library(rjags); setwd("C:/R files BHMRA")

**# read in y and predictors (x standardised)**

attach("DS\_7\_9\_FM.Rdata")

attach("DS\_7\_9.Rdata")

options(scipen=999)

library(flexmix)

FLM2 <- flexmix(y ~ x1+x2+x3,data= DS\_7\_9\_FM,k=2)

FLM3 <- flexmix(y ~ x1+x2+x3,data=DS\_7\_9\_FM,k=3)

FLM4 <- flexmix(y ~ x1+x2+x3,data= DS\_7\_9\_FM,k=4)

**# set number of discrete mixture components and predictors**

K = 3

p =3

KM=K-1

**# No selection, normal N(0,1000) priors on beta coeffs**

set.seed(1234)

**# model code**

cat("model { for (i in 1:N) {

y[i] ~ dnorm(alph[G[i]]+sum(betas[i,1:p,G[i]]), 1/sigma[G[i]]^2)

ynew[i] ~ dnorm(alph[G[i]]+sum(betas[i,1:p,G[i]]), 1/sigma[G[i]]^2)

r[i] <- (y[i]- alph[G[i]]-sum(betas[i,1:p,G[i]]))/sigma[G[i]]

**# log-likelihood**

LL[i] <- -0.5\*(r[i]\*r[i]+log(sigma[G[i]]))

**# predictive discrepancy**

predF[i] <- pow(y[i]-ynew[i],2)

**# group indicator**

G[i] ~ dcat(pi[1:K])

for (j in 1:p) {for (k in 1:K) {betas[i,j,k] <- beta[j,k]\*x[i,j]}}

**# monitor index to obtain posterior mean allocation probabilities**

for (k in 1:K) {index[i,k] <- equals(G[i],k)

avsal[i,k] <- index[i,k]\*y[i]}}

for (j in 1:p) {for (k in 1:K) {beta[j,k] ~ dnorm(0,0.001)}}

pi[1:K] ~ ddirch(w[1:K])

for (j in 1:K) {w[j] <- 5

alph[j] ~ dnorm(0,0.001)

avg.sal[j] <- mean(avsal[,j])

sig1[j] ~ dgamma(1,0.001)}

sigma=sort(sig1)

**# Fit measures**

BIC <- -2\*sum(LL[])+(p\*K+2\*K)\*log(N)

C.F <- sum(predF[])}

",file="salaries1.jag")

**# Estimation**

beta.init1 <- matrix(0,p,K)

beta.init2 <- matrix(0.5,p,K)

ini1 <- list(alph=c(2,5,15),beta=beta.init1,sig1=c(0.4,1,10))

ini2 <- list(alph=c(2,4,16),beta=beta.init2,sig1=c(0.4,1,10))

inits <- list(ini1,ini2)

M1 <- jags.model(inits=inits,data=DS\_7\_9,n.chains=2, file="salaries1.jag",n.adapt=500)

params =c("alph","beta","sigma","C.F","BIC","pi")

S1.1 <- coda.samples(M1,params ,n.iter=10000)

gelman.diag(S1.1,multivariate=F)

summary(S1.1)

S1.2 <- coda.samples(M1, c(params,"avg.sal"),n.iter=5000)

summary(S1.2)

**# Model 2 Laplace priors on beta coeffs**

cat("model { for (i in 1:N) {

y[i] ~ dnorm(alph[G[i]]+sum(betas[i,1:p,G[i]]), 1/sigma[G[i]]^2)

ynew[i] ~ dnorm(alph[G[i]]+sum(betas[i,1:p,G[i]]), 1/sigma[G[i]]^2)

r[i] <- (y[i]- alph[G[i]]-sum(betas[i,1:p,G[i]]))/sigma[G[i]]

**# log-likelihood**

LL[i] <- -0.5\*(r[i]\*r[i]+log(sigma[G[i]]))

**# predictive discrepancy**

predF[i] <- pow(y[i]-ynew[i],2)

**# group indicator**

G[i] ~ dcat(pi[1:K])

for (j in 1:p) {for (k in 1:K) {betas[i,j,k] <- gam[j,k]\*beta[j,k]\*x[i,j]}}

**# monitor index to obtain posterior mean allocation probabilities**

for (k in 1:K) {index[i,k] <- equals(G[i],k)}}

for (j in 1:p) {for (k in 1:K) {beta[j,k] ~

dnorm(0,1/(eta2[j,k]\*sigma[k]^2))

xi[j,k] <- gam[j,k]\*beta[j,k]

eta2[j,k] ~ dexp(lam[k]^2/2)

gam[j,k] ~ dbern(omeg[k])}}

pi[1:K] ~ ddirch(w[1:K])

for (j in 1:K) {w[j] <- 5

alph[j] ~ dnorm(0,0.001)

lam[j] ~ dunif(0.01,100)

omeg[j] ~ dbeta(1,1)

sig1[j] ~ dgamma(1,0.001)}

sigma=sort(sig1)

**# Fit measures**

BIC <- -2\*sum(LL[])+(p\*K+2\*K)\*log(N)

C.F <- sum(predF[])}

",file="salaries2.jag")

**# Initial Values and Estimation**

ini1 <- list(alph=c(2,5,15),beta=beta.init1, sig1=c(0.4,1,10))

ini2 <- list(alph=c(3,6,16),beta=beta.init2, sig1=c(0.4,1,10))

inits <- list(ini1,ini2)

params =c("alph","xi","sigma","lam","lam","pi")

M2 <- jags.model(inits=inits,data=DS\_7\_9,n.chains=2, file="salaries2.jag",n.adapt=5000)

S2.1 <- coda.samples(M2,params,n.iter=25000)

gelman.diag(S2.1,multivariate=F)

summary(S2.1)

S2.2 <- coda.samples(M2, c(params,"gam"),n.iter=5000)

summary(S2.2)

**# Model 3, no selection, Laplace priors on beta coeffs**

cat("model { for (i in 1:N) {

y[i] ~ dnorm(alph[G[i]]+sum(betas[i,1:p,G[i]]), 1/sigma[G[i]]^2)

ynew[i] ~ dnorm(alph[G[i]]+sum(betas[i,1:p,G[i]]), 1/sigma[G[i]]^2)

r[i] <- (y[i]- alph[G[i]]-sum(betas[i,1:p,G[i]]))/sigma[G[i]]

**# log-likelihood**

LL[i] <- -0.5\*(r[i]\*r[i]+log(sigma[G[i]]))

**# predictive discrepancy**

predF[i] <- pow(y[i]-ynew[i],2)

**# group indicator**

G[i] ~ dcat(pi[1:K])

for (j in 1:p) {for (k in 1:K) {betas[i,j,k] <- beta[j,k]\*x[i,j]}}

**# monitor index to obtain posterior mean allocation probabilities**

for (k in 1:K) {index[i,k] <- equals(G[i],k)}}

for (j in 1:p) {for (k in 1:K) {beta[j,k] ~ dnorm(0,1/(eta2[j,k]\*sigma[k]^2))

eta2[j,k] ~ dexp(lam[k]^2/2)}}

pi[1:K] ~ ddirch(w[1:K])

for (j in 1:K) {w[j] <- 5

alph[j] ~ dnorm(0,0.001)

lam[j] ~ dunif(0.01,100)

omeg[j] ~ dbeta(1,1)

sig1[j] ~ dgamma(1,0.001)}

sigma=sort(sig1)

**# Fit measures**

BIC <- -2\*sum(LL[])+(p\*K+2\*K)\*log(N)

C.F <- sum(predF[])}

",file="salaries3.jag")

**# Initial Values and Estimation**

ini1 <- list(alph=c(2,5,15),beta=beta.init1, sig1=c(0.4,1,10))

ini2 <- list(alph=c(3,6,16),beta=beta.init2, sig1=c(0.4,1,10))

inits <- list(ini1,ini2)

M3 <- jags.model(inits=inits,data=DS\_7\_9,n.chains=2, file="salaries3.jag",n.adapt=5000)

S3.1 <- coda.samples(M3,c("alph","beta" ,"sigma","lam","pi"),n.iter=30000)

gelman.diag(S3.1,multivariate=F)

summary(S3.1)

S3.2 <- coda.samples(M3, c("alph","beta","sigma","lam","pi"),n.iter=5000)

summary(S3.2)