**require(jagsUI)**

**setwd("C:/R files BHMRA")**

**attach("DS\_4\_4.Rdata")**

**set.seed(1234)**

**# Model 1**

**cat(" model {for (i in 1:n){# likelihood (s2 and s1 are standard errors)**

**my2[i] <- th2[i]+rho[i]\*(s2[i]/s1[i])\*(y1[i]-th1[i]) # Conditional expectation, y2**

**V2[i] <- pow(s2[i],2)\*(1-pow(rho[i],2)) # Conditional variance y2**

**V1[i] <- s1[i]\*s1[i]**

**y1[i ]~ dnorm(th1[i],1/V1[i])**

**y2[i] ~dnorm(my2[i],1/V2[i])**

**# second stage**

**th1[i] ~ dnorm(nu1[i],invtau1.2)**

**th2[i] ~dnorm(mnth2[i],1/V.th2)**

**nu1[i] <- mu[1]+beta[1]\*ish[i]**

**nu2[i] <- mu[2]+beta[2]\*ish[i]**

**mnth2[i] <- nu2[i]+rho.tau\*sqrt(tau2.2/tau1.2)\*(th1[i]-nu1[i])**

**# mixed exceedance checks**

**th1new[i] ~ dnorm(nu1[i],invtau1.2)**

**th2new[i] ~dnorm(nu2[i],1/V.th2)**

**y1new[i ]~ dnorm(th1new[i],1/V1[i])**

**y2new[i] ~dnorm(my2new[i],1/V2[i])**

**my2new[i] <-th2new[i]+rho[i]\*(s2[i]/s1[i])\*(y1new[i]-th1new[i])**

**exc1[i] <- step(y1new[i]-y1[i])**

**exc2[i] <- step(y2new[i]-y2[i])}**

**V.th2 <- tau2.2\*(1-pow(rho.tau,2))**

**a ~ dunif(0,3.1412) #spherical parameterization**

**rho.tau <- cos(a)**

**for (j in 1:p) {mu[j] ~dnorm(0,0.001); beta[j] ~dnorm(0,0.001)}**

**invtau1.2 ~ dgamma(1,0.001); invtau2.2 ~ dgamma(1,0.001)**

**tau1.2 <- 1/invtau1.2; tau2.2 <- 1/invtau2.2;**

**tau1 <- sqrt(tau1.2); tau2 <- sqrt(tau2.2)**

**cov.tau <- sqrt(tau1.2 \*tau2.2)\*rho.tau}**

**", file="model1.jag")**

**# initial values and estimation**

**inits <- function(){list(invtau1.2=rexp(1,1),invtau2.2=rexp(1,1),**

**mu=rnorm(2,0,0.1) ,beta=rnorm(2,0,0.1))}**

**pars <- c("mu","beta","tau1","tau2","cov.tau","rho.tau","exc1","exc2")**

**R1=autojags(DS\_4\_4, inits, pars, "model1.jag",2, n.adapt=100, iter.increment=1000, n.burnin=500,Rhat.limit=1.1, max.iter=5000,seed=1234)**

**R1$summary**

**# Model 2**

**cat(" model {for (i in 1:n){# likelihood (s2 and s1 are standard errors)**

**my2[i] <- th2[i]+rho[i]\*(s2[i]/s1[i])\*(y1[i]-th1[i]) # Conditional expectation, y2**

**V2[i] <- pow(s2[i],2)\*(1-pow(rho[i],2)) # Conditional variance y2**

**V1[i] <- s1[i]\*s1[i]**

**y1[i ]~ dnorm(th1[i],1/V1[i])**

**y2[i] ~dnorm(my2[i],1/V2[i])**

**# second stage**

**th1[i] ~ dnorm(nu1[i],invtau1.2)**

**th2[i] ~dnorm(mnth2[i],1/V.th2)**

**nu1[i] <- mu[1]+beta[1]\*ish[i]**

**nu2[i] <- mu[2]+beta[2]\*ish[i]**

**mnth2[i] <- nu2[i]+rho.tau\*(tau2/tau1)\*(th1[i]-nu1[i])**

**# mixed exceedance checks**

**th1new[i] ~ dnorm(nu1[i],invtau1.2)**

**th2new[i] ~dnorm(nu2[i],1/V.th2)**

**y1new[i ]~ dnorm(th1new[i],1/V1[i])**

**y2new[i] ~dnorm(my2new[i],1/V2[i])**

**my2new[i] <-th2new[i]+rho[i]\*(s2[i]/s1[i])\*(y1new[i]-th1new[i])**

**exc1[i] <- step(y1new[i]-y1[i])**

**exc2[i] <- step(y2new[i]-y2[i])}**

**V.th2 <- tau2^2\*(1-pow(rho.tau,2))**

**rho.tau ~ dunif(0,1)**

**for (j in 1:p) {mu[j] ~dnorm(0,0.001); beta[j] ~dnorm(0,0.001)}**

**tau1 ~ dnorm(0,2) T(0,)**

**tau2 ~ dnorm(0,2) T(0,)**

**invtau1.2 <- 1/tau1^2**

**invtau2.2 <- 1/tau2^2**

**cov.tau <- tau1 \*tau2\*rho.tau}**

**", file="model2.jag")**

**# initial values and estimation**

**inits <- function(){list(tau1=rexp(1,100), tau2=rexp(1,100),**

**mu=rnorm(2,0,0.1) ,beta=rnorm(2,0,0.1))}**

**pars <- c("mu","beta","tau1","tau2","cov.tau","rho.tau","exc1","exc2")**

**R2=autojags(DS\_4\_4, inits, pars, "model2.jag",2, n.adapt=100, iter.increment=1000, n.burnin=500,Rhat.limit=1.1, max.iter=5000,seed=1234)**

**R2$summary**