require(jagsUI)

require(lqmm)

require(MASS)

require(loo)

setwd("C:/R files BHMRA")

attach("DS\_12\_9.Rdata")

# negative binomial

RNB <- glm.nb(y~hosp+excelhlth+numchron+gender+school+privins,link=log, data=DS\_12\_9)

# Machado and Santos Silva (2005) method

RLQM <- lqm.counts(y ~ hosp+excelhlth+numchron+gender+school+privins,tau=0.5,M=100, data=DS\_12\_9)

n=4406

# Set quantile

DS\_12\_9$q <- 0.5

#

# Jittering method

#

cat("model{ xi <- (1-2\*q)/(q\*(1-q))

for (i in 1:n){ eta[i] <- b[1]+b[2]\*hosp[i]+b[3]\*excelhlth[i]+b[4]\*numchron[i]+b[5]\*gender[i]

+b[6]\*school[i]+b[7]\*privins[i]

w[i] ~ dexp(sigmaq)

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

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

r[i] ~ dunif(0,1)

z[i] <- y[i]+r[i]

zch[i] <- step(q-z[i])

# set zstar to small +ve constant if z[i] is less than q

zstar[i] <- log(zch[i]\*0.01+(1-zch[i])\*(z[i]-q))

log(L[i]) <- 0.5\*log(tau[i])-0.5\*tau[i]\*(zstar[i]-mu[i])\*(zstar[i]-mu[i])

LL[i] <- log(L[i])

phi[i] <- -LL[i]+ 1000

h[i] ~ dpois(phi[i])}

sigmaq ~ dgamma(1,0.001)

for (j in 1:7) {b[j] ~ dnorm(0,0.001) }}

", file="model1.jag")

pars = c("b","sigmaq","LL")

inits <- function(){list(sigmaq=rgamma(1,5,5),b=rnorm(7,0,0.1),

w=rgamma(4406,5,5))}

M1 = autojags(DS\_12\_9, inits, pars, model.file="model1.jag",2, n.adapt=100, iter.increment=500, n.burnin=500,Rhat.limit=1.1, seed=1234, max.iter=5000,codaOnly=c("LL"))

M1$summary

loo(as.matrix(M1$sims.list$LL))

#

# HQRPLN model

#

cat("model{ xi <- (1-2\*q)/(q\*(1-q))

for (i in 1:n){ y[i] ~ dpois(mu[i])

log(mu[i]) <- nu[i]

eta[i] <- b[1]+b[2]\*hosp[i]+b[3]\*excelhlth[i]

+b[4]\*numchron[i]+b[5]\*gender[i]

+b[6]\*school[i]+b[7]\*privins[i]

w[i] ~ dexp(sigmaq)

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

nu[i] ~ dnorm(xi\*w[i] + eta[i],tau[i])

log(L[i]) <- -mu[i]+y[i]\*log(mu[i])-logfact(y[i])

LL[i] <- log(L[i])}

sigmaq ~ dgamma(1,0.001)

for (j in 1:7) {b[j] ~ dnorm(0,0.001) }}

", file="model2.jag")

**# Initial values and estimation**

inits <- function(){list(sigmaq=rgamma(1,5,5),b=rnorm(7,0,0.1),

w=rgamma(4406,5,5))}

pars = c("b","sigmaq","LL","w")

M2 = autojags(DS\_12\_9, inits, pars, model.file="model2.jag",2, n.adapt=100, iter.increment=2500, n.burnin=500,Rhat.limit=1.1,seed=1234, max.iter=10000,codaOnly=c("LL","w"))

M2$summary

**# Fit**

loo(as.matrix(M2$sims.list$LL))

**# largest w (outlier indicators,HQRPLN)**

w.mn=apply(as.matrix(M2$sims.list$w),2,mean)

subj <- seq(1:n)

list.w.mn <- data.frame(w.mn,subj)

list.w.mn =list.w.mn[order(-list.w.mn$w.mn),]

head(list.w.mn,10)

**#**

**# Quantile regressions at q=0.75**

**#**

DS\_12\_9$q <- 0.75

RLQM.75 <- lqm.counts(y ~ hosp+excelhlth+numchron+gender+school+privins,tau=0.75,M=100, data=DS\_12\_9)

inits <- function(){list(sigmaq=rgamma(1,5,5),b=rnorm(7,0,0.1),w=rgamma(4406,5,5))}

pars <- c("b","sigmaq")

# Jittering

M.75.1 <- autojags(DS\_12\_9, inits, pars, model.file="model1.jag",2, n.adapt=100, iter.increment=500, n.burnin=500,Rhat.limit=1.1, max.iter=5000,seed=1234)

M.75.1$summary

# HQRPLN model

M.75.2 <- autojags(DS\_12\_9, inits, pars, model.file="model2.jag",2, n.adapt=100, iter.increment=500, n.burnin=500,Rhat.limit=1.1, max.iter=5000,seed=1234)

M.75.2$summary

#

# Quantile regressions at q=0.95

#

DS\_12\_9$q = 0.95

RLQM.95 = lqm.counts(y ~ hosp+excelhlth+numchron+gender+school+privins,

tau=0.95,M=100, data=DS\_12\_9)

inits =function(){list(sigmaq=rgamma(1,5,5),b=rnorm(7,0,0.1),

w=rgamma(4406,5,5))}

pars <- c("b","sigmaq")

# Jittering

M.95.1 <- autojags(DS\_12\_9, inits, pars, model.file="model1.jag",2, n.adapt=100, iter.increment=500, n.burnin=500,Rhat.limit=1.1, max.iter=5000,seed=1234)

M.95.1$summary

# HQRPLN model

M.95.2 <- autojags(DS\_12\_9, inits, pars, model.file="model2.jag",2, n.adapt=100, iter.increment=500, n.burnin=500,Rhat.limit=1.1, max.iter=5000,seed=1234)

M.95.2$summary