require(rube)

options(scipen=999)

require(mcmcse)

setwd("C:/R files BHMRA")

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

attach("DS\_7\_10.Rdata")

# ZIP

**model1= "model**{ for (i in 1:387) {y[i] ~ dpois(mu.s[i])

mu.s[i] <- (1-d[i])\*mu[i]

**# indicator of true zero**

d[i] ~ dbern(omega[i])

logit(omega[i]) <- gamma0 +gamma[1]\*(educ[i]-mean(educ[]))+gamma[2]\*(anx[i]-mean(anx[]))

log(mu[i]) <- beta0 + beta[1]\*(educ[i]-mean(educ[]))+beta[2]\*(anx[i]-mean(anx[]))

**# mixed predictive check**

d.new[i] ~ dbern(omega[i])

mu.s.new[i] <- (1-d.new[i])\*mu[i]

y.new[i] ~ dpois(mu.s.new[i])

predch[i] <- step(y.new[i]-y[i])-0.5\*equals(y.new[i],y[i])

**# likelihood**

D0[i] <- equals(y[i],0)

p[i] <- D0[i]\*p.eq.0[i]+(1-D0[i])\*p.gt.0[i]

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

p.eq.0[i] <- omega[i]+(1-omega[i])\*exp(-mu[i]);

p.gt.0[i] <- (1-omega[i])\*p.pois[i]

log(p.pois[i]) <- -mu[i]+y[i]\*log(mu[i])-logfact(y[i])}

**# total log-likelihood**

TLL <- sum(LL[])

**# priors**

beta0 ~ dnorm(0,0.001)

gamma0 ~ dnorm(0,0.001)

for (j in 1:2) {beta[j]~ dnorm(0,0.001)

gamma[j] ~ dnorm(0,0.1)}}

"

ini1 <- list(beta0=-0.5,gamma0=-0.5,beta=rep(0,2), gamma= rep(0,2));

ini2 <- list(beta0=0, gamma0=0, beta=rep(-0.5,2),gamma=rep(-0.5,2))

init <- list(ini1,ini2)

pars= c("beta","gamma","TLL")

r = rube(model1, DS\_7\_10, init)

summary(r)

M1.1 = rube(model1, DS\_7\_10, init, pars, n.burn=500, n.thin=2, n.chains=2,n.iter=10000)

# multivariate effective sample size

multiESS(as.data.frame(M1.1$sims.array))

M1.2 = rube(model1, DS\_7\_10, init, c(pars,"predch"), n.burn=500, n.thin=2, n.chains=2,n.iter=10000)

summary(M1.2)

**# predictive checks**

A=as.array(M1.2$sims.array)

A=matrix(A,2\*4750,393)

predch.m=apply(A[,6:393],2,mean)

sum(predch.m <0.05)

sum(predch.m >0.95)

**# ZINB**

model2= "model{ for (i in 1:387) {y[i] ~ dnegbin(p.NB[i],r)

logit(omega[i]) <- gamma0+gamma[1]\*(educ[i]-mean(educ[]))+gamma[2]\*(anx[i]-mean(anx[]))

log(mu[i]) <- beta0 + beta[1]\*(educ[i]-mean(educ[]))+beta[2]\*(anx[i]-mean(anx[]))

p.NB[i] <- r/(r+mu.s[i])

mu.s[i] <- (1-d[i])\*mu[i]

**# indicator of true zero**

d[i] ~ dbern(omega[i])

**# mixed predictive check**

y.new[i] ~ dnegbin(p.NB.new[i],r)

p.NB.new[i] <- r/(r+mu.s.new[i])

mu.s.new[i] <- (1-d.new[i])\*mu[i]

d.new[i] ~ dbern(omega[i])

predch[i] <- step(y.new[i]-y[i])-0.5\*equals(y.new[i],y[i])

**# likelihood**

D0[i] <- equals(y[i],0)

p[i] <- D0[i]\*p.eq.0[i]+(1-D0[i])\*p.gt.0[i]

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

log(probNB[i]) <- loggam(y[i]+r)-loggam(r)-logfact(y[i])+r\*log(p.NB[i])+y[i]\*log(1-p.NB[i])

p.eq.0[i] <- omega[i]+(1-omega[i])\*pow(p.NB[i],r)

p.gt.0[i] <- (1-omega[i])\*probNB[i]}

**# priors**

beta0 ~ dnorm(0,0.001)

gamma0 ~ dnorm(0,0.001)

for (j in 1:2) {beta[j]~ dnorm(0,0.001)

gamma[j] ~ dnorm(0,0.1)}

r ~ dexp(1)

**# total log-likelihood**

TLL <- sum(LL[])}

**"**

ini1 <- list(beta=c(-1,0),gamma= rep(0,2),r=1,beta0=0,gamma0=0);

ini2 <- list(beta=c(-0.5,0),gamma=rep(-0.5,2),beta0=0,gamma0=0,r=2)

init <- list(ini1,ini2)

pars= c("beta","gamma","TLL","r")

parsp = c(pars,"predch")

r = rube(model2, DS\_7\_10, init)

summary(r)

M2.1 = rube(model2, DS\_7\_10, init, pars, n.burn=500, n.thin=2, n.chains=2,n.iter=10000)

multiESS(as.data.frame(M2.1$sims.array))

M2.2 = rube(model2, DS\_7\_10, init, parsp, n.burn=500, n.thin=2, n.chains=2,n.iter=10000)

summary(M2.2)

**# predictive checks**

A=as.array(M2.2$sims.array)

A=matrix(A,2\*4750,394)

predch.m=apply(A[,7:394],2,mean)

sum(predch.m <0.05)

sum(predch.m >0.95)