In Example 1.1, the data are generated (n = 1000 values) and then the

underlying parameters are estimated as follows:

library(mcmcse)

library(MASS)

library(R2WinBUGS)

**# generate data**

set.seed(1234)

y = rnorm(1000,3,5)

**# initial vector setting and parameter values**

T = 10000; B = T/10; B1=B+1

mu = sig = numeric(T)

**# initial parameter values**

mu[1] = 0

sig[1] = 1

u.mu = u.sig = runif(T)

**# rejection counter**

REJmu = 0; REJsig = 0

**# log posterior density (up to a constant)**

logpost = function(mu,sig){

loglike = sum(dnorm(y,mu,sig,log=TRUE))

return(loglike - log(sig))}

**# Sampling loop**

for (t in 2:T) { print(t)

mut = mu[t-1]; sigt = sig[t-1]

# uniform proposals with kappa=0.5

mucand = mut + runif(1,-0.5,0.5)

sigcand = abs(sigt + runif(1,-0.5,0.5))

alph.mu = logpost(mucand,sigt)-logpost(mut,sigt)

if (log(u.mu[t]) <= alph.mu) mu[t] = mucand

else { mu[t] = mut; REJmu = REJmu+1 }

alph.sig = logpost(mu[t],sigcand)-logpost(mu[t],sigt)

if (log(u.sig[t]) <= alph.sig) sig[t] = sigcand

else { sig[t] <- sigt; REJsig <- REJsig+1 }}

**# sequence of sampled values and ACF plots**

plot(mu)

plot(sig)

acf(mu,main="acf plot, mu")

acf(sig,main="acf plot, sig")

**# posterior summaries**

summary(mu[B1:T])

summary(sig[B1:T])

**# Monte Carlo Standard Errors**

D=data.frame(mu[B1:T],sig[B1:T])

mcse.mat(D)

**# Acceptance Rates**

ACCmu=1-REJmu/T

ACCsig=1-REJsig/T

cat("Acceptance Rate mu =",ACCmu,"\n ")

cat("Acceptance Rate sigma = ",ACCsig, "\n ")

**# Kernel density plots**

plot(density(mu[B1:T]),main= "Density plot for mu posterior")

plot(density(sig[B1:T]),main= "Density plot for sigma posterior ")

f1=kde2d(mu[B1:T], sig[B1:T], n=50, lims=c(2.5,3.4,4.7,5.3))

filled.contour(f1,main="Figure 1.1 Bivariate Density", xlab="mu", ylab="sigma",

color.palette=colorRampPalette(c('white','blue','yellow','red','darkred')))

filled.contour(f1,main="Figure 1.1 Bivariate Density",xlab="mu", ylab="sigma",

color.palette=colorRampPalette(c('white','lightgray','gray','darkgray', 'black')))

**# Estimates of Effective Sample Sizes**

effectiveSize(mu[B1:T])

effectiveSize(sig[B1:T])

ess(D)

multiESS(D)

**# posterior probability on hypothesis μ < 3**

sum(mu[B1:T] < 3)/(T-B)