setwd("C:/R files BHMRA")

require(mcmcse)

require(loo)

library(MCMCvis)

library(ggplot2)

library(reshape)

options(scipen=999)

require(rube)

Sys.setenv(BUGSDIR="c:\\users\\p congdon\\documents\\WINBUGS14")

attach("DS\_12\_7.Rdata")

# define response Y[,q] for each quantile regression

Y <- matrix(NA,71,19)

n <- DS\_12\_7$n

Q <- DS\_12\_7$Q

for (i in 1:n){for (q in 1:Q) {Y[i,q] <- DS\_12\_7$lctm[i]}}

DS\_12\_7$Y <- Y

model1="model{ for (q in 1:Q) {# posterior predictive checks

PPC[q] <- step(sum(e2rep[q,])-sum(e2[q,]))

# xi=0 for median regression

xi[q] <- (1-2\*quant[q])/(quant[q]\*(1-quant[q]))

for (i in 1:n){eta[i,q] <- b1[q] + b2[q]\*widrat[i]

w[i,q] ~ dexp(delta[q])

mu[i,q] <- xi[q]\*w[i,q] + eta[i,q]

tau[i,q] <- (quant[q]\*(1-quant[q])\*delta[q])/(2\*w[i,q])

# data copies (lctm is response)

Y[i,q] ~ dnorm(mu[i,q],tau[i,q]) I(0,)

Yrep[i,q] ~ dnorm(mu[i,q],tau[i,q]) I(0,)

e2[q,i] <- abs(Y[i,q]-mu[i,q])

e2rep[q,i] <- abs(Yrep[i,q]-mu[i,q])}}

# predictions at quantiles 0.1, 0.5, 0.9 and width-depth ratios 0 to 60

for (j in 1:61) {widr[j] <- j-1

# 0.1 quantile

w.10[j] ~ dexp(delta[2])

tau.10[j] <- (0.1\*0.9\*delta[2])/(2\*w.10[j])

mu.10[j] <- b1[2] + b2[2]\*widr[j]

y.pred.10[j] ~ dnorm(mu.10[j],tau.10[j])

# 0.5 quantile

w.50[j] ~ dexp(delta[10])

tau.50[j] <- (0.5\*0.5\*delta[10])/(2\*w.50[j])

mu.50[j] <- b1[10] + b2[10]\*widr[j]

y.pred.50[j] ~ dnorm(mu.50[j],tau.50[j])

# 0.9 quantile

w.90[j] ~ dexp(delta[18])

tau.90[j] <- (0.9\*0.1\*delta[18])/(2\*w.90[j])

mu.90[j] <- b1[18] + b2[18]\*widr[j]

y.pred.90[j] ~ dnorm(mu.90[j],tau.90[j])}

#Priors

for (q in 1:Q) {b1[q] ~ dnorm(0,0.001)

b2[q] ~ dnorm(0,0.001);

delta[q] ~ dgamma(1,0.001)}}"

# Initial values and estimation

init1 <- list(b1= rep(0,19), b2= rep(0,19),delta=rep(1,19))

init2 <- list(b1= rep(-0.5,19), b2= rep(0,19),delta=rep(10,19))

inits <- list(init1,init2)

M1 = rube(model1, DS\_12\_7, inits)

pars <- c("b1","b2","PPC")

S1 = rube(model1, DS\_12\_7, inits, pars, n.burn=500, n.thin=1, n.chains=2,n.iter=10000)

summary(S1,limit=50)

#

# Nonlinear Model

#

model2="model{ for (q in 1:Q) {

# posterior predictive checks

PPC[q] <- step(sum(e2rep[q,])-sum(e2[q,]))

# xi=0 for median regression

xi[q] <- (1-2\*quant[q])/(quant[q]\*(1-quant[q]))

for (i in 1:n){eta[i,q] <- b1[q] + b2[q]\*widrat[i]

w[i,q] ~ dexp(sigmaq[q])

mu[i,q] <- xi[q]\*w[i,q] + eta[i,q]

tau[i,q] <- (quant[q]\*(1-quant[q])\*sigmaq[q])/(2\*w[i,q])

# Data copies (log lctm is response)

Y[i,q] ~ dnorm(mu[i,q],tau[i,q])

Yrep[i,q] ~ dnorm(mu[i,q],tau[i,q])

e2[q,i] <- abs(Y[i,q]-mu[i,q])

e2rep[q,i] <- abs(Yrep[i,q]-mu[i,q])}}

for (j in 1:61) {widr[j] <- j-1

# Predictions (transformed to original scale) at 0.1, 0.5, 0.9 and

# Width-depth ratios 0 to 60

# 0.1 Quantile

w.10[j] ~ dexp(sigmaq[2])

tau.10[j] <- (0.1\*0.9\*sigmaq[2])/(2\*w.10[j])

mu.10[j] <- b1[2] + b2[2]\*widr[j]

lny.pred.10[j] ~ dnorm(mu.10[j],tau.10[j])

y.pred.10[j] <- exp(lny.pred.10[j])

# 0.5 Quantile

w.50[j] ~ dexp(sigmaq[10])

tau.50[j] <- (0.5\*0.5\*sigmaq[10])/(2\*w.50[j])

mu.50[j] <- b1[10] + b2[10]\*widr[j]

lny.pred.50[j] ~ dnorm(mu.50[j],tau.50[j])

y.pred.50[j] <- exp(lny.pred.50[j])

# 0.9 Quantile

w.90[j] ~ dexp(sigmaq[18])

tau.90[j] <- (0.9\*0.1\*sigmaq[18])/(2\*w.90[j])

mu.90[j] <- b1[18] + b2[18]\*widr[j]

# Transform back from log scale

lny.pred.90[j] ~ dnorm(mu.90[j],tau.90[j])

y.pred.90[j] <- exp(lny.pred.90[j])}

# Priors

for (q in 1:Q) {b1[q] ~ dnorm(0,0.001)

b2[q] ~ dnorm(0,0.001);

sigmaq[q] ~ dgamma(1,0.001)}} "

# Initial Values and Estimation

init1 <- list(b1= rep(0,19), b2= rep(0,19),sigmaq=rep(1,19))

init2 <- list(b1= rep(-0.5,19), b2= rep(0,19),sigmaq=rep(10,19))

inits <- list(init1,init2)

pars <- c("b1","b2","PPC","y.pred.10","y.pred.50","y.pred.90")

M2 = rube(model2, DS\_12\_7, inits)

S2= rube(model2, DS\_12\_7, inits, pars, n.burn=500, n.thin=1, n.chains=2,n.iter=10000)

summary(S2,limit=50)