require(jagsUI)

require(HDInterval)

setwd("C:/R files BHMRA")

attach("DS\_9\_2.Rdata")

attach(DS\_9\_2)

y <- matrix(,48,15)

y[,1] =y1; y[,2] =y2;y[,3] =y3;y[,4] =y4;y[,5] =y5;y[,6] =y6;y[,7] =y7;y[,8] =y8;

y[,9] =y9; y[,10]=y10; y[,11] =y11; y[,12] =y12;y[,13] =y13;y[,14] =y14;y[,15] =y15

y <- scale(y)

p=15

R2=diag(2)

zero2=rep(0,2)

D <- list(y=y,R=R2,p=p,n=48,zero=zero2)

**# MLE factor analysis**

library(lavaan)

F2=factanal(~y1+y2+y3+y4+y5+y6+y7+y8+y9+y10+y11+y12+y13+y14+y15, factors=2)

**#**

**# PX code for two factors**

**#**

set.seed=1234

cat("model{

for (i in 1:n){ Fstar[i,1:2]~dmnorm(zero[1:2],Phi.inv[1:2,1:2])

for (j in 1:p) {y[i,j]~dnorm(Fstar[i,1]\*lambda1star[j] + Fstar[i,2]\*lambda2star[j], tau[j]) } }

# prior for non-identified loadings

for (j in 1:2) {omega[j] ~ dexp(1)}

for (j in 1:p){ lambda1star[j]~dnorm(0,omega[1]) }

lambda2star[1] ~ dnorm(0,100)

for (j in 2:p){ lambda2star[j] ~dnorm(0,omega[2]) }

# other priors

for (j in 1:p){ tau[j]~dgamma(0.1,0.1) }

# Covariance between factors

Phi.inv[1:2,1:2]~dwish(R[1:2,1:2],2)

CovF[1:2,1:2]<-inverse(Phi.inv[1:2, 1:2])

# transform to identified parameters

for (j in 1:p){ lambda1[j]<-ifelse(lambda1star[1]<0,-1,1)\*lambda1star[j]\*sqrt(CovF[1,1])

lambda2[j]<-ifelse(lambda2star[2]<0,-1,1)\* lambda2star[j]\*sqrt(CovF[2,2]) }

# factor correlation

rho <-ifelse(lambda1star[1]\*lambda2star[2]<0,-1,1)\* CovF[1,2]/sqrt(CovF[1,1]\*CovF[2,2])} ", file="model1.jag")

# Estimation

F0 <- matrix(0,48,2)

inits1 <- list(lambda1star=rep(0,15), lambda2star=rep(0,15),tau=rep(0.2,15),Fstar=F0)

inits2 <- list(lambda1star=rep(0,15), lambda2star=rep(0,15),tau=rep(0.4,15),Fstar=F0)

inits=list(inits1,inits2)

pars=c("lambda1","lambda2","rho","tau")

R = autojags(D, inits, pars,model.file="model1.jag",2,iter.increment=20000, n.burnin=500,Rhat.limit=1.1, max.iter=100000, seed=1234)

R$summary

hdi(R,credMass=0.9)

# MLE Factor Analysis Original Indicator Ordering

F3=factanal(~y1+y2+y3+y4+y5+y6+y7+y8+y9+y10+y11+y12+y13+y14+y15, factors=3)

**#**

**# Three factors with indicators resorted**

**#**

set.seed=1234

p=15

R3=diag(3)

zero3=rep(0,3)

yr <- matrix(,48,15)

yr[,1] =y1; yr[,2] =y2;yr[,3] =y4;yr[,4] =y3;yr[,5] =y5;yr[,6] =y6;yr[,7] =y7;yr[,8] =y8;

yr[,9] =y9; yr[,10]=y10; yr[,11] =y11; yr[,12] =y12;yr[,13] =y13;yr[,14] =y14;yr[,15] =y15

yr <- scale(yr)

D.reord <- list(y=yr,R=R3,p=p,n=48,zero=zero3)

**#**

**# PX code for three factors**

**#**

cat("model{ for (i in 1:n){ Fstar[i,1:3]~dmnorm(zero[1:3],Phi.inv[1:3,1:3])

for (j in 1:p) {y[i,j]~dnorm(Fstar[i,1]\*lambda1star[j] + Fstar[i,2]\*lambda2star[j]

+Fstar[i,3]\*lambda3star[j], tau[j]) } }

# prior for non-identified loadings

for (j in 1:3) {omega[j] ~ dexp(1)}

for (j in 1:p){ lambda1star[j]~dnorm(0,omega[1]) }

lambda2star[1] ~ dnorm(0,100)

for (j in 2:p){ lambda2star[j] ~dnorm(0,omega[2]) }

lambda3star[1] ~ dnorm(0,100)

lambda3star[2] ~ dnorm(0,100)

for (j in 3:p){ lambda3star[j] ~dnorm(0,omega[3]) }

# other priors

for (j in 1:p){ tau[j]~dgamma(0.1,0.1) }

# Covariance between factors

Phi.inv[1:3,1:3]~dwish(R[1:3,1:3],3)

CovF[1:3,1:3]<-inverse(Phi.inv[1:3, 1:3])

# transform to identified parameters

for (j in 1:p){ lambda1[j]<-ifelse(lambda1star[1]<0,-1,1)\*lambda1star[j]\*sqrt(CovF[1,1])

lambda2[j]<-ifelse(lambda2star[2]<0,-1,1)\* lambda2star[j]\*sqrt(CovF[2,2])

lambda3[j]<-ifelse(lambda3star[3]<0,-1,1)\* lambda3star[j]\*sqrt(CovF[3,3]) }

# correlations between factors

rho12 <- ifelse(lambda1star[1]\*lambda2star[2]<0,-1,1)\* CovF[1,2]/sqrt(CovF[1,1]\*CovF[2,2])

rho13 <- ifelse(lambda1star[1]\*lambda3star[3]<0,-1,1)\* CovF[1,3]/sqrt(CovF[1,1]\*CovF[3,3])

rho23 <- ifelse(lambda2star[2]\*lambda3star[3]<0,-1,1)\* CovF[2,3]/sqrt(CovF[2,2]\*CovF[3,3])} ", file="model2.jag")

# Estimation

F0 <- matrix(0,48,3)

inits1 <- list(lambda1star=rep(0,15), lambda2star=rep(0,15), lambda3star=rep(0,15),

tau=rep(0.2,15),Fstar=F0)

inits2 <- list(lambda1star=rep(0,15), lambda2star=rep(0,15), lambda3star=rep(0,15),

tau=rep(0.4,15),Fstar=F0)

inits=list(inits1,inits2)

pars=c("lambda1","lambda2","lambda3","rho12","rho23","rho13","tau")

R <- autojags(D.reord, inits, pars,model.file="model2.jag",2,iter.increment=20000, n.burnin=500,Rhat.limit=1.1, max.iter=100000, seed=1234)

R$summary

hdi(R,credMass=0.9)