2+0.25*x1[x1< 0.5], 0.1),
        rnorm(sum(x1>=0.5), 0.4+0.75*x1[x1>=0.5], 0.1))
plot(x1,y1)
segments(x0=c(0, 0.5), x1=c(0.5,1),
         y0=c(0.20, 0.775), y1=c(0.325, 1.15), col="gray")

## data set 2: segments(x0=c(0, 0.5), x1=c(0.5,1),
##                     y0=c(0.0, 0.25), y1=c(0.25, 0.5))
## segment 1:
y2 <- c(rnorm(sum(x1< 0.5), 0.25+0.0*x1[x1< 0.5], 0.1),
        rnorm(sum(x1>=0.5), -0.25+1.0*x1[x1>=0.5], 0.1))
x2 <- x1
plot(x2,y2)
segments(x0=c(0, 0.5), x1=c(0.5,1),
         y0=c(0.25, 0.25), y1=c(0.25, 0.75), col="gray")

## data set 3: segments(x0=c(0, 0.5), x1=c(0.5,1),
##                     y0=c(0.3, 0.75), y1=c(0.3, 0.75))
## segment 1: y=0.3, segment 2: y=0.75
y3 <- c(rnorm(sum(x1< 0.5), 0.55+0*x1[x1< 0.5], 0.01),
        rnorm(sum(x1>=0.5), 0.70-0*x1[x1>=0.5], 0.05))
x3 <- x1
plot(x3,y3)
segments(x0=c(0, 0.5), x1=c(0.5,1),
         y0=c(0.55, 0.7), y1=c(0.55, 0.7), col="gray")

## data set 4: y=0.5+0.5x + e
x4 <- x1
```

```

y4 <- rnorm(100, 0.5+0.8*x4, 0.15)
plot(x4, y4)
segments(x0=0, x1=1, y0=0.5, y1=1.3, col="gray")

```

The three models are fitted to these four x-y pairs (12 model runs). Model residuals are obtained through posterior simulations using the R package "rv" (Kerman and Gelman 2007):

```

modell1.1 <- rvsims(templ[[1]])
modell1.2 <- rvsims(templ[[2]])
modell1.3 <- rvsims(templ[[3]])

resid1.1<-y1-( (modell1.1["beta[1]"]+modell1.1["delta[1]"]*
               (x1>=modell1.1["phi"]))+
              (modell1.1["beta[2]"]+modell1.1["delta[2]"]*
               (x1>=modell1.1["phi"]))) *
              (x1-modell1.1["phi"]))
resid1.2<-y1-(modell1.2["beta[1]"] +
              (modell1.2["beta[2]"]+modell1.2["delta"]*
               (x1>=modell1.2["phi"]))) *
              (x1-modell1.2["phi"]))
resid1.3<-y1-(modell1.3["beta"] + modell1.3["delta"]*
               (x1>=modell1.3["phi"]))
ylims <- range(sims(range(resid1.1, resid1.2, resid1.3)))

par(mfrow=c(1,3), mar=c(3,3,3,0.25), mgp=c(1.5,0.5,0), tck= -0.01)
plot(x1, resid1.1, xlab="x", ylab="Residuals", ylim=ylims, cex=0.75)
abline(h=0, lwd=2, col="gray")
title(main="general", line=0.5)

plot(x1, resid1.2, xlab="x", ylab="Residuals", ylim=ylims, cex=0.75)
mtext("dataset 1 (general)", line=1.75)
abline(h=0, lwd=2, col="gray")
title(main="hockey stick", line=0.5)

plot(x1, resid1.3, xlab="x", ylab="Residuals", ylim=ylims, cex=0.75)
abline(h=0, lwd=2, col="gray")
title(main="step function", line=0.5)

```