

two-components Gaussian Mixture model

```
mcmc=function(N, r, n_iter, theta_ini, mu, burnin){
  ## N is number of observations
  ## r is mixture weights
  ## n_iter is number of iterations
  ## theta_ini is the initial value of theta
  ## mu is the true means of two components
  ##burnin is the number of burn-in

  #-----
  #generate simulated data
  #-----
  ##number of components
  K=2

  probs = c(r,1-r)
  dists = runif(N)

  c_sim=vector(length=N)
  X_sim=vector(length=N)
  for(i in 1:N){
    if(dists[i]<probs[1]){
      c_sim[i]=1 ##the first component
      X_sim[i] = rnorm(1, mean=mu[1], sd=1)
    } else {
      c_sim[i]=2 ## the second component
      X_sim[i] = rnorm(1, mean=mu[2], sd=1)
    }
  }

  ##summarize data
  plot(density(X_sim), main="density of simulated X")

  #-----
  ## Gibbs sampling
  #-----

  ##set initial values
  c=vector(length = N)
  theta=theta_ini

  ##set priors
  theta_pri=10~{4}

  f_c=matrix(0, N, K)

  ##recording structure, each row is one iteration
  theta_keep=matrix(0, nrow=n_iter, ncol=K)
  c_keep=matrix(0, nrow=n_iter, ncol=N)
  f_c_keep=matrix(0, nrow=n_iter, ncol=N) ##record the probability of c_{i}=1 in each iteration
  mean_M_keep=matrix(0, nrow=n_iter, ncol=K)
```

```

var_M_keep=matrix(0, nrow=n_iter, ncol=K)

#-----
# RUN ITERATIONS
#-----
for (m in 1:n_iter){

  ##sample c_{i} for all i
  for(i in 1:N){
    for (l in 1:K){
      f_c[i,l]=dnorm(X_sim[i], mean=theta[l],sd=1)*probs[l]
    }
  }

  for(i in 1:N){
    f_c_keep[m, i]=f_c[i,1]/sum(f_c[i, ])
    c[i]=rcat(n=1,p=f_c[i,]/sum(f_c[i, ]))
  }

  ##sample theta
  for(l in 1:K){
    index=which(c==l)
    num_index=length(index)
    var_M=((1/theta_pri)+num_index)^{-1}
    mean_M=var_M*sum(X_sim[index])
    var_M_keep[m,l]=var_M
    mean_M_keep[m,l]=mean_M
    theta[l]=rnorm(1, mean=mean_M, sd=sqrt(var_M))
  }

  ##record parameters
  c_keep[m, ]=c
  theta_keep[m,]=theta
} ##iteration ends

##diagnostics
thetaMean=apply(theta_keep[-(1:burnin), ], 2, mean)
thetaSD=apply(theta_keep[-(1:burnin), ], 2, sd)

ClassProbs=vector(length=N) ##classification probability
for(i in 1:N){
  ClassProbs[i]=length(which(c_keep[-(1:burnin),i]==1))/(n_iter-burnin)
}

traceplot(x=as.mcmc(theta_keep[-(1:burnin),1]), ylab="theta_1")
traceplot(x=as.mcmc(theta_keep[-(1:burnin),2]), ylab="theta_2")
plot(density(theta_keep[-(1:burnin),1]), main="density of theta1")
plot(density(theta_keep[-(1:burnin),2]), main="density of theta2")

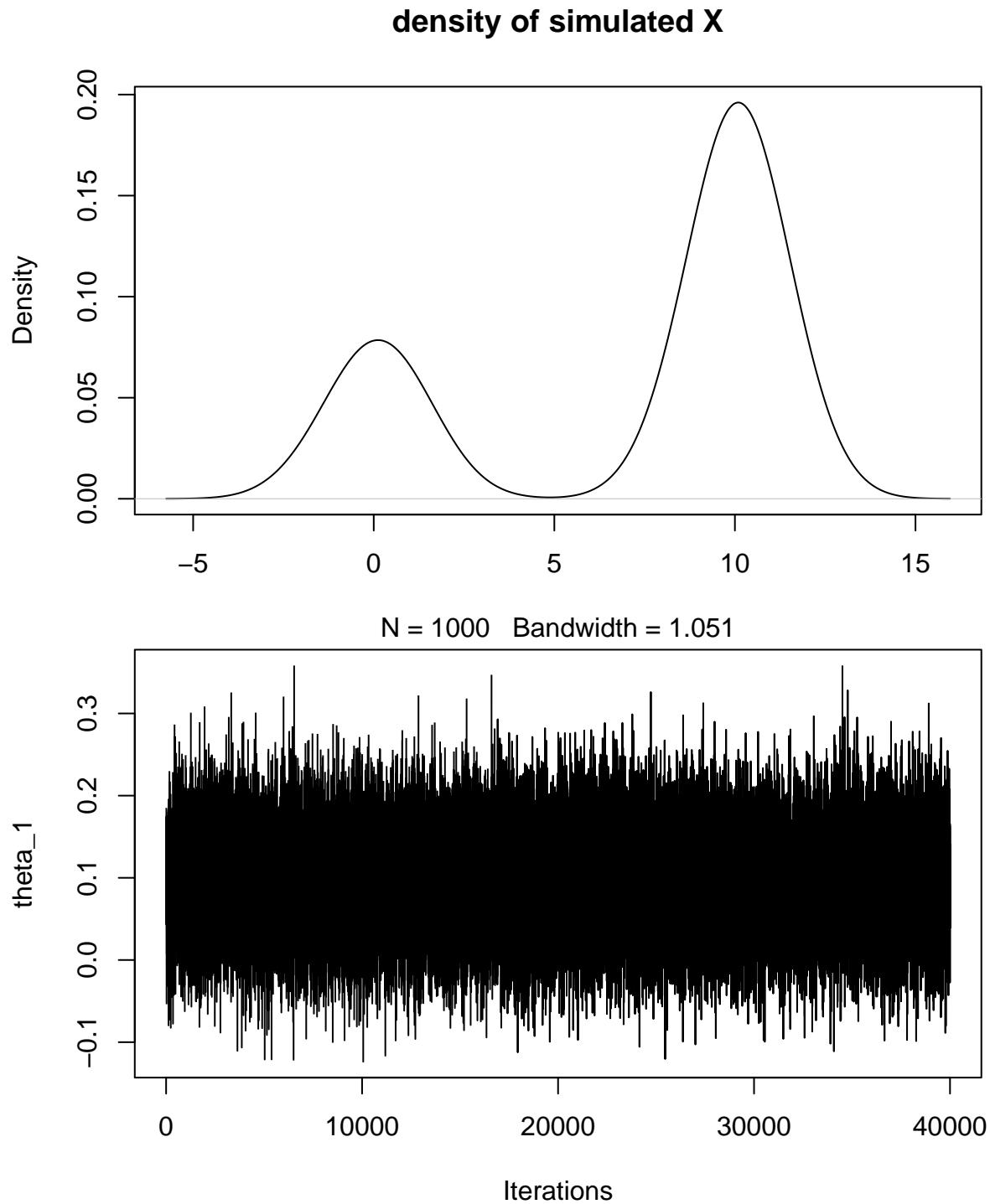
return(list(cSim=c_sim, XSim=X_sim, ClassProbs=ClassProbs, thetaMean=thetaMean, thetaSD=thetaSD,
           cKeep=c_keep[-(1:burnin), ], thetaKeep=theta_keep[-(1:burnin), ],
           fcKeep=f_c_keep[-(1:burnin), ], varMkeep=var_M_keep[-(1:burnin), ], meanMKeep=mean_M_keep[

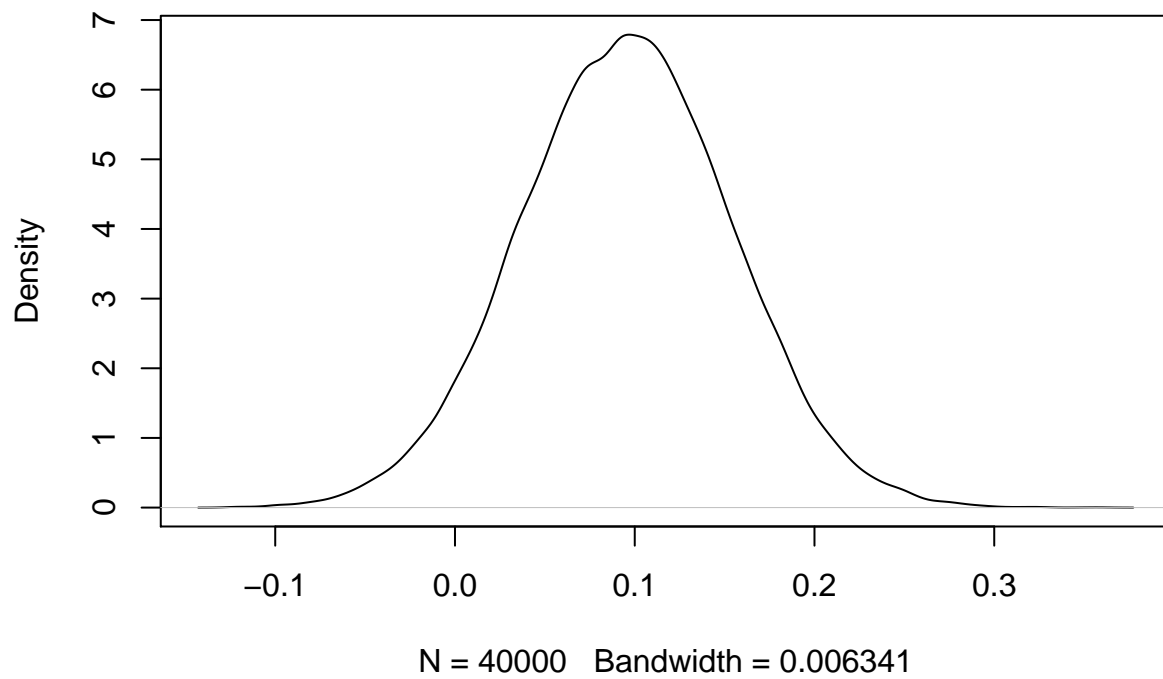
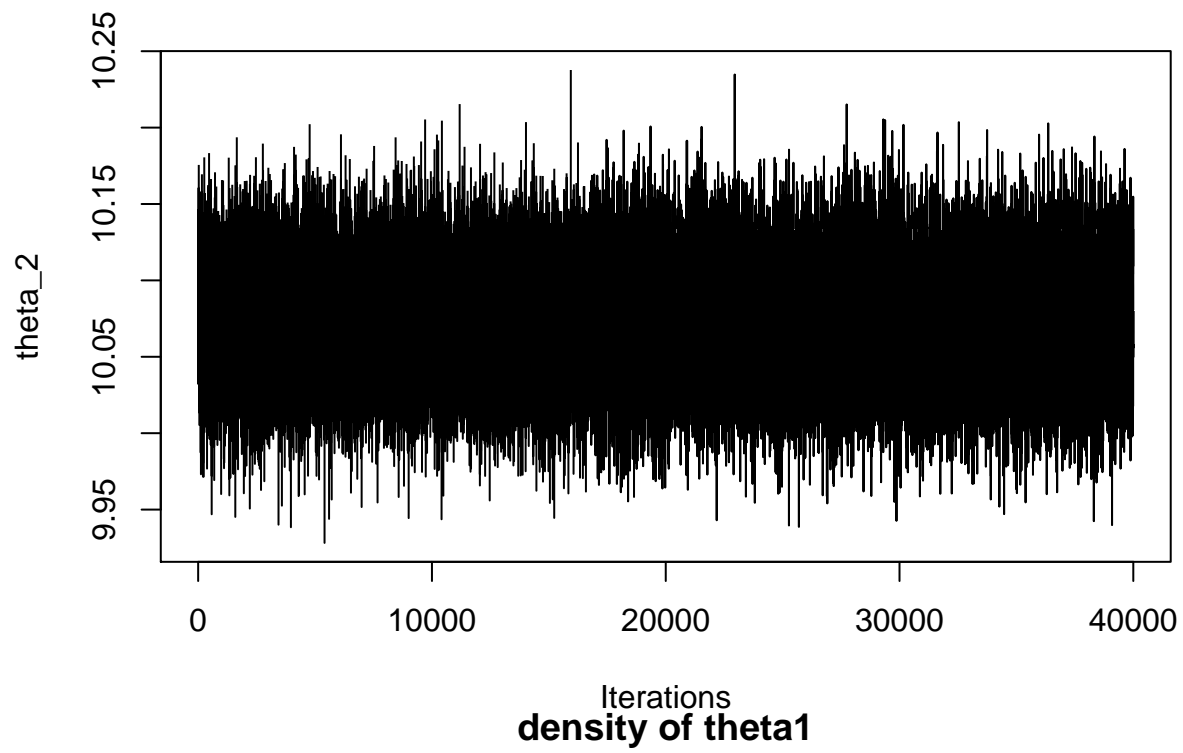
```

```
}
```

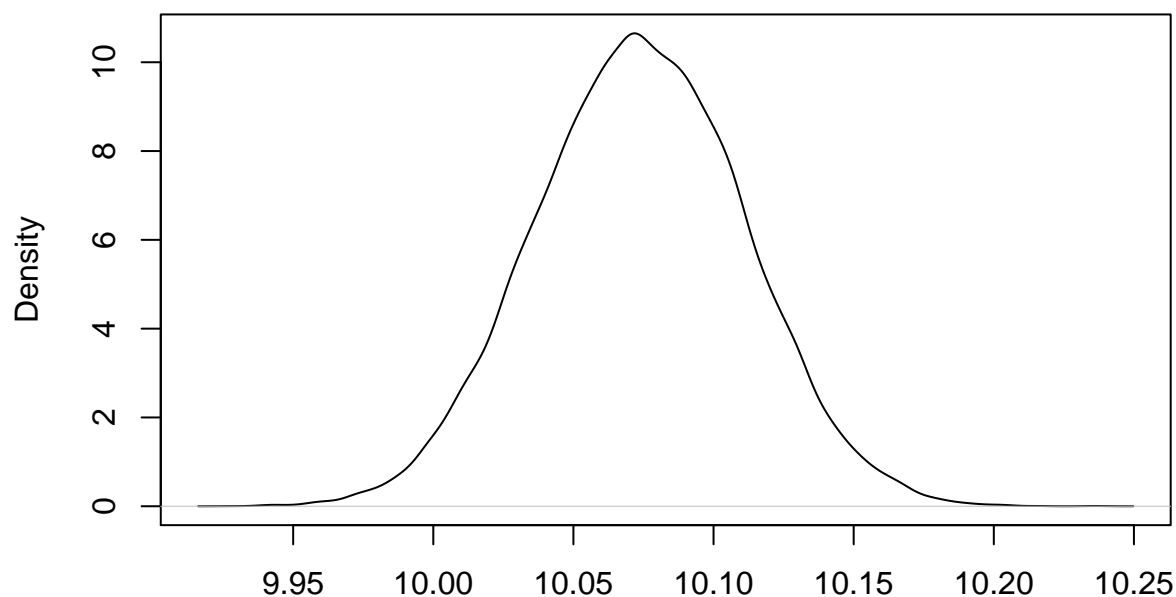
Case 1

```
mcmc1=mcmc(N=1000, r=0.3, n_iter=50000, theta_ini=c(2, 12), mu=c(0,10), burnin=10000)
```





density of theta2



N = 40000 Bandwidth = 0.004027

mcmc1\$ClassProbs

```
##      [1] 0 0 0 0 1 0 1 0 0 0 0 0 0 0 1 1 0 1 0 1 1 1 0 0 0 0 0 0 1 0 0 0 0 0
##     [35] 1 0 0 0 1 0 0 1 0 1 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0
##     [69] 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0
##    [103] 1 1 0 0 0 0 1 0 0 0 0 0 1 1 0 1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0
##    [137] 0 0 0 1 1 0 0 0 1 1 0 0 0 0 0 0 0 1 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0
##    [171] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 1 1 1 0 0
##    [205] 1 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 1 0 1 0 0 1 0 0 0 0 0 1 0
##    [239] 0 0 1 0 1 0 1 1 0 1 0 0 0 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0
##    [273] 0 1 1 0 0 0 1 0 0 1 1 0 1 0 0 0 1 1 0 1 0 0 0 1 0 0 0 0 1 0 0 1 0 1 0 1
##    [307] 1 0 0 0 0 0 0 1 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1
##    [341] 0 1 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 1 1 0 1 0 1 1 0 0 0 1 0 0 0 0
##    [375] 1 0 1 0 0 1 0 0 1 0 0 0 0 0 0 1 1 0 1 1 0 0 0 0 0 1 0 0 0 0 0 1 1 0 1 0
##    [409] 0 1 1 0 0 0 0 1 0 1 1 1 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0
##    [443] 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 1
##    [477] 1 0 0 1 0 1 0 1 0 0 1 0 0 0 0 0 1 0 0 1 1 0 0 0 0 0 0 1 0 0 1 0 0 0 0
##    [511] 1 0 0 0 0 1 0 1 0 0 1 0 0 0 0 1 1 1 1 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0
##    [545] 0 1 0 1 0 0 1 1 0 0 0 1 0 0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0
##    [579] 0 1 1 0 1 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0
##    [613] 0 1 0 1 0 1 1 1 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 1 1 1 1 0 1
##    [647] 0 1 0 0 0 0 0 0 0 1 1 1 0 1 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 0 1
##    [681] 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 1 1 0 0 1 1 1 1 1 0 1 0
##    [715] 1 1 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 1 0 1 0 0 0 0
##    [749] 0 1 0 0 0 0 0 1 1 1 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0
##    [783] 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 1 0 0 0
##    [817] 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 1 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1
##    [851] 1 1 0 0 0 1 1 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0 1 0 0 1 1 0
##    [885] 0 1 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 0 1 0 1 1 0 1 0 0 0 0 1 1 1 0 0 0
##    [919] 1 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 1 1
```

```
## [953] 1 0 1 0 0 1 0 1 0 0 1 0 1 0 0 0 0 1 0 0 0 0 1 0 0 0 1 1 0 0 0 1 1 0
## [987] 0 0 0 0 1 1 0 0 0 1 1 0 0 0
```

```
mcmc1$thetaMean
```

```
## [1] 0.09535879 10.07373608
```

```
mcmc1$thetaSD
```

```
## [1] 0.05865950 0.03725399
```

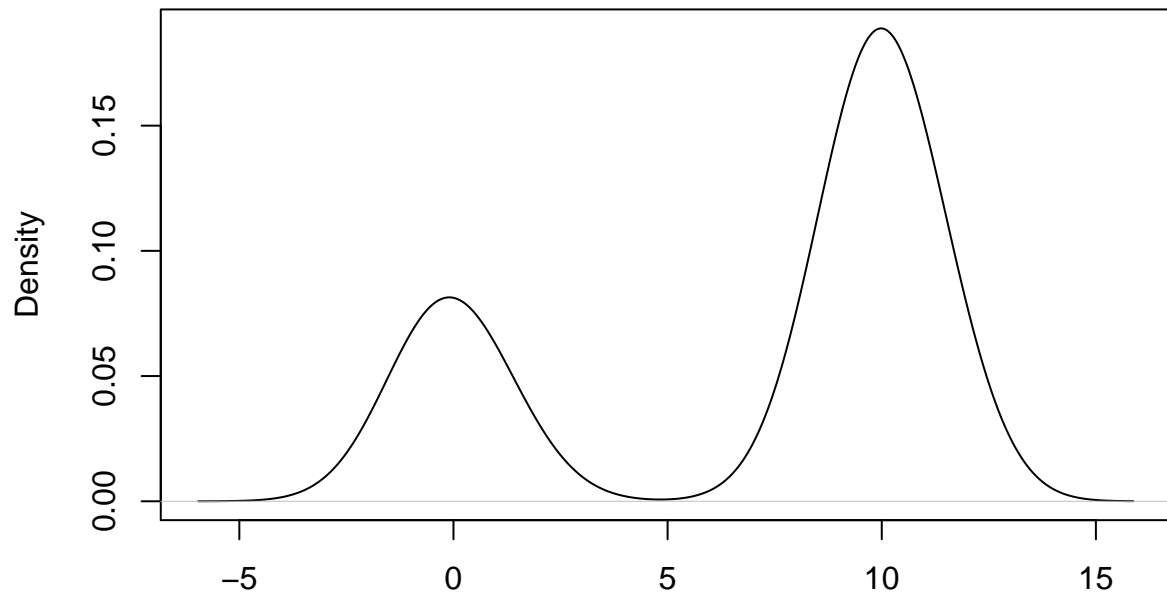
```
mcmc1$cSim
```

```
## [1] 2 2 2 2 1 2 1 2 2 2 2 2 2 2 1 1 2 1 2 1 1 1 2 2 2 2 2 2 1 2 2 2 2 2
## [35] 1 2 2 2 1 2 2 1 2 1 2 2 2 2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 1 2 2
## [69] 2 2 2 2 2 2 1 2 2 2 2 2 1 2 1 2 1 1 1 2 2 2 2 2 2 2 2 2 1 2 1 2 2 2 2
## [103] 1 1 2 2 2 2 1 2 2 2 2 1 1 2 1 2 2 2 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2
## [137] 2 2 2 1 1 2 2 2 1 1 2 2 2 2 2 2 1 2 1 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2
## [171] 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 1 2 2 1 1 1 2 2 2
## [205] 1 2 1 1 2 2 1 2 2 2 2 2 2 2 2 2 1 1 2 1 2 2 1 2 1 2 2 1 2 2 2 2 1 2
## [239] 2 2 1 2 1 2 1 1 2 1 2 2 2 1 2 1 2 2 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2
## [273] 2 1 1 2 2 2 1 2 2 1 1 2 1 2 2 1 1 2 1 2 2 2 1 2 2 2 1 2 2 1 2 1 2 1 2
## [307] 1 2 2 2 2 2 2 1 2 2 2 1 2 1 1 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 1 1 1
## [341] 2 1 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 2 2 2 1 1 2 1 2 1 1 2 2 2 1 2 2 2 2
## [375] 1 2 1 2 2 1 2 2 1 2 2 2 2 2 1 1 2 1 1 2 2 2 2 1 2 2 2 2 1 1 2 1 2 2 2
## [409] 2 1 1 2 2 2 2 1 2 1 1 1 2 2 2 1 2 2 2 2 2 1 2 2 2 2 2 2 2 2 1 2 2 2 1
## [443] 1 1 2 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 1 1 2 1 2
## [477] 1 2 2 1 2 1 2 1 2 2 1 2 2 2 2 1 2 2 2 1 1 2 2 2 2 2 2 1 2 2 1 2 2 2 2
## [511] 1 2 2 2 2 1 2 1 2 2 1 2 2 2 2 1 1 1 1 2 1 2 2 2 2 2 2 2 1 2 2 2 2 2 2
## [545] 2 1 2 1 2 2 1 1 2 2 2 1 2 2 2 1 1 2 1 2 2 2 2 2 2 2 2 1 2 1 2 2 2 2 2
## [579] 2 1 1 2 1 1 2 2 2 2 2 1 1 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 1 2 2 1
## [613] 2 1 2 1 2 1 1 1 2 1 2 2 1 2 1 2 2 2 2 2 2 1 2 2 2 2 2 1 1 1 1 2 1 1 2
## [647] 2 1 2 2 2 2 2 2 1 1 1 2 1 2 1 2 2 2 2 2 2 1 2 2 2 2 2 1 2 2 2 2 1 1 2
## [681] 2 1 2 1 1 2 2 2 2 2 2 2 1 2 2 1 2 2 2 1 2 2 1 1 2 2 1 1 1 1 1 2 1 2 1 2
## [715] 1 1 2 2 1 2 2 2 2 2 1 2 2 2 2 2 2 2 2 1 2 2 2 1 1 2 2 1 2 1 2 2 2 2 2
## [749] 2 1 2 2 2 2 1 1 1 1 2 2 2 2 2 1 1 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 2 2 2
## [783] 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2 2 2 2 1 2 1 2 2 1 2 2
## [817] 2 2 2 2 2 2 2 2 2 2 2 1 1 1 2 1 2 2 2 2 2 2 1 1 2 2 2 2 2 2 2 2 1 1 2 2
## [851] 1 1 2 2 2 1 1 2 2 1 2 2 1 2 2 1 2 2 2 2 2 2 2 1 1 2 2 1 2 2 1 1 2 1
## [885] 2 1 2 2 2 2 2 2 1 2 2 2 1 2 2 2 1 2 1 1 2 1 2 2 2 1 1 1 2 2 2 1 2
## [919] 1 2 2 2 2 2 2 2 2 1 2 2 1 1 1 2 1 2 2 1 2 2 2 2 2 2 2 2 2 1 1 2 2
## [953] 1 2 1 2 2 1 2 1 2 2 1 2 1 2 2 2 2 1 2 2 2 2 1 2 2 2 2 1 1 2 2 2 1 1 2
## [987] 2 2 2 2 1 1 2 2 2 1 1 2 2 2
```

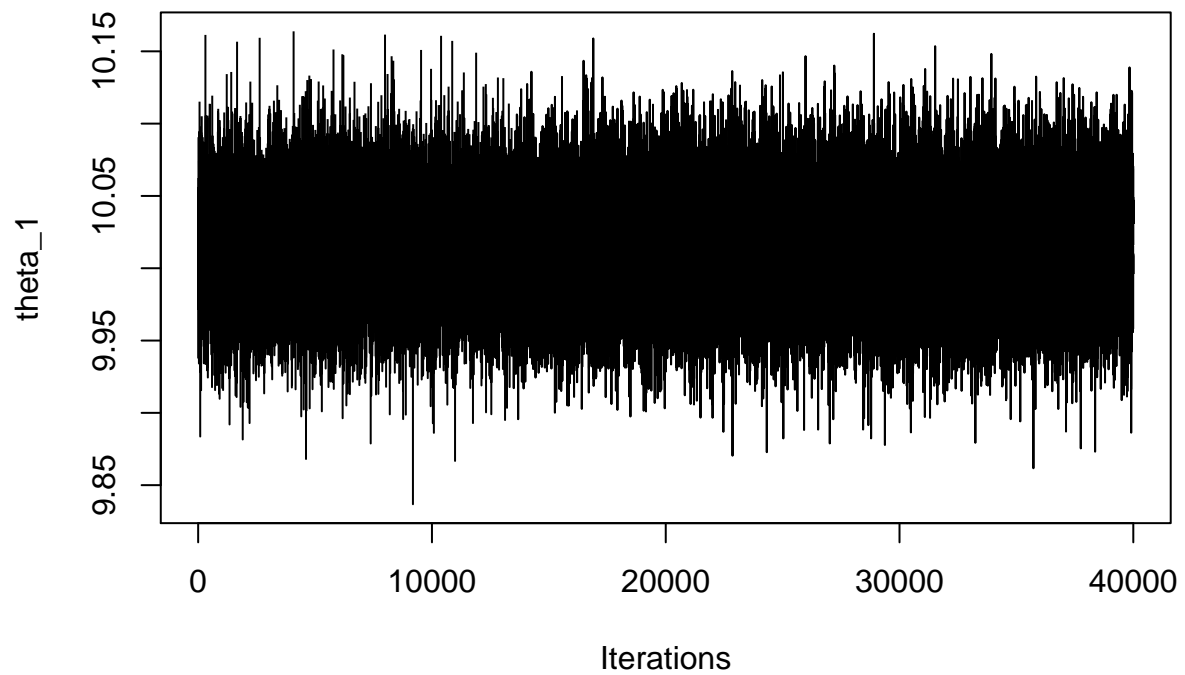
Case 2

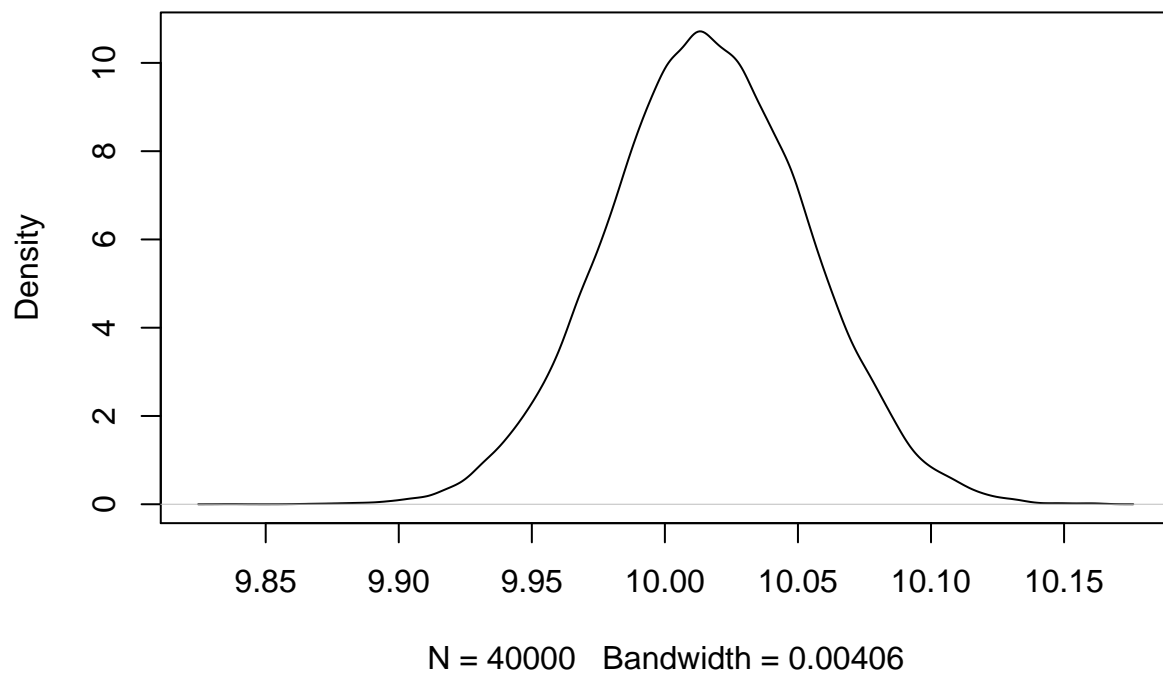
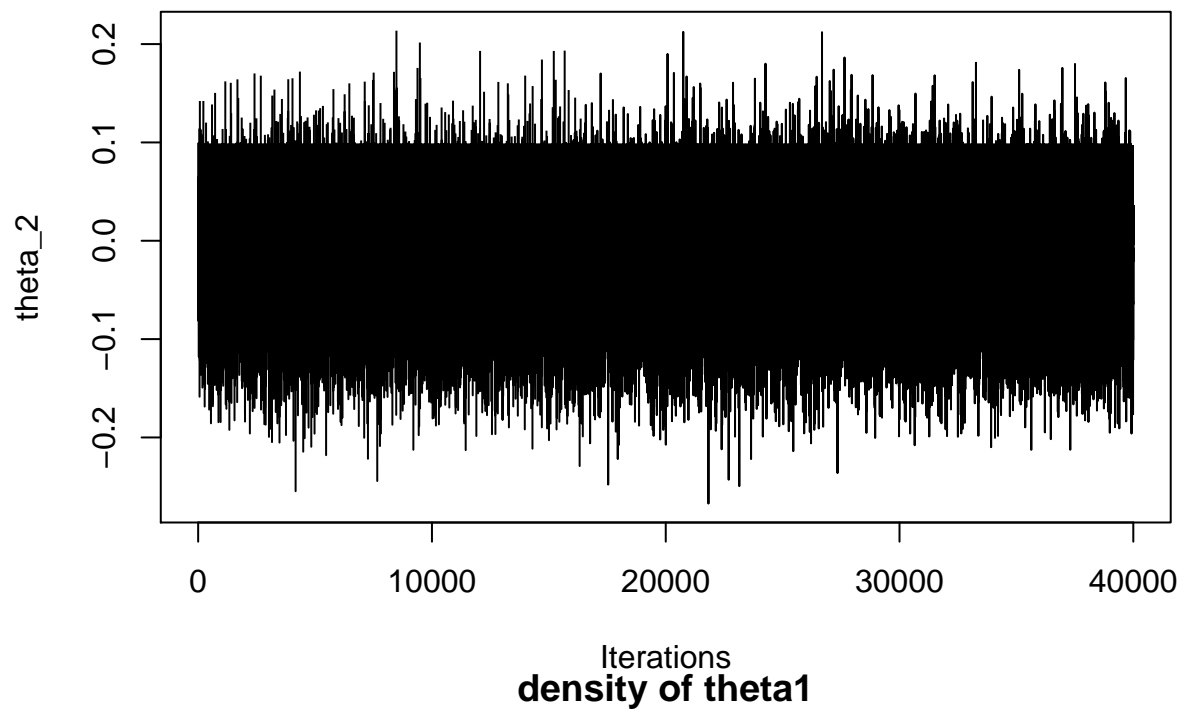
```
mcmc2=mcmc(N=1000, r=0.3, n_iter=50000, theta_ini=c(12, 2), mu=c(0,10), burnin=10000)
```

density of simulated X

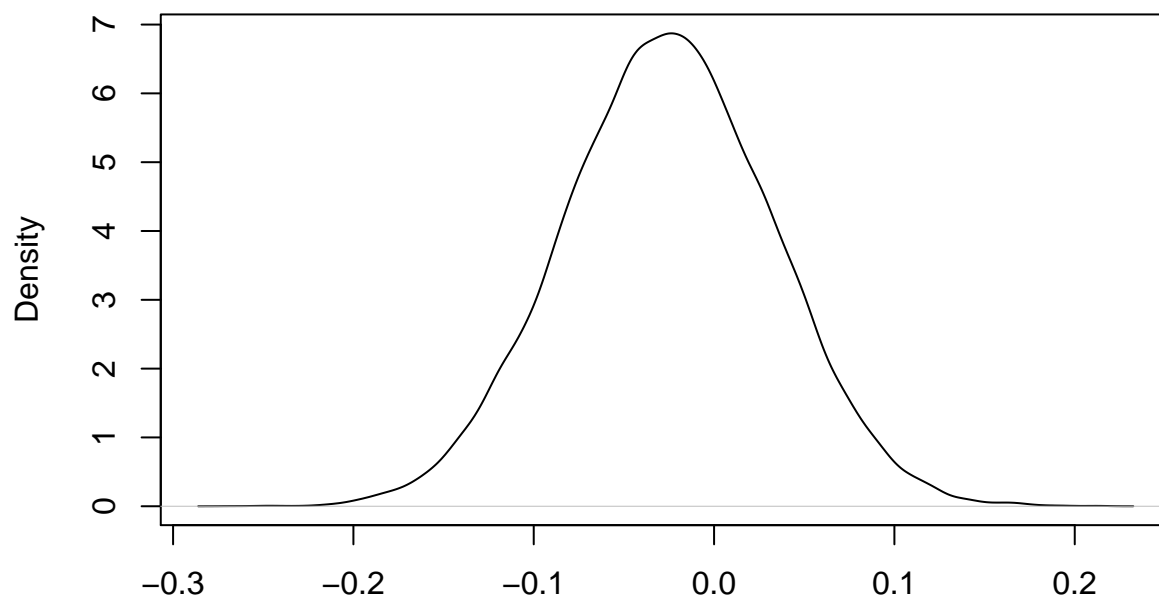


N = 1000 Bandwidth = 1.064





density of theta2



N = 40000 Bandwidth = 0.006281

mcmc2\$ClassProbs

```
##      [1] 1 1 0 0 0 1 0 1 0 1 1 1 1 0 0 1 1 1 1 1 0 1 1 0 0 1 1 1 1 1 1
##     [35] 1 1 1 1 1 1 1 1 1 0 1 1 1 0 1 1 1 1 1 1 1 0 1 1 1 0 1 1 1 1 1
##     [69] 1 1 1 0 1 0 1 1 1 1 0 1 1 0 1 1 1 0 1 1 1 0 1 1 1 1 0 0 1 1 1 1
##    [103] 0 0 1 1 1 1 1 1 1 0 0 1 1 1 1 0 1 1 0 0 0 0 1 1 1 0 1 0 0 0 1 1
##    [137] 1 1 1 1 0 1 1 1 1 1 0 1 0 0 1 1 1 0 0 1 0 1 1 0 1 1 1 1 1 1 1 1
##    [171] 1 1 0 0 1 0 1 1 1 1 1 0 1 1 1 1 1 1 1 0 0 1 1 0 1 0 0 1 1 0 0 1
##    [205] 1 0 1 1 1 1 0 1 0 1 0 1 1 1 1 0 1 0 0 1 0 1 0 1 1 1 1 1 1 0 1 1
##    [239] 0 1 1 0 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 0 0 1 1 0 1 1 0 1 1 1 1
##    [273] 0 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 0 0 1 0 1 1 1 1 1 1 1 1 1 1 0 1
##    [307] 1 0 1 1 0 1 1 0 1 0 1 0 1 0 0 1 0 1 1 1 1 0 1 0 0 0 1 1 0 1 1 1
##    [341] 1 1 1 0 1 1 0 1 0 1 0 1 0 0 1 1 1 1 1 0 1 1 0 0 0 1 1 1 1 0 0 1
##    [375] 1 0 1 1 0 0 0 1 0 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 0 0 0 1 0 1 1 1
##    [409] 1 0 0 1 1 0 1 1 0 1 1 1 1 0 1 1 1 0 1 1 1 1 1 0 0 1 1 1 1 1 0
##    [443] 0 1 1 0 1 0 1 1 1 1 0 0 1 1 1 1 0 0 0 1 1 0 1 1 1 1 1 1 0 0 1 1
##    [477] 1 0 1 0 0 0 1 0 0 1 0 0 1 0 0 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 0
##    [511] 0 1 0 1 0 0 1 1 0 1 1 0 1 1 1 1 1 0 1 1 0 1 1 1 1 1 1 1 1 1 0 1
##    [545] 1 1 0 0 1 0 1 1 1 1 1 1 1 1 0 1 1 0 0 0 1 1 1 1 0 1 0 0 1 1 1 1
##    [579] 1 1 1 1 1 0 1 0 0 1 1 1 1 1 0 1 0 1 0 1 1 1 1 1 0 1 1 1 1 1 0 1
##    [613] 1 1 0 1 1 1 0 0 1 1 1 0 1 1 1 0 1 1 1 1 1 1 0 0 1 1 0 0 1 0 1 1
##    [647] 0 1 1 0 1 1 0 0 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1
##    [681] 1 1 0 1 1 0 0 1 1 1 0 0 1 0 1 1 1 0 0 0 0 0 1 0 1 1 1 1 0 1 1 0
##    [715] 1 0 0 1 1 1 1 1 0 0 0 1 1 1 1 0 1 0 0 1 1 1 1 0 1 0 1 1 1 1 1
##    [749] 0 1 1 1 1 0 0 1 1 1 0 1 1 1 1 1 0 1 0 1 1 0 1 1 1 0 1 0 1 1 1
##    [783] 1 0 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 0 1 0 1 0 1 1 1
##    [817] 1 1 1 1 0 1 1 1 1 1 0 1 1 1 1 1 0 1 1 1 1 0 0 1 0 0 1 0 1 1 1
##    [851] 1 1 1 1 1 1 1 0 1 1 1 1 1 0 0 1 1 1 1 1 1 1 0 1 0 1 1 0 1 0 0
##    [885] 1 0 1 0 1 1 1 1 1 1 0 0 1 1 1 0 1 0 1 0 1 1 1 1 1 1 1 1 0 1 1
##    [919] 1 0 0 0 1 1 0 1 1 1 1 1 1 1 1 1 0 0 0 1 1 1 0 1 1 1 1 1 0 1 1
```

```
## [953] 1 1 1 1 1 0 0 1 0 1 1 1 1 0 1 0 1 1 1 0 1 0 1 1 1 1 1 1 1 0 0 0 1 1
## [987] 0 1 1 1 0 1 1 0 1 1 1 0 1 0
```

```
mcmc2$thetaMean
```

```
## [1] 10.01581990 -0.02567434
```

```
mcmc2$thetaSD
```

```
## [1] 0.03756172 0.05810655
```

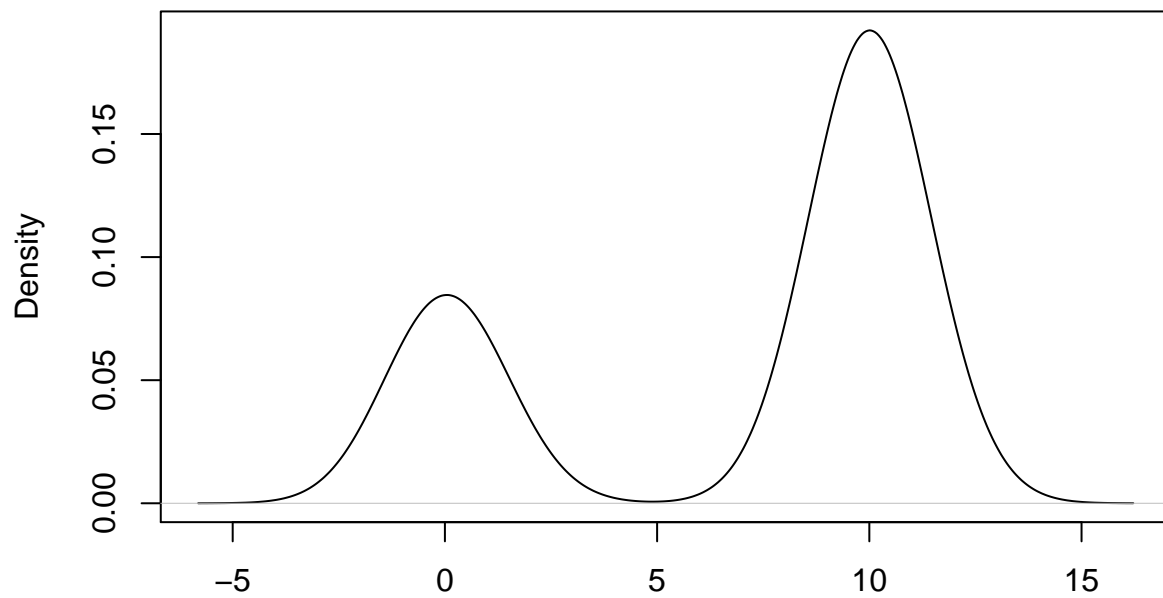
```
mcmc2$cSim
```

```
## [1] 2 2 1 1 1 2 1 2 1 2 2 2 2 1 1 2 2 2 2 2 2 1 2 2 1 1 2 2 2 2 2 2 2
## [35] 2 2 2 2 2 2 2 2 2 1 2 2 2 1 2 2 2 2 2 2 2 1 2 2 2 1 2 2 2 2 2 2
## [69] 2 2 2 1 2 1 2 2 2 2 1 2 2 1 2 2 2 1 2 2 2 1 2 2 2 2 1 1 2 2 2 2 2
## [103] 1 1 2 2 2 2 2 2 1 1 2 2 2 2 1 2 2 1 1 1 1 2 2 2 1 2 1 1 1 2 2 1 1 2
## [137] 2 2 2 2 1 2 2 2 2 2 1 2 1 1 2 2 2 1 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2
## [171] 2 2 1 1 2 1 2 2 2 2 2 1 2 2 2 2 2 2 1 1 2 2 1 2 1 1 2 2 1 1 1 2 2 1
## [205] 2 1 2 2 2 2 1 2 1 2 1 2 2 2 1 2 1 1 2 1 2 1 2 2 2 2 2 2 1 2 2 2 2
## [239] 1 2 2 1 2 2 2 2 1 2 1 2 2 2 2 2 2 2 1 1 2 2 1 2 2 1 2 2 1 2 2 2 1
## [273] 1 2 2 2 2 2 2 2 2 1 2 2 2 2 1 1 2 1 2 2 2 2 2 2 2 2 2 2 1 2 1 2 1 2
## [307] 2 1 2 2 1 2 2 1 2 1 2 1 1 2 1 2 2 2 2 1 2 1 1 1 2 2 1 2 2 2 2 1 2 1
## [341] 2 2 2 1 2 2 1 2 1 2 1 1 2 2 2 2 1 2 2 1 1 1 2 2 2 2 1 2 2 2 1 1 2 2
## [375] 2 1 2 2 1 1 1 2 1 2 2 2 2 2 2 1 1 2 2 1 2 2 2 1 1 1 2 1 2 2 2 1 1 2
## [409] 2 1 1 2 2 1 2 2 1 2 2 2 2 1 2 2 2 1 2 2 2 2 2 1 1 2 2 2 2 1 1 2 2
## [443] 1 2 2 1 2 1 2 2 2 1 1 2 2 2 2 1 1 1 2 2 1 2 2 2 2 2 1 1 2 2 2 1 2 1
## [477] 2 1 2 1 1 1 2 1 1 2 1 1 2 1 1 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 1 1
## [511] 1 2 1 2 1 1 2 2 1 2 2 1 2 2 2 2 1 2 2 1 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2
## [545] 2 2 1 1 2 1 2 2 2 2 2 2 2 1 2 2 1 1 1 2 2 2 1 2 1 1 2 2 2 2 2 2 2 2
## [579] 2 2 2 2 2 1 2 1 1 2 2 2 2 1 2 1 2 1 2 2 2 2 1 2 2 2 2 2 2 1 2 2 1
## [613] 2 2 1 2 2 2 1 1 2 2 2 1 2 2 2 1 2 2 2 2 2 1 1 2 2 1 1 2 1 2 2 1 2
## [647] 1 2 2 1 2 2 1 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2
## [681] 2 2 1 2 2 1 1 2 2 2 1 1 2 2 2 1 1 1 1 1 2 2 2 2 2 2 2 2 1 2 2 1 1 2
## [715] 2 1 1 2 2 2 2 2 1 1 1 2 2 2 2 1 2 1 1 2 2 2 2 1 2 1 2 2 2 2 1 2 2 2
## [749] 1 2 2 2 2 1 1 2 2 2 1 2 2 2 2 2 1 2 1 2 2 1 2 2 2 1 2 1 2 2 2 2 2 2
## [783] 2 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 1 2 1 2 2 2 2 2 2
## [817] 2 2 2 2 1 2 2 2 2 2 1 2 2 2 2 2 1 2 2 2 2 1 1 2 1 1 2 1 2 2 2 2 2 2
## [851] 2 2 2 2 2 2 2 1 2 2 2 2 2 1 1 2 2 2 2 2 2 2 1 2 1 2 2 1 2 1 1 1 2 2
## [885] 2 1 2 1 2 2 2 2 2 1 1 2 2 2 1 2 1 2 1 2 2 2 2 2 2 2 2 2 1 2 1 2 2 2
## [919] 2 1 1 1 2 2 1 2 2 2 2 2 2 2 1 1 1 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2
## [953] 2 2 2 2 2 1 1 2 1 2 2 2 2 1 2 1 2 2 2 1 2 2 2 2 2 2 2 2 2 1 1 1 2 2
## [987] 1 2 2 2 1 2 2 1 2 2 2 1 2 1
```

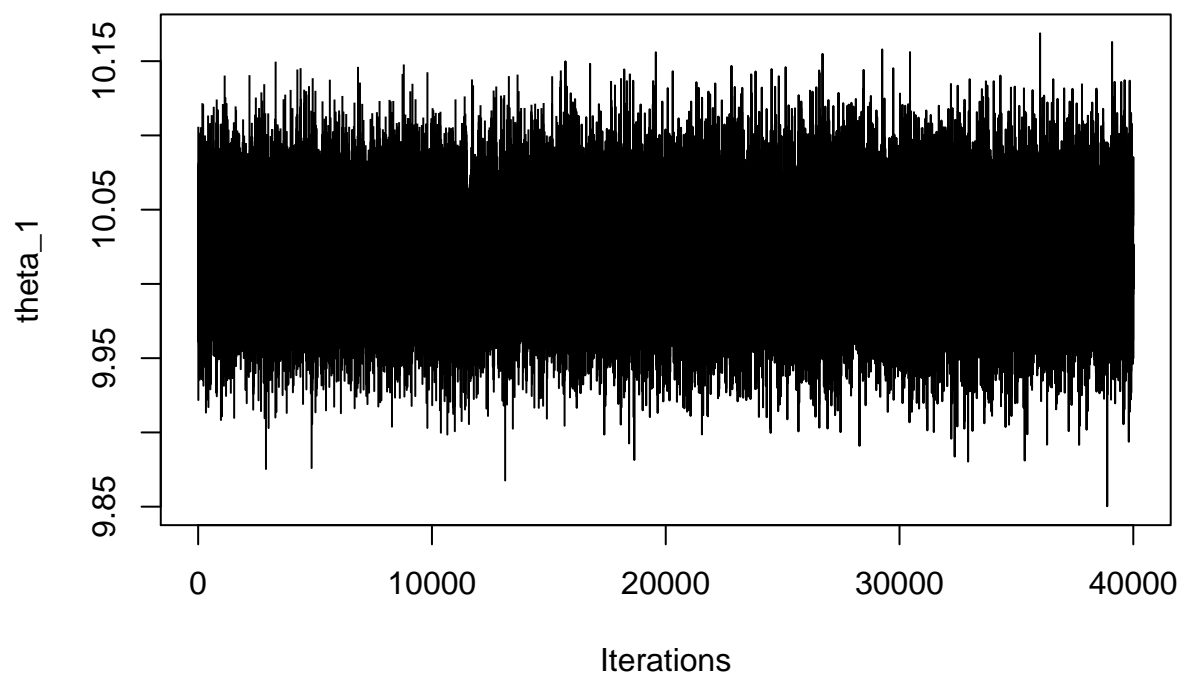
Case 3

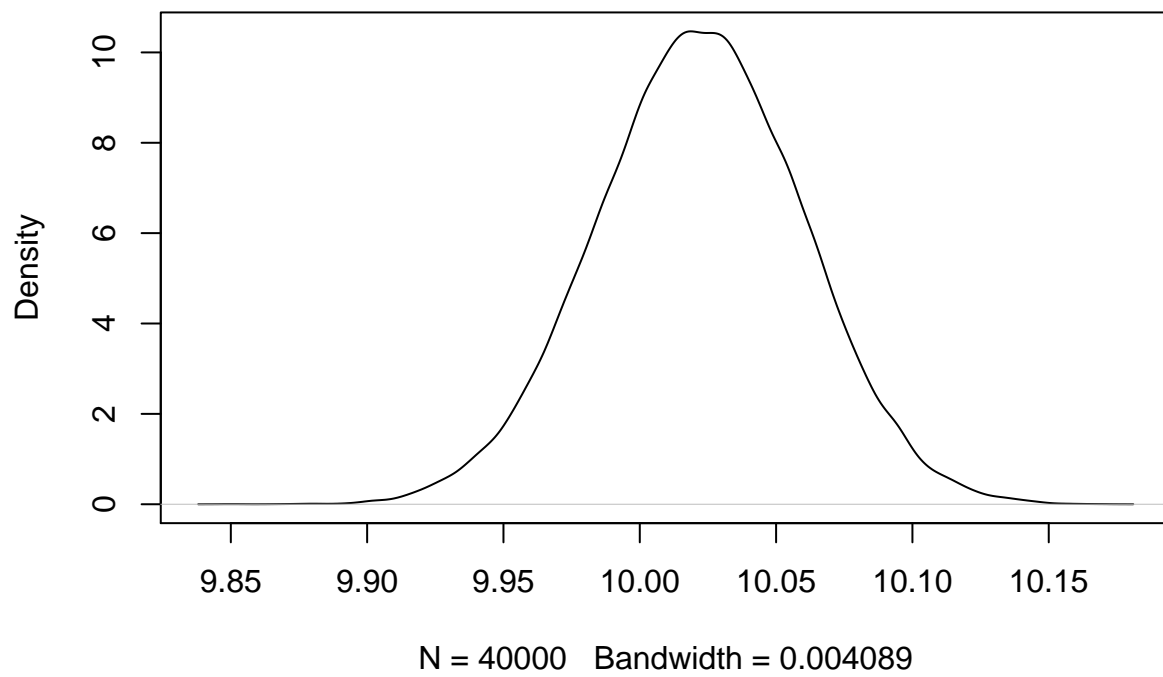
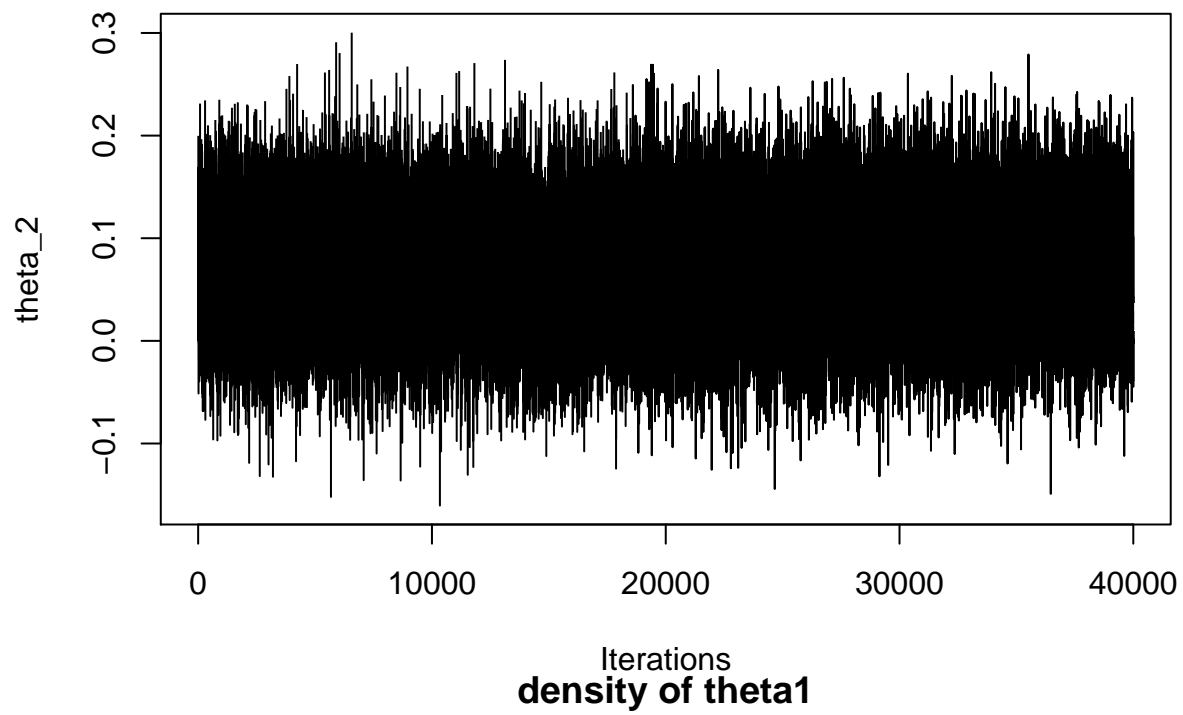
```
mcmc3=mcmc(N=1000, r=0.3, n_iter=50000, theta_ini=c(5, 5), mu=c(0,10), burnin=10000)
```

density of simulated X

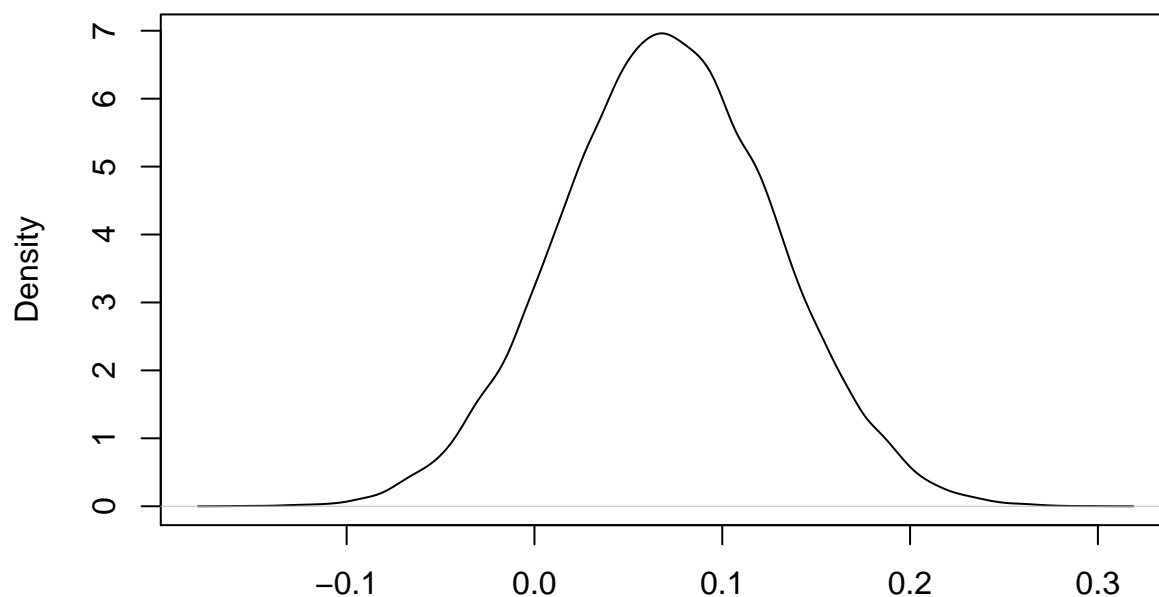


N = 1000 Bandwidth = 1.06





density of theta2



N = 40000 Bandwidth = 0.006193

```
mcmc3$ClassProbs
```

```
##      [1] 1 1 0 1 0 0 1 0 1 1 1 1 0 1 1 1 1 1 1 0 1 1 0 1 0 0 1 0 1 0 1 1 0
##     [35] 0 1 1 0 1 1 1 1 1 1 0 0 1 0 1 1 0 0 1 0 1 1 1 1 1 0 1 1 0 1 1 1 1 1
##     [69] 1 1 0 0 1 1 1 1 0 0 1 0 1 1 1 1 1 1 0 1 1 0 1 0 1 1 1 1 0 1 1 0 0 1 0 1
##    [103] 1 0 1 1 1 1 1 1 1 1 0 1 1 1 0 0 0 1 0 0 1 1 0 1 1 0 1 1 0 1 1 1 1 0 1
##    [137] 0 0 0 1 0 0 1 1 1 1 1 1 1 1 0 0 1 1 1 1 0 0 0 0 1 0 1 1 1 1 1 1 0 1 1 0
##    [171] 1 1 0 1 1 1 1 0 0 1 1 0 0 1 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 1 0 1 1 0 1
##    [205] 0 1 1 1 0 1 0 1 1 1 1 0 0 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 0
##    [239] 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 0 0 0 1 0 0 1
##    [273] 1 1 1 1 1 1 1 0 1 1 1 0 1 1 1 1 1 0 0 1 1 0 1 0 1 0 1 0 1 0 0 1 1 1 1 1 1 1
##    [307] 0 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 0 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 0
##    [341] 1 1 1 0 1 0 0 0 1 1 1 0 0 1 0 1 1 1 1 0 1 1 1 1 1 0 1 0 0 1 1 1 1 1 0 1 1 1
##    [375] 0 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 0 0 1 1 1 1 1 0 1 1 0 1 1 1 1 0 0 0 1 1 0 1
##    [409] 1 1 0 1 1 1 1 0 1 0 1 1 1 0 1 1 1 1 0 1 0 1 0 1 0 1 1 1 1 1 1 0 1 1 1 1 0 1
##    [443] 0 1 0 0 0 1 1 0 1 1 1 1 1 1 1 1 0 1 1 0 1 1 0 1 0 1 1 0 1 1 1 1 0 1 0 1 0
##    [477] 1 1 0 0 1 0 1 0 1 1 1 0 1 1 1 1 1 0 1 1 0 1 1 0 0 0 1 1 1 1 0 0 1 1 0 1 1
##    [511] 0 1 0 0 1 1 1 1 1 1 0 1 0 0 1 1 1 1 1 1 1 1 0 1 0 0 0 1 1 1 1 1 1 1 1 0 0
##    [545] 1 0 1 0 1 1 1 1 1 0 1 0 1 0 1 1 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 1 1 1 0 1
##    [579] 1 0 1 1 1 1 1 0 1 0 0 1 0 1 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 1 0 1 0 1 0 1 1
##    [613] 1 1 1 1 0 0 1 1 0 0 1 0 1 1 1 1 1 0 1 1 1 1 0 1 0 1 0 1 0 0 1 0 0 1 0 1 1
##    [647] 1 1 1 1 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 0 0 1 1 0 1 0 1 1 1 1 0 1 1
##    [681] 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 0 1 1 0 1 1 1 1 0 1 1 1 1 1 1 0 1 0 1 1 0 0
##    [715] 0 1 0 0 1 1 1 0 1 1 1 1 1 1 0 1 1 0 1 1 1 0 1 1 0 1 1 1 1 1 1 1 0 1 0 0 1
##    [749] 1 0 1 1 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 1 1 1 0
##    [783] 1 0 1 1 1 1 1 0 1 1 1 0 1 1 1 0 1 0 0 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 0 1 0
##    [817] 0 1 1 1 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 0 0 0 1 1 0 1 1 0 1 0 0 1 0 1 0 1 0 1
##    [851] 1 1 1 1 1 1 0 0 1 1 1 1 0 1 1 1 1 1 1 1 1 0 0 0 1 1 0 1 1 0 0 1 1 0 1 1 1
##    [885] 0 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 1 0 0 0 1 0 1 0 1 1 0 0 1 1
##    [919] 1 0 0 0 1 1 1 0 1 1 1 1 1 0 0 1 1 1 1 0 1 1 1 1 1 1 0 1 1 1 1 1 0 0 1 1 0
```

```
## [953] 1 0 0 0 0 1 1 1 1 1 0 1 1 1 1 0 1 1 1 1 0 1 1 0 1 1 1 1 0 1 1 1
## [987] 0 1 1 1 1 1 1 1 1 0 1 1 1 1
```

```
mcmc3$thetaMean
```

```
## [1] 10.02195050 0.07095467
```

```
mcmc3$thetaSD
```

```
## [1] 0.03782651 0.05728546
```

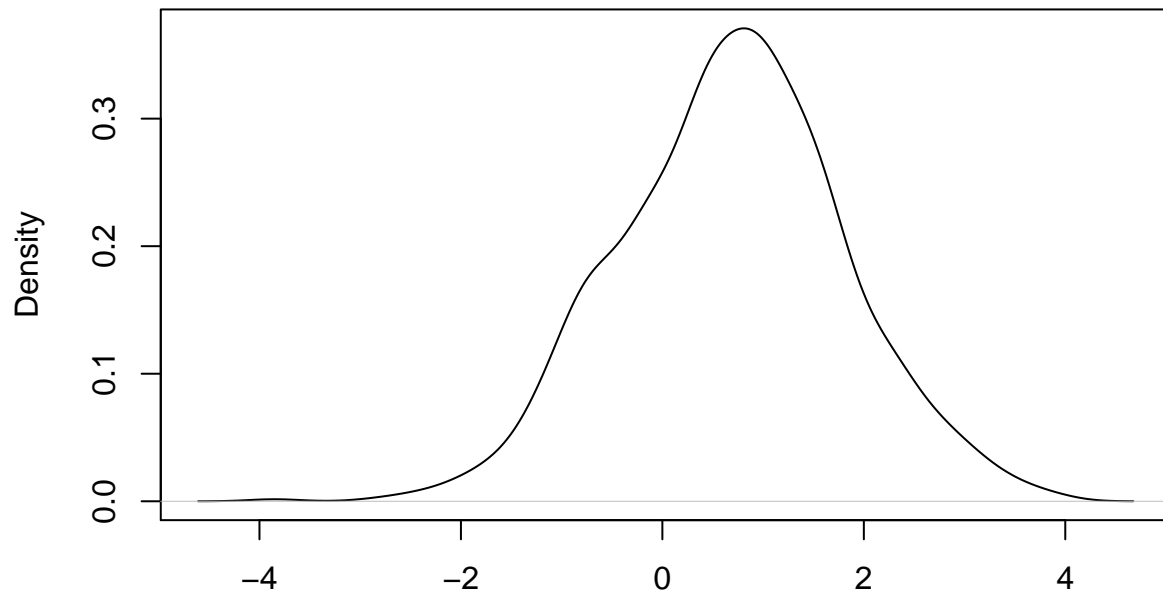
```
mcmc3$cSim
```

```
## [1] 2 2 1 2 1 1 2 1 2 2 2 1 2 2 2 2 2 2 1 2 1 2 1 1 2 1 2 1 2 2 1
## [35] 1 2 2 1 2 2 2 2 2 1 1 2 1 2 2 1 1 2 1 2 2 2 2 1 2 2 1 2 2 2 2 2
## [69] 2 2 1 1 2 2 2 1 1 2 1 2 2 2 2 2 1 2 2 1 2 2 2 2 1 2 2 1 1 2 1 2
## [103] 2 1 2 2 2 2 2 2 2 1 2 2 2 1 1 1 2 1 1 2 2 1 2 2 1 2 2 1 2 2 1 2
## [137] 1 1 1 2 1 1 2 2 2 2 2 2 2 1 1 2 2 2 2 1 1 1 2 1 2 2 2 2 1 2 2 1
## [171] 2 2 1 2 2 2 1 1 2 2 1 1 2 1 1 1 1 2 2 2 2 2 2 2 2 1 1 2 1 2 2 1 2
## [205] 1 2 2 2 1 2 1 2 2 2 1 1 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 1
## [239] 2 2 2 2 2 2 2 1 2 2 2 2 2 1 2 2 2 2 1 1 1 2 2 2 2 2 2 1 1 1 2 1 1 2
## [273] 2 2 2 2 2 2 1 2 2 2 1 2 2 2 2 1 1 2 2 1 2 1 2 1 2 1 1 2 2 2 2 2 2
## [307] 1 2 2 2 2 2 2 2 2 2 2 1 2 2 1 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1
## [341] 2 2 2 1 2 1 1 1 2 2 1 1 2 1 2 2 2 1 2 2 2 2 1 2 1 1 2 2 2 2 1 2 2 2
## [375] 1 2 2 2 2 2 2 2 2 1 2 2 2 2 1 1 2 2 2 2 1 2 2 1 2 2 2 2 1 1 1 2 2 1 2
## [409] 2 2 1 2 2 2 1 2 1 2 2 1 2 2 2 1 2 1 2 1 2 1 2 2 2 2 2 1 2 2 2 2 1 2
## [443] 1 2 1 1 1 2 2 1 2 2 2 2 2 2 2 1 2 2 1 2 1 2 1 2 2 1 2 2 2 1 2 1 2 1
## [477] 2 2 1 1 2 1 2 1 2 2 1 2 2 2 2 1 2 2 1 2 2 1 1 1 2 2 2 1 1 2 2 1 2 2
## [511] 1 2 1 1 2 2 2 2 2 1 2 1 1 2 2 2 2 2 2 1 2 1 1 1 2 2 2 2 2 2 2 1 1
## [545] 2 1 2 1 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 2 2 1 2
## [579] 2 1 2 2 2 2 1 2 1 1 2 1 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 1 2 1 2 1 2 2
## [613] 2 2 2 2 1 1 2 2 1 1 2 1 2 2 2 2 2 1 2 2 2 2 1 2 1 2 1 1 2 1 1 2 2 2
## [647] 2 2 2 2 1 2 1 2 2 2 2 2 2 2 2 2 2 1 2 2 1 1 2 2 1 2 1 2 2 2 1 2 2
## [681] 2 2 2 2 1 2 2 2 2 2 2 2 1 1 2 2 1 2 2 2 2 1 2 2 2 2 2 1 2 2 2 1 1
## [715] 1 2 1 1 2 2 2 1 2 2 2 2 2 2 1 2 2 1 2 2 1 2 2 1 2 2 2 2 2 1 2 1 1 2
## [749] 2 1 2 2 2 2 2 2 2 2 1 1 2 2 2 2 1 1 1 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 1
## [783] 2 1 2 2 2 2 1 2 2 2 1 2 2 2 1 2 1 1 2 2 1 2 2 2 2 2 2 2 2 2 2 1 2 1
## [817] 1 2 2 2 2 2 2 1 2 2 2 2 2 1 2 2 2 1 1 1 2 2 1 2 2 1 2 1 1 2 1 2 1 2
## [851] 2 2 2 2 2 1 1 2 2 2 2 1 2 2 2 2 2 2 2 1 1 1 2 2 1 2 2 1 1 2 2 1 2 2
## [885] 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 1 2 1 1 1 2 1 2 1 2 2 1 1 2 2
## [919] 2 1 1 1 2 2 1 2 2 2 2 2 1 1 2 2 2 1 2 2 2 2 2 1 2 2 2 2 2 1 1 2 2 1
## [953] 2 1 1 1 1 2 2 2 2 2 1 2 2 2 2 1 2 2 2 2 2 1 2 2 2 2 2 2 2 1 2 2 2
## [987] 1 2 2 2 2 2 2 2 2 1 2 2 2 2
```

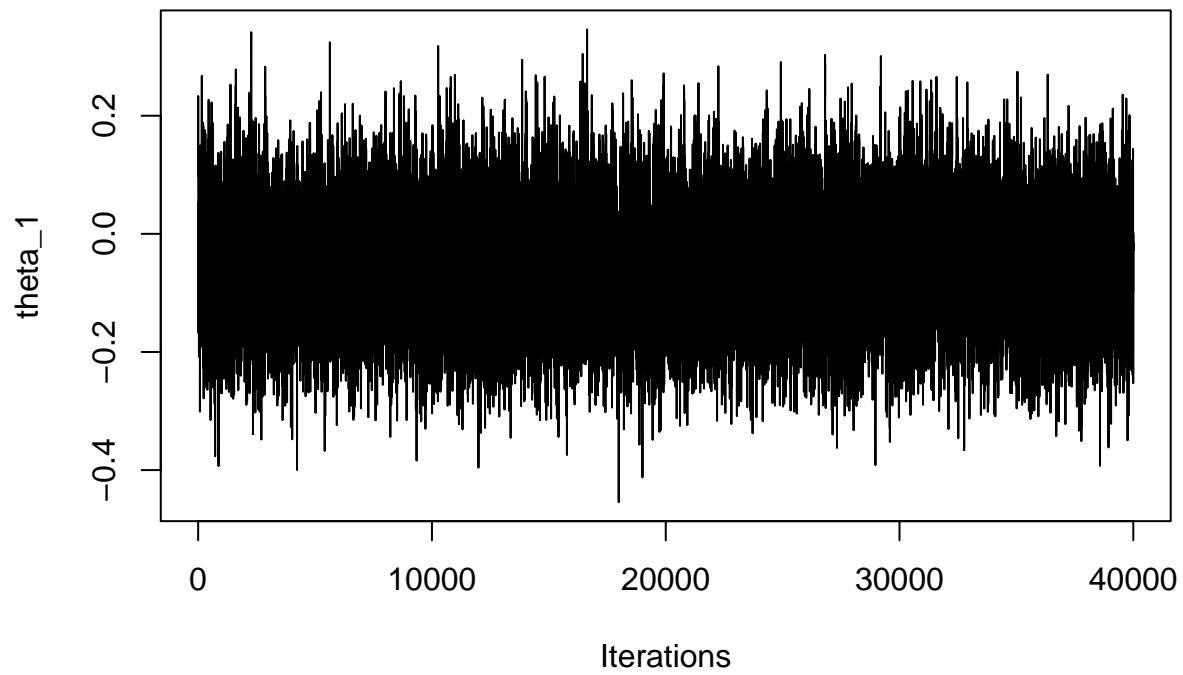
Case 4

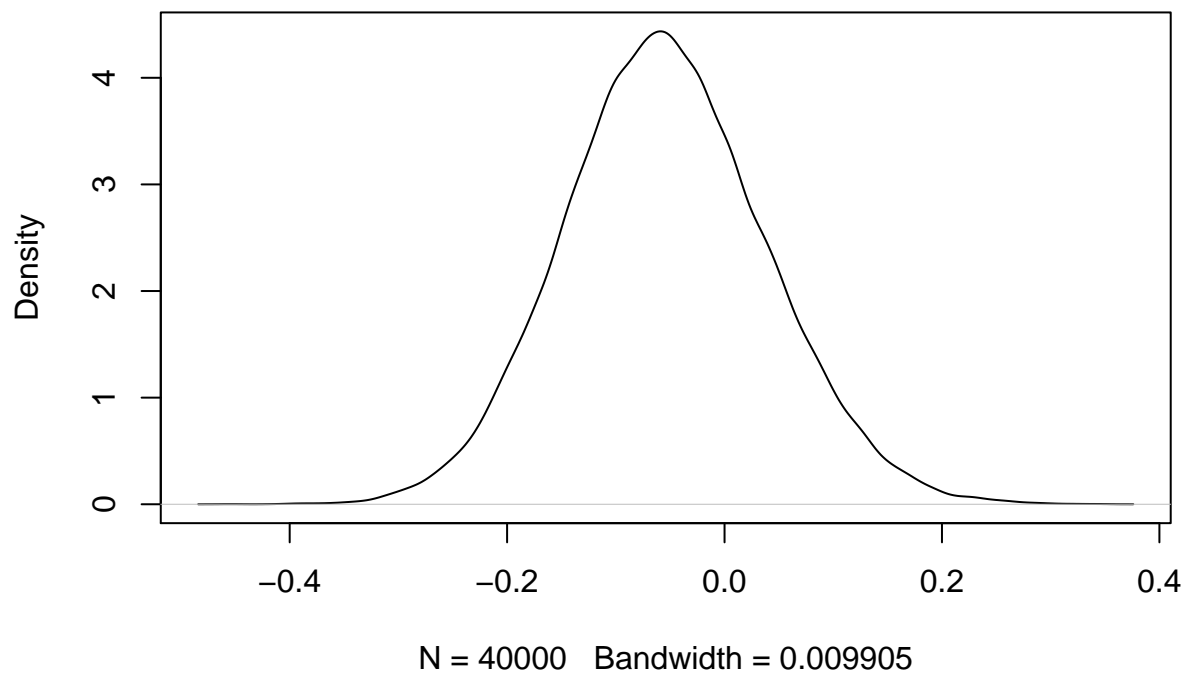
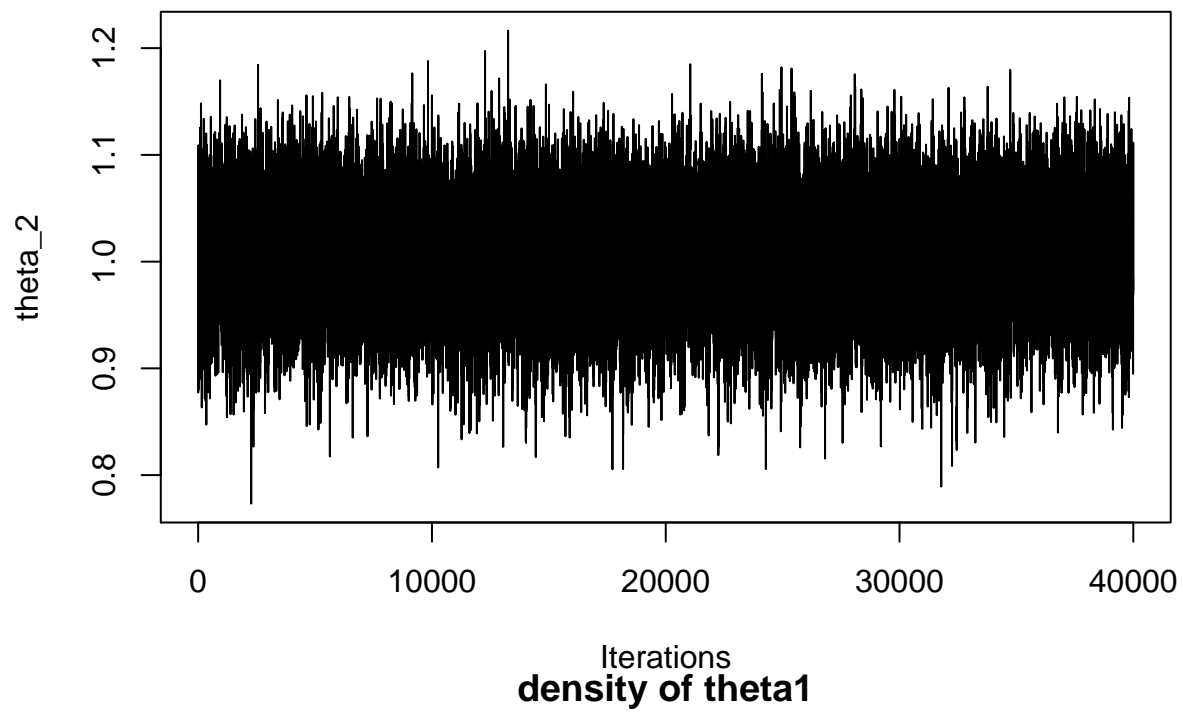
```
mcmc4=mcmc(N=1000, r=0.3, n_iter=50000, theta_ini=c(0.5, 0.5), mu=c(0,1), burnin=10000)
```

density of simulated X

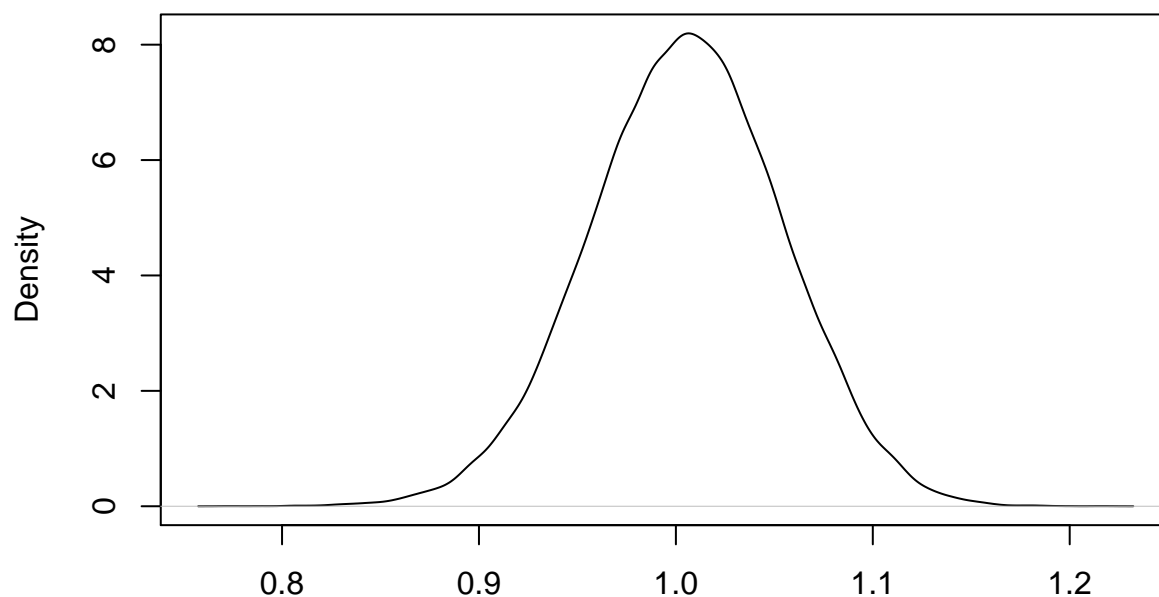


N = 1000 Bandwidth = 0.2527





density of theta2



N = 40000 Bandwidth = 0.005309

mcmc4\$ClassProbs

```
##      [1] 0.322500 0.285375 0.521700 0.199825 0.180275 0.339900 0.606450
##      [8] 0.341950 0.334250 0.579500 0.292875 0.152800 0.153450 0.243300
##     [15] 0.373775 0.068250 0.086225 0.310700 0.125875 0.277300 0.357500
##     [22] 0.634950 0.303200 0.532100 0.089825 0.135100 0.440425 0.446850
##     [29] 0.556800 0.130500 0.358050 0.054825 0.338400 0.123325 0.187275
##     [36] 0.119100 0.619200 0.494025 0.201950 0.218700 0.219325 0.858700
##     [43] 0.340125 0.104750 0.239425 0.103200 0.543325 0.596600 0.564175
##     [50] 0.263325 0.169900 0.328675 0.065800 0.372425 0.376100 0.467900
##     [57] 0.146475 0.090450 0.190625 0.858350 0.738925 0.453625 0.021050
##     [64] 0.250525 0.786625 0.264325 0.428600 0.589875 0.120675 0.130050
##     [71] 0.028325 0.227525 0.365800 0.271275 0.414375 0.506925 0.326675
##     [78] 0.025075 0.248400 0.245275 0.199875 0.128000 0.104850 0.104275
##     [85] 0.343275 0.157450 0.229925 0.052225 0.660875 0.087625 0.243375
##     [92] 0.643200 0.377775 0.700500 0.508775 0.185425 0.214725 0.306950
##     [99] 0.102850 0.315625 0.076150 0.214925 0.087775 0.187250 0.453475
##    [106] 0.207750 0.136200 0.421225 0.365375 0.602225 0.205300 0.040375
##    [113] 0.274575 0.020500 0.254050 0.115650 0.092250 0.394500 0.242125
##    [120] 0.682275 0.464300 0.457050 0.455450 0.256450 0.404775 0.236075
##    [127] 0.725925 0.608475 0.567150 0.531125 0.507200 0.125600 0.279150
##    [134] 0.190525 0.101575 0.124750 0.101225 0.402525 0.281150 0.500250
##    [141] 0.260375 0.297125 0.445500 0.470300 0.070850 0.213225 0.485050
##    [148] 0.275025 0.122850 0.229025 0.120750 0.174050 0.127775 0.273925
##    [155] 0.569200 0.431750 0.163525 0.026550 0.621550 0.268250 0.319075
##    [162] 0.136450 0.635750 0.343225 0.190450 0.597525 0.161425 0.168800
##    [169] 0.234625 0.198475 0.216725 0.633725 0.212225 0.202425 0.094750
##    [176] 0.318275 0.056800 0.625950 0.369375 0.089925 0.343250 0.201550
##    [183] 0.308700 0.081975 0.614975 0.137300 0.425350 0.208250 0.225175
##    [190] 0.536925 0.380425 0.309700 0.229550 0.274650 0.121825 0.405175
```

```

## [197] 0.171600 0.440925 0.214950 0.058225 0.144650 0.591725 0.170075
## [204] 0.189325 0.247900 0.846675 0.114100 0.265600 0.220900 0.124850
## [211] 0.188825 0.339600 0.451175 0.075525 0.172975 0.198175 0.129500
## [218] 0.723475 0.147025 0.313175 0.406350 0.412525 0.209350 0.235525
## [225] 0.228125 0.030225 0.053375 0.127375 0.579175 0.199700 0.154900
## [232] 0.171850 0.417875 0.140150 0.694075 0.177875 0.042350 0.231425
## [239] 0.067425 0.353000 0.255200 0.298225 0.051425 0.152675 0.116475
## [246] 0.330525 0.492625 0.437925 0.261925 0.247225 0.406200 0.313400
## [253] 0.246475 0.107625 0.199000 0.265150 0.472475 0.158250 0.184725
## [260] 0.597650 0.060925 0.260150 0.398775 0.185825 0.038875 0.282425
## [267] 0.042500 0.705250 0.235925 0.168575 0.222325 0.120450 0.447700
## [274] 0.226900 0.028450 0.363125 0.056825 0.234825 0.829350 0.267325
## [281] 0.209050 0.171250 0.478150 0.217775 0.137850 0.148975 0.192375
## [288] 0.119625 0.175500 0.702025 0.333675 0.472425 0.111425 0.493300
## [295] 0.186250 0.460500 0.346575 0.219475 0.203400 0.404850 0.073450
## [302] 0.162150 0.521900 0.297500 0.741600 0.172600 0.640300 0.787300
## [309] 0.623600 0.345450 0.108850 0.527225 0.359625 0.352325 0.408500
## [316] 0.134525 0.269775 0.058550 0.255625 0.245100 0.129875 0.030525
## [323] 0.063850 0.106000 0.576550 0.342400 0.078500 0.318400 0.298450
## [330] 0.169825 0.272050 0.204250 0.100350 0.928175 0.556825 0.125625
## [337] 0.568975 0.635750 0.200750 0.060525 0.152850 0.318200 0.044875
## [344] 0.205175 0.718025 0.181750 0.255225 0.493175 0.264450 0.274200
## [351] 0.088575 0.244325 0.438650 0.012875 0.091650 0.891775 0.357100
## [358] 0.782525 0.487600 0.122000 0.438875 0.139250 0.111775 0.049050
## [365] 0.125975 0.660575 0.695150 0.527175 0.050900 0.146550 0.327625
## [372] 0.124775 0.229175 0.234300 0.187150 0.319750 0.186800 0.637375
## [379] 0.497850 0.242075 0.200700 0.044375 0.477625 0.658400 0.370425
## [386] 0.167325 0.219200 0.061200 0.507475 0.140525 0.306550 0.133825
## [393] 0.095175 0.692825 0.722275 0.116825 0.217975 0.644375 0.663300
## [400] 0.096800 0.189475 0.231475 0.579075 0.157175 0.036000 0.230225
## [407] 0.053275 0.625800 0.136125 0.353525 0.156550 0.360200 0.547600
## [414] 0.411800 0.407875 0.500500 0.588550 0.601150 0.372750 0.264650
## [421] 0.574825 0.042950 0.063325 0.019425 0.569350 0.313525 0.257350
## [428] 0.075100 0.251750 0.096550 0.153925 0.308900 0.589350 0.076800
## [435] 0.132925 0.428425 0.063975 0.102950 0.085375 0.909700 0.268275
## [442] 0.021075 0.262225 0.858575 0.156025 0.441125 0.179375 0.089400
## [449] 0.122025 0.794250 0.028875 0.599525 0.807775 0.272800 0.088625
## [456] 0.190025 0.675200 0.540150 0.657925 0.324275 0.125650 0.150800
## [463] 0.040475 0.074850 0.189650 0.089250 0.260375 0.069050 0.199450
## [470] 0.124050 0.097150 0.054925 0.173700 0.579225 0.406175 0.155250
## [477] 0.132300 0.236950 0.102825 0.188775 0.194525 0.425025 0.162275
## [484] 0.479350 0.063250 0.255550 0.196750 0.144150 0.123600 0.667750
## [491] 0.111475 0.181775 0.231125 0.581450 0.122325 0.288225 0.462725
## [498] 0.203725 0.263650 0.350275 0.157575 0.694900 0.233075 0.266350
## [505] 0.645000 0.138000 0.596025 0.476125 0.322450 0.175425 0.340825
## [512] 0.212650 0.439325 0.038175 0.421075 0.236525 0.385925 0.746775
## [519] 0.053875 0.107475 0.291000 0.101900 0.012475 0.256300 0.756450
## [526] 0.037125 0.124650 0.145525 0.332400 0.130550 0.165975 0.766650
## [533] 0.208750 0.322525 0.420375 0.605400 0.132200 0.497375 0.075450
## [540] 0.101325 0.326950 0.290325 0.216925 0.603775 0.557125 0.293150
## [547] 0.437275 0.122975 0.627450 0.553700 0.184000 0.149300 0.140875
## [554] 0.328100 0.311225 0.204775 0.339675 0.340600 0.101550 0.170025
## [561] 0.208350 0.171075 0.290050 0.668425 0.762100 0.175050 0.094500
## [568] 0.365550 0.494175 0.079325 0.044775 0.302925 0.873625 0.300350

```

##	[575]	0.127625	0.042125	0.066475	0.231150	0.456325	0.282225	0.699025
##	[582]	0.207350	0.511250	0.306025	0.303375	0.305400	0.100675	0.102375
##	[589]	0.064550	0.467850	0.725375	0.100400	0.028575	0.490250	0.134675
##	[596]	0.314675	0.159275	0.775500	0.234500	0.620675	0.056300	0.450175
##	[603]	0.170300	0.084575	0.082675	0.428775	0.325575	0.037925	0.066575
##	[610]	0.017175	0.109150	0.197850	0.220575	0.126150	0.116125	0.062975
##	[617]	0.598675	0.823950	0.232175	0.218200	0.385600	0.242200	0.291900
##	[624]	0.022025	0.305475	0.172025	0.431425	0.430900	0.652700	0.239725
##	[631]	0.597125	0.078425	0.251675	0.667100	0.127950	0.093350	0.308425
##	[638]	0.152200	0.113500	0.509500	0.078825	0.223925	0.068750	0.472500
##	[645]	0.307375	0.052825	0.208600	0.195875	0.152700	0.480875	0.704725
##	[652]	0.569475	0.724025	0.516500	0.275025	0.099150	0.234200	0.759400
##	[659]	0.274800	0.190000	0.060250	0.343150	0.276025	0.199675	0.257900
##	[666]	0.201850	0.600600	0.391725	0.438075	0.339825	0.061350	0.650350
##	[673]	0.148750	0.277125	0.066700	0.125800	0.119975	0.174150	0.031325
##	[680]	0.456600	0.825500	0.349650	0.172325	0.718750	0.368050	0.159350
##	[687]	0.446400	0.106750	0.041675	0.183850	0.454150	0.369825	0.453750
##	[694]	0.323275	0.185575	0.147425	0.307675	0.081000	0.570425	0.283625
##	[701]	0.734075	0.517750	0.332775	0.689325	0.143200	0.272675	0.025575
##	[708]	0.658275	0.358475	0.138250	0.103150	0.077825	0.302000	0.539425
##	[715]	0.641325	0.549450	0.281725	0.029825	0.571750	0.272625	0.362600
##	[722]	0.653550	0.147050	0.195300	0.539950	0.653750	0.208800	0.402975
##	[729]	0.199025	0.457725	0.034250	0.058950	0.111575	0.281225	0.102100
##	[736]	0.152275	0.303925	0.168425	0.454575	0.256525	0.231050	0.829225
##	[743]	0.370675	0.382000	0.735700	0.729600	0.157850	0.148125	0.693575
##	[750]	0.128775	0.896475	0.302800	0.126175	0.084650	0.832700	0.067600
##	[757]	0.106750	0.369200	0.308125	0.062050	0.273950	0.026575	0.020450
##	[764]	0.122825	0.195575	0.083800	0.130525	0.060775	0.056000	0.245675
##	[771]	0.139400	0.801750	0.477625	0.131250	0.182850	0.582175	0.167975
##	[778]	0.109375	0.199350	0.065400	0.158425	0.616150	0.470675	0.233650
##	[785]	0.156675	0.128700	0.694025	0.681000	0.800825	0.263725	0.068075
##	[792]	0.038125	0.309675	0.433450	0.538075	0.444450	0.206300	0.321850
##	[799]	0.718250	0.206800	0.040700	0.052675	0.297400	0.792900	0.046050
##	[806]	0.571650	0.324675	0.429325	0.129175	0.540050	0.210900	0.224350
##	[813]	0.194725	0.272900	0.105650	0.502725	0.270500	0.112125	0.129125
##	[820]	0.088175	0.430800	0.078925	0.592200	0.209525	0.179900	0.423450
##	[827]	0.135600	0.204100	0.624600	0.120450	0.288325	0.521400	0.315525
##	[834]	0.179900	0.429825	0.600975	0.647800	0.062125	0.147575	0.066275
##	[841]	0.451000	0.034250	0.115850	0.362625	0.312600	0.126500	0.272975
##	[848]	0.080775	0.582125	0.395125	0.258075	0.577750	0.292375	0.093900
##	[855]	0.226200	0.288675	0.109325	0.329875	0.972075	0.176925	0.166450
##	[862]	0.094575	0.351900	0.041275	0.284225	0.148200	0.362375	0.179750
##	[869]	0.088050	0.414550	0.058600	0.368225	0.567825	0.599650	0.197875
##	[876]	0.081750	0.092200	0.368350	0.632575	0.641475	0.716600	0.604950
##	[883]	0.369075	0.306625	0.560625	0.379725	0.148100	0.392550	0.157500
##	[890]	0.437275	0.035250	0.302750	0.240125	0.656375	0.241825	0.057775
##	[897]	0.515425	0.232825	0.050400	0.639975	0.470525	0.076125	0.184700
##	[904]	0.558675	0.296700	0.402700	0.390600	0.306650	0.709750	0.157650
##	[911]	0.212450	0.565450	0.280200	0.014600	0.094925	0.476650	0.062875
##	[918]	0.105025	0.110850	0.419075	0.137800	0.229775	0.615175	0.273675
##	[925]	0.616650	0.450800	0.140925	0.063875	0.465775	0.223475	0.357900
##	[932]	0.203875	0.650700	0.467500	0.049350	0.313850	0.216625	0.024375
##	[939]	0.048125	0.491125	0.198850	0.135675	0.178175	0.161950	0.316600
##	[946]	0.290550	0.392925	0.113250	0.030500	0.256300	0.160775	0.633400

```
## [953] 0.620300 0.343725 0.294750 0.211775 0.444925 0.541725 0.493100
## [960] 0.230925 0.300700 0.561625 0.302100 0.323600 0.186775 0.188525
## [967] 0.435975 0.016875 0.128800 0.495725 0.153900 0.293950 0.211550
## [974] 0.712900 0.136275 0.042825 0.095250 0.337925 0.361800 0.159800
## [981] 0.037850 0.338725 0.771800 0.275250 0.238150 0.344650 0.487700
## [988] 0.106000 0.222175 0.331100 0.169750 0.026550 0.510675 0.084400
## [995] 0.224775 0.208100 0.434225 0.699400 0.168825 0.195075
```

```
mcmc4$thetaMean
```

```
## [1] -0.05443058 1.00519192
```

```
mcmc4$thetaSD
```

```
## [1] 0.09273937 0.04911460
```

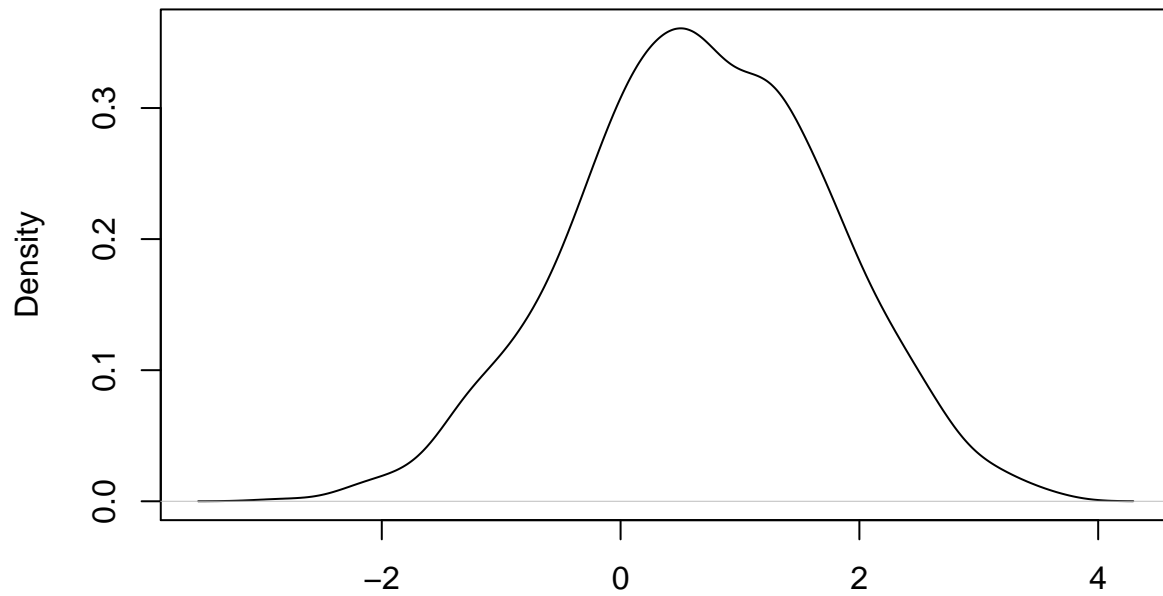
```
mcmc4$cSim
```

```
## [1] 2 2 2 1 2 2 1 1 2 1 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 1 2 1 2
## [35] 2 2 2 1 2 2 2 1 2 2 2 1 2 1 2 2 2 2 2 2 2 2 1 2 1 1 1 1 1 2 1
## [69] 2 2 2 2 2 1 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 1 1 2 2 1 2 2 2 1
## [103] 2 2 2 2 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2 2 2 2 2 2
## [137] 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 1 2 1 2
## [171] 1 1 1 2 2 2 2 1 2 2 1 1 2 2 1 2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 2
## [205] 2 1 2 1 2 2 1 2 2 1 2 2 1 1 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2 2 1 2 2 2
## [239] 2 2 1 2 2 2 2 1 1 1 2 2 1 2 1 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 1 2
## [273] 1 2 2 1 2 1 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 1 2 2 2 2 1 2 2
## [307] 1 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 1 2 1 2 2 2 1 1 2 2 2 2
## [341] 2 2 2 2 1 2 1 2 2 1 2 2 2 2 1 1 1 1 1 2 2 2 2 2 2 2 2 1 2 2 2 1 2 2 2
## [375] 1 2 2 1 2 2 2 2 2 1 1 1 2 2 1 2 1 2 2 1 1 1 2 1 1 2 1 2 1 2 2 2 2 1
## [409] 1 1 2 1 1 1 2 1 1 1 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 1 1 2
## [443] 2 1 1 2 1 1 1 2 2 1 2 1 2 1 1 1 1 1 1 2 2 2 1 2 1 2 2 2 2 2 2 2 2 2
## [477] 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 1 2 1 2 1 1 2 2 2 2 1 2 2 1
## [511] 1 2 2 2 1 2 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 1 2 1
## [545] 1 1 2 2 2 1 2 2 2 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 1 1 2 2 1 1 2 2 2 2 2
## [579] 2 2 1 2 1 2 1 2 2 2 2 1 1 2 2 1 2 2 1 1 2 2 1 1 1 2 2 1 1 2 2 2 1 2 2
## [613] 2 2 2 2 1 1 1 2 1 2 2 2 2 2 1 1 2 2 1 2 2 1 1 2 1 2 2 1 2 2 2 2 2 2
## [647] 2 2 2 2 1 1 1 2 2 2 2 1 2 2 2 2 2 2 2 2 1 2 1 2 1 1 2 2 2 2 2 1 2 1
## [681] 1 1 2 1 2 2 2 1 2 2 2 1 2 2 2 2 2 2 2 2 1 2 1 1 2 1 1 2 2 2 2 2 2 2 2
## [715] 1 2 2 2 2 2 2 1 2 2 1 1 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 1 2 2 1 1 2 2
## [749] 1 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 1 1 1 2 1 2 2 2 2 2 1
## [783] 1 2 2 2 2 2 2 1 2 2 2 1 1 1 1 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 1 2 1 2 2
## [817] 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 1 2 2 1 2 2 2 2 2 2 1 1 2 1 1
## [851] 2 1 1 2 2 2 2 2 1 1 2 2 2 1 2 2 2 2 2 2 2 2 1 2 1 2 1 2 2 2 2 1 2 1 2 2 2
## [885] 1 2 2 1 1 2 2 1 1 1 2 2 2 2 2 2 2 1 2 1 2 1 2 1 1 2 1 2 2 2 2 2 2 2 2
## [919] 2 2 2 1 1 1 2 2 1 2 2 2 2 2 2 1 2 2 1 1 2 2 2 2 2 2 2 2 1 2 2 2 2 2 1
## [953] 1 1 2 1 2 2 1 2 2 2 2 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2
## [987] 2 2 2 2 2 2 2 1 1 2 1 2 1 2 2
```

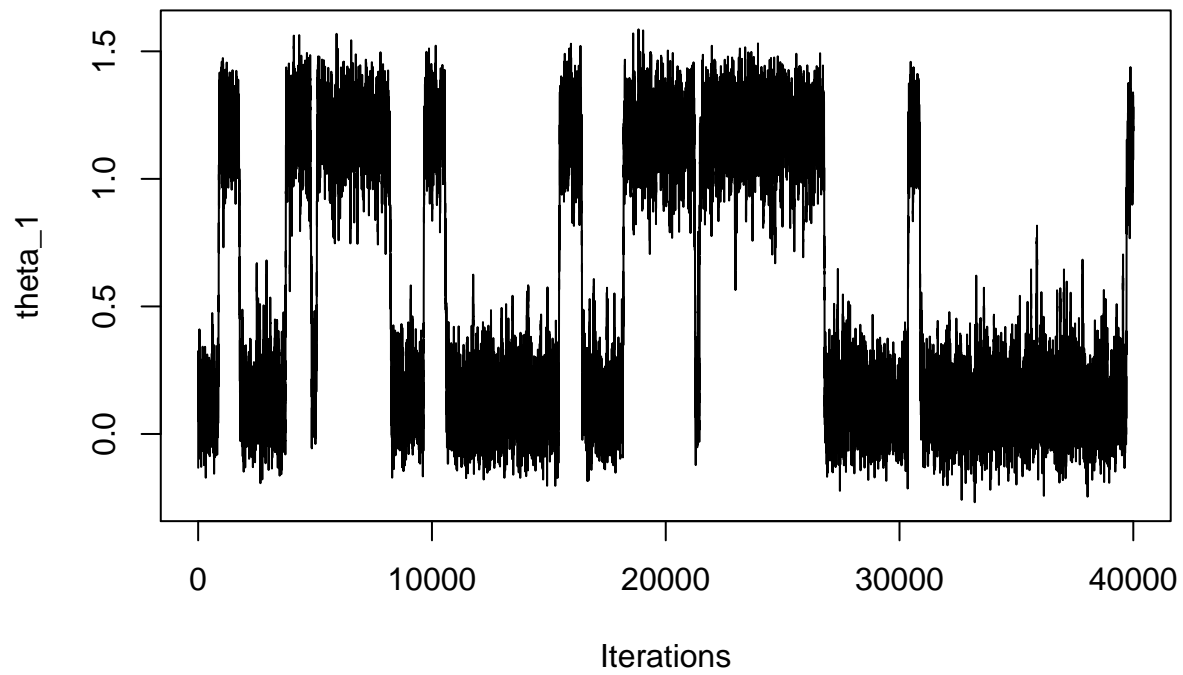
Case 5

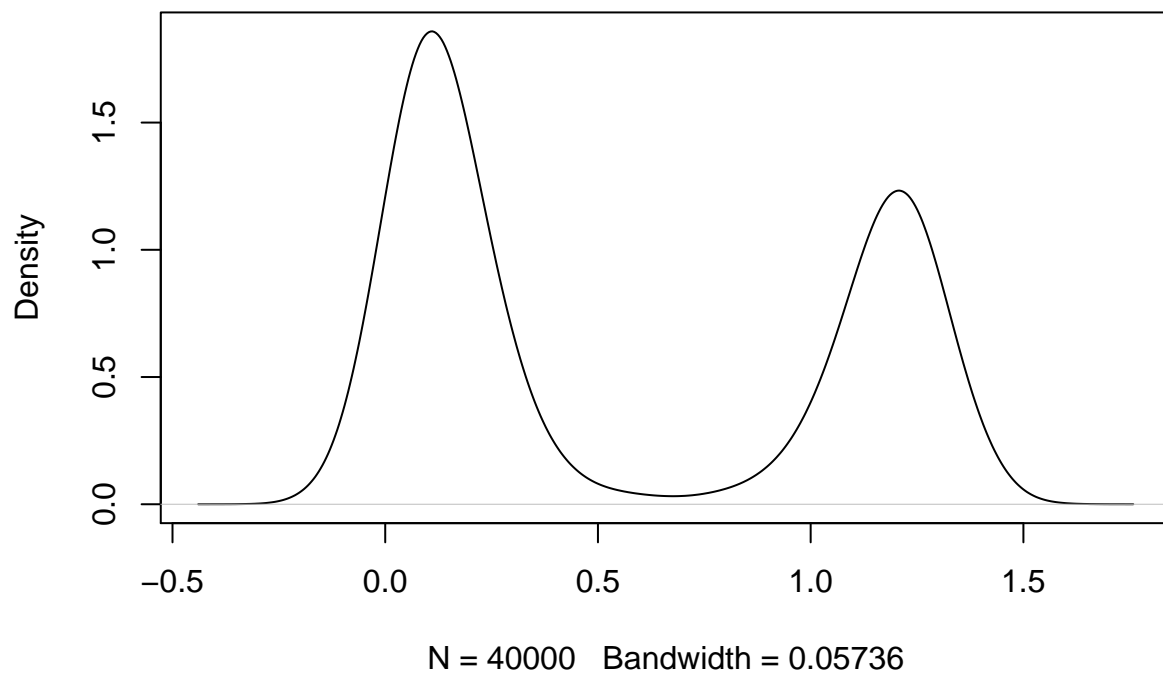
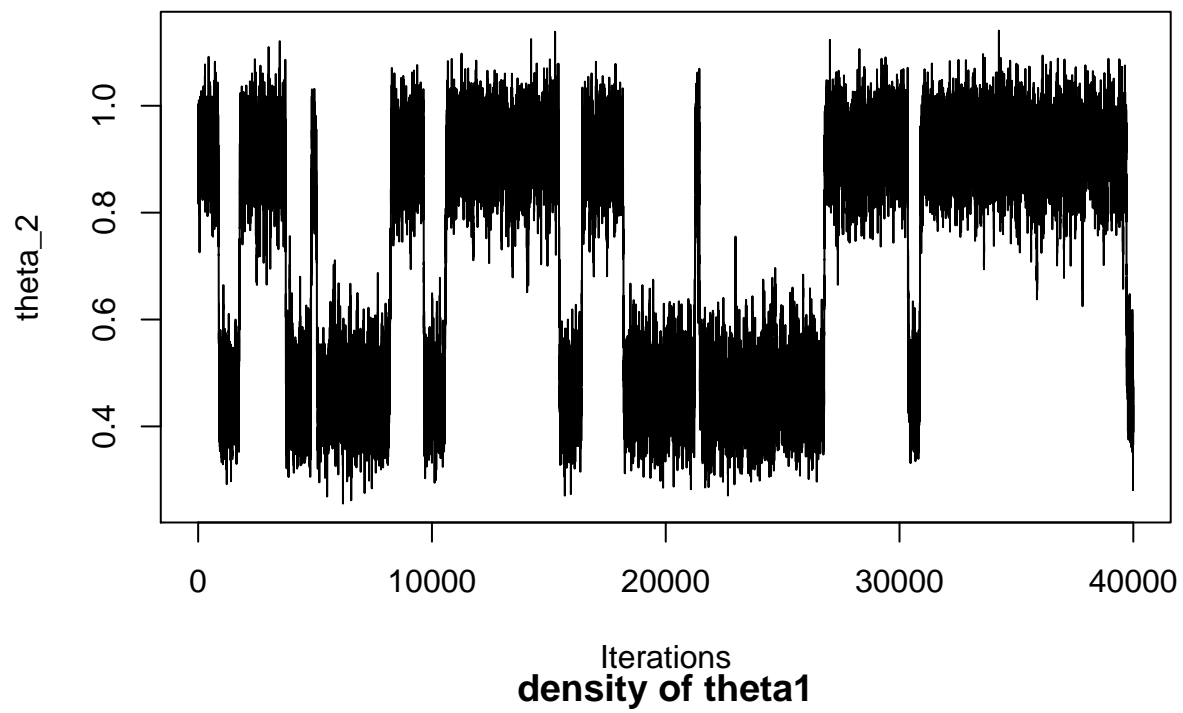
```
mcmc5=mcmc(N=1000, r=0.3, n_iter=50000, theta_ini=c(0.5, 1.5), mu=c(0,1), burnin=10000)
```

density of simulated X

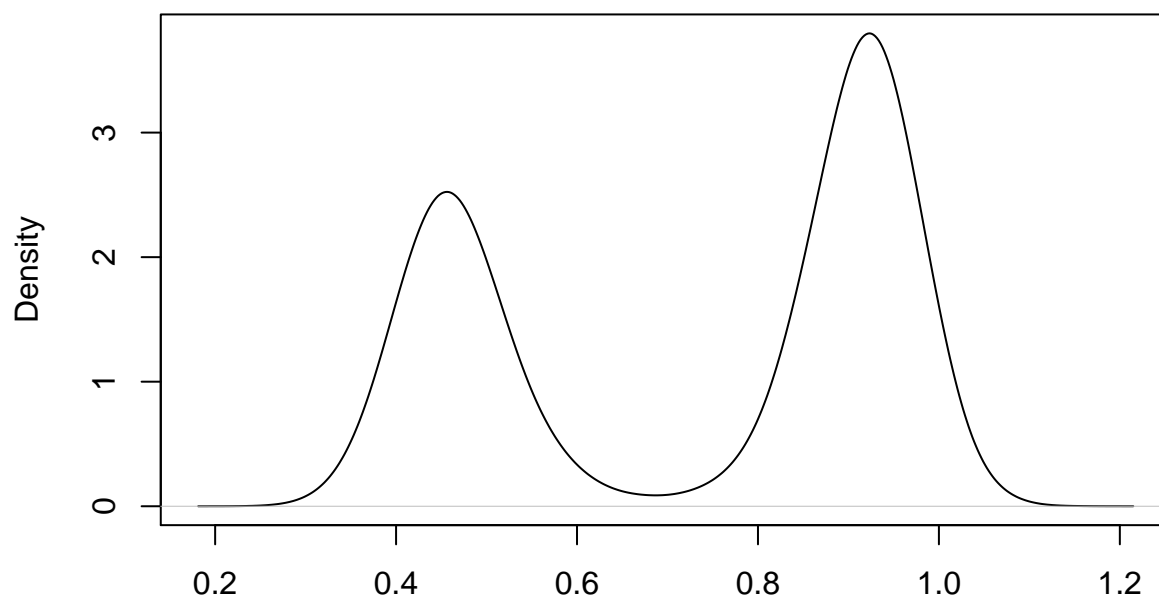


N = 1000 Bandwidth = 0.2406





density of theta2



N = 40000 Bandwidth = 0.02479

mcmc5\$ClassProbs

```
##      [1] 0.430350 0.264125 0.273075 0.278150 0.293725 0.307000 0.359500
##      [8] 0.272225 0.281075 0.332475 0.269650 0.305875 0.371850 0.268125
##     [15] 0.278900 0.279350 0.386450 0.269400 0.263000 0.268175 0.265625
##     [22] 0.304675 0.325625 0.347200 0.294175 0.272275 0.275450 0.276650
##     [29] 0.266550 0.267750 0.261200 0.277875 0.384425 0.264625 0.321900
##     [36] 0.303175 0.266225 0.289650 0.266650 0.283650 0.360525 0.295200
##     [43] 0.369625 0.374850 0.339950 0.377775 0.469300 0.322625 0.263350
##     [50] 0.327175 0.346525 0.287850 0.274125 0.275225 0.409625 0.267550
##     [57] 0.295675 0.304175 0.266575 0.268050 0.427875 0.269175 0.278725
##     [64] 0.270525 0.299775 0.272650 0.467975 0.264800 0.280325 0.282975
##     [71] 0.265275 0.268150 0.345375 0.276425 0.270900 0.277250 0.270950
##     [78] 0.267425 0.321100 0.262400 0.372600 0.303675 0.321375 0.265675
##     [85] 0.286875 0.278825 0.271500 0.263200 0.265400 0.269850 0.276150
##     [92] 0.264850 0.264875 0.282275 0.315700 0.275675 0.269200 0.266550
##     [99] 0.290850 0.264775 0.268400 0.284600 0.298775 0.296050 0.311200
##    [106] 0.336875 0.263525 0.281875 0.292800 0.316300 0.270125 0.275225
##    [113] 0.276900 0.344775 0.274125 0.283050 0.351550 0.333825 0.319975
##    [120] 0.264200 0.278725 0.309325 0.281075 0.307300 0.391275 0.275525
##    [127] 0.265850 0.283525 0.314850 0.266325 0.481125 0.265850 0.298400
##    [134] 0.303875 0.283475 0.262750 0.291450 0.265325 0.456650 0.268150
##    [141] 0.261175 0.276375 0.264500 0.265925 0.368075 0.277725 0.277600
##    [148] 0.277375 0.427175 0.275875 0.267575 0.270900 0.273925 0.356750
##    [155] 0.272375 0.297025 0.266350 0.264400 0.316525 0.265425 0.276975
##    [162] 0.284250 0.266825 0.266875 0.311700 0.282075 0.292550 0.313000
##    [169] 0.265400 0.411425 0.292925 0.275025 0.311150 0.267775 0.345350
##    [176] 0.290100 0.287725 0.308600 0.283500 0.407900 0.267700 0.269325
##    [183] 0.268650 0.292025 0.272500 0.410600 0.294250 0.342275 0.294925
##    [190] 0.282675 0.270150 0.269100 0.301150 0.263550 0.290000 0.286375
```

```

## [197] 0.367825 0.425175 0.277350 0.318825 0.265600 0.280925 0.322700
## [204] 0.280650 0.261675 0.301300 0.272625 0.293325 0.285425 0.294225
## [211] 0.264400 0.344375 0.302800 0.293225 0.265450 0.317550 0.266425
## [218] 0.267125 0.266650 0.443850 0.265275 0.296225 0.264100 0.282275
## [225] 0.272600 0.265900 0.326125 0.329650 0.266750 0.279500 0.267475
## [232] 0.283350 0.270325 0.287300 0.393450 0.267775 0.274900 0.271300
## [239] 0.341125 0.456475 0.322700 0.385175 0.308550 0.284175 0.268075
## [246] 0.284050 0.303750 0.267875 0.393650 0.302675 0.272925 0.477250
## [253] 0.268050 0.279825 0.274225 0.275300 0.268250 0.268175 0.264825
## [260] 0.286025 0.331875 0.282450 0.285450 0.273775 0.264500 0.270950
## [267] 0.344475 0.321925 0.285500 0.325575 0.276200 0.271400 0.412850
## [274] 0.280075 0.267925 0.286350 0.363575 0.278200 0.271950 0.277500
## [281] 0.267475 0.272550 0.297025 0.331850 0.264250 0.403125 0.301750
## [288] 0.266600 0.266225 0.274050 0.382650 0.297550 0.288100 0.266350
## [295] 0.273275 0.265425 0.284950 0.306000 0.276750 0.415100 0.309300
## [302] 0.350875 0.269250 0.310075 0.315550 0.260325 0.273000 0.308675
## [309] 0.289925 0.265475 0.358975 0.286150 0.322425 0.266125 0.331600
## [316] 0.266300 0.287550 0.342700 0.402800 0.291325 0.286750 0.284575
## [323] 0.269875 0.311250 0.265700 0.328525 0.311000 0.265775 0.268475
## [330] 0.309600 0.352600 0.281625 0.328175 0.306075 0.298900 0.274775
## [337] 0.355975 0.272175 0.292550 0.267225 0.264550 0.267900 0.269375
## [344] 0.417125 0.306425 0.266350 0.269625 0.269900 0.265950 0.286075
## [351] 0.263375 0.373750 0.268950 0.278225 0.268525 0.270300 0.321725
## [358] 0.271075 0.264950 0.267400 0.269125 0.263375 0.324325 0.267050
## [365] 0.297150 0.266100 0.411750 0.275975 0.307100 0.265125 0.267400
## [372] 0.310025 0.273875 0.263300 0.378175 0.278750 0.274800 0.271250
## [379] 0.275100 0.275100 0.314250 0.265425 0.334975 0.300675 0.275700
## [386] 0.363225 0.313475 0.263475 0.264575 0.265750 0.278875 0.261350
## [393] 0.395325 0.342325 0.267050 0.267800 0.272850 0.324925 0.275375
## [400] 0.424175 0.275575 0.329575 0.284675 0.323100 0.270375 0.264225
## [407] 0.270900 0.268775 0.343825 0.293475 0.273475 0.268925 0.267875
## [414] 0.261025 0.425475 0.266550 0.274700 0.291700 0.308325 0.265025
## [421] 0.273375 0.264525 0.320325 0.288875 0.264875 0.265100 0.360450
## [428] 0.262775 0.280075 0.288125 0.263700 0.266375 0.305425 0.281875
## [435] 0.271525 0.267000 0.331350 0.375125 0.276050 0.265000 0.282550
## [442] 0.293375 0.284100 0.332700 0.300650 0.267825 0.268925 0.272400
## [449] 0.265875 0.378075 0.276750 0.316425 0.286825 0.291975 0.293150
## [456] 0.370175 0.338650 0.305100 0.305025 0.265700 0.285350 0.267900
## [463] 0.348925 0.270225 0.321350 0.273800 0.271525 0.284150 0.287325
## [470] 0.303450 0.392925 0.287225 0.263150 0.264500 0.320825 0.276200
## [477] 0.292975 0.273250 0.281550 0.284600 0.305675 0.347150 0.262900
## [484] 0.271300 0.261000 0.273125 0.304125 0.282525 0.298250 0.403800
## [491] 0.377275 0.271325 0.264200 0.267100 0.436100 0.292100 0.270450
## [498] 0.269125 0.322300 0.270250 0.305325 0.274950 0.346500 0.295650
## [505] 0.327650 0.264825 0.278575 0.267725 0.292450 0.271325 0.281100
## [512] 0.270875 0.264750 0.279625 0.322150 0.277175 0.291400 0.298850
## [519] 0.339325 0.268400 0.325125 0.269325 0.265600 0.270900 0.261550
## [526] 0.270225 0.263775 0.273275 0.278125 0.264875 0.299375 0.267350
## [533] 0.292425 0.275000 0.277150 0.299700 0.279300 0.297875 0.417300
## [540] 0.295500 0.271000 0.279750 0.273800 0.278375 0.437800 0.279225
## [547] 0.266625 0.263050 0.405525 0.277725 0.301975 0.267050 0.266200
## [554] 0.318825 0.313475 0.263525 0.293050 0.413900 0.265750 0.304150
## [561] 0.277925 0.277925 0.318850 0.263125 0.274975 0.317350 0.263250
## [568] 0.318025 0.270225 0.414025 0.267825 0.269875 0.286550 0.278000

```


##	[575]	0.301500	0.292675	0.263400	0.262200	0.272350	0.325500	0.315700
##	[582]	0.300100	0.269300	0.273850	0.271300	0.296725	0.272100	0.273750
##	[589]	0.333575	0.291975	0.307425	0.450600	0.314700	0.288500	0.271800
##	[596]	0.283400	0.276400	0.307700	0.272300	0.273275	0.267625	0.271225
##	[603]	0.282200	0.265925	0.264825	0.303750	0.284275	0.311750	0.308650
##	[610]	0.271850	0.271375	0.381525	0.391200	0.316775	0.268450	0.342800
##	[617]	0.327050	0.277600	0.484700	0.269875	0.280800	0.263875	0.267975
##	[624]	0.278325	0.266050	0.352150	0.265050	0.304200	0.272300	0.266625
##	[631]	0.261450	0.283825	0.292050	0.267075	0.313850	0.263275	0.267650
##	[638]	0.292375	0.262750	0.268450	0.416200	0.274500	0.279925	0.286050
##	[645]	0.279375	0.264575	0.369750	0.426050	0.260250	0.278025	0.294600
##	[652]	0.267350	0.266700	0.266250	0.295350	0.265475	0.270475	0.283100
##	[659]	0.268225	0.290675	0.284400	0.312000	0.377500	0.289725	0.441750
##	[666]	0.272500	0.300475	0.265175	0.417625	0.277550	0.325425	0.269725
##	[673]	0.318475	0.282400	0.331650	0.385075	0.278625	0.378950	0.390575
##	[680]	0.277375	0.396850	0.293075	0.360700	0.356850	0.302500	0.312250
##	[687]	0.270550	0.340925	0.266075	0.296125	0.327625	0.459750	0.263625
##	[694]	0.271650	0.312400	0.282900	0.284500	0.281200	0.279875	0.264550
##	[701]	0.325450	0.273225	0.269150	0.270075	0.285425	0.265200	0.265150
##	[708]	0.299375	0.327600	0.436400	0.263650	0.265900	0.270675	0.296125
##	[715]	0.272350	0.338800	0.285775	0.286900	0.266550	0.351650	0.266625
##	[722]	0.319150	0.358800	0.281950	0.372900	0.352250	0.287175	0.272725
##	[729]	0.285825	0.275875	0.285625	0.279200	0.264350	0.272650	0.279100
##	[736]	0.275575	0.273950	0.359125	0.294300	0.316225	0.287800	0.288850
##	[743]	0.296075	0.296550	0.267100	0.273100	0.278775	0.276525	0.284000
##	[750]	0.264475	0.264100	0.267400	0.276925	0.263650	0.320775	0.269200
##	[757]	0.282750	0.281350	0.267125	0.290800	0.272425	0.282625	0.307475
##	[764]	0.472700	0.303325	0.355150	0.345225	0.407850	0.269175	0.459500
##	[771]	0.269125	0.275025	0.282400	0.281475	0.277375	0.294875	0.365375
##	[778]	0.389775	0.393200	0.265550	0.267675	0.336550	0.327400	0.265375
##	[785]	0.299125	0.302075	0.324425	0.412975	0.282625	0.269450	0.268950
##	[792]	0.292275	0.276875	0.369425	0.295400	0.314750	0.303725	0.340700
##	[799]	0.316400	0.324300	0.390450	0.295675	0.309625	0.271950	0.291325
##	[806]	0.272475	0.322125	0.382050	0.267725	0.281050	0.268750	0.266225
##	[813]	0.294775	0.265500	0.365475	0.339000	0.315350	0.280250	0.265075
##	[820]	0.292050	0.359875	0.285850	0.263925	0.297200	0.268975	0.266800
##	[827]	0.375675	0.354650	0.322675	0.351525	0.277375	0.263200	0.336925
##	[834]	0.375650	0.265150	0.288950	0.267125	0.272625	0.264350	0.265850
##	[841]	0.275900	0.290200	0.315900	0.269550	0.280725	0.321650	0.272850
##	[848]	0.284250	0.272350	0.312875	0.481550	0.335425	0.275125	0.268025
##	[855]	0.358950	0.281025	0.402100	0.284800	0.315800	0.295025	0.392275
##	[862]	0.341625	0.279800	0.297275	0.368150	0.267650	0.308625	0.278325
##	[869]	0.279275	0.298650	0.279500	0.297500	0.265750	0.270325	0.369525
##	[876]	0.341825	0.342950	0.265175	0.320500	0.301575	0.400925	0.299800
##	[883]	0.336725	0.262700	0.270550	0.265025	0.352850	0.268025	0.270325
##	[890]	0.346275	0.315525	0.333325	0.274575	0.336950	0.286100	0.385025
##	[897]	0.264700	0.268150	0.325650	0.288850	0.270025	0.264050	0.272425
##	[904]	0.302875	0.296525	0.273500	0.340350	0.419675	0.263575	0.378275
##	[911]	0.270125	0.331950	0.266100	0.322775	0.293950	0.262825	0.346000
##	[918]	0.268325	0.273025	0.282350	0.310675	0.278075	0.343575	0.293700
##	[925]	0.282100	0.310800	0.300525	0.278625	0.274675	0.302375	0.416225
##	[932]	0.277475	0.304375	0.430875	0.289275	0.273425	0.294950	0.278475
##	[939]	0.287000	0.262200	0.265725	0.284550	0.280175	0.290575	0.369425
##	[946]	0.324700	0.398600	0.281900	0.305500	0.297250	0.411775	0.348800

```
## [953] 0.271000 0.405125 0.349575 0.269100 0.303500 0.418125 0.321950
## [960] 0.265050 0.267625 0.264075 0.268875 0.274300 0.350925 0.264850
## [967] 0.517100 0.308675 0.319050 0.407150 0.315725 0.311575 0.375600
## [974] 0.287525 0.293275 0.299375 0.331575 0.326775 0.294175 0.265850
## [981] 0.265600 0.282600 0.269500 0.278025 0.267825 0.284875 0.369350
## [988] 0.392775 0.264875 0.306400 0.297325 0.284400 0.332525 0.267525
## [995] 0.268300 0.266050 0.288025 0.289500 0.265650 0.276875
```

```
mcmc5$thetaMean
```

```
## [1] 0.5588862 0.7322894
```

```
mcmc5$thetaSD
```

```
## [1] 0.5306414 0.2292996
```

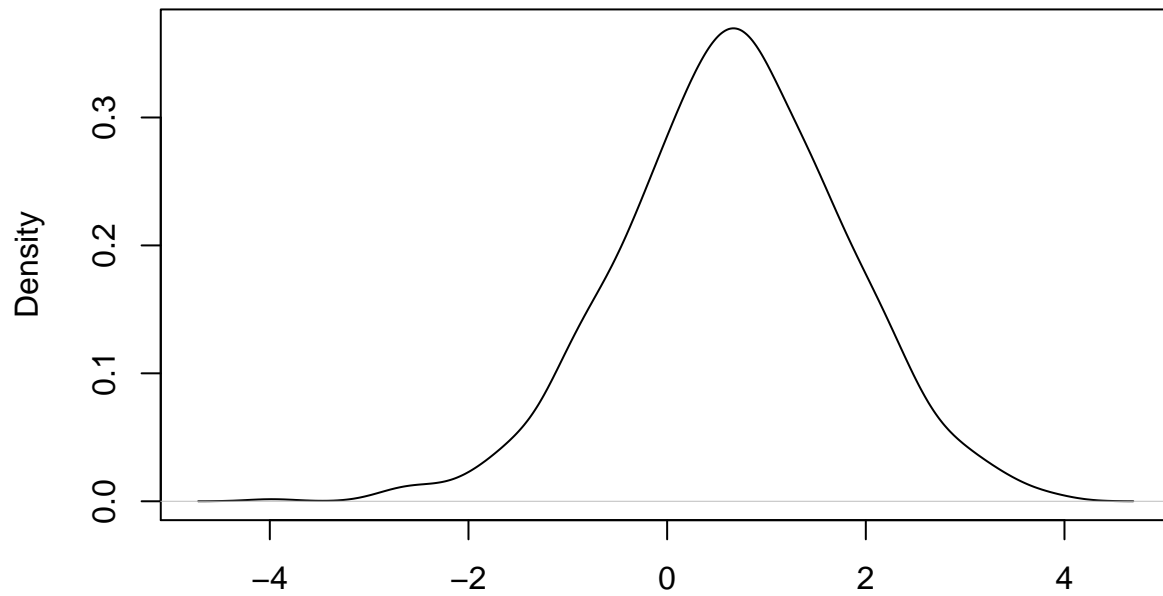
```
mcmc5$cSim
```

```
## [1] 2 2 2 2 2 2 1 2 2 2 2 2 1 2 2 2 2 1 2 2 2 1 1 2 2 1 2 2 2 2 2 1 2
## [35] 2 2 2 1 1 1 1 2 2 2 1 2 1 1 2 1 2 2 1 1 1 2 2 1 2 2 1 2 1 2 1 2 1 2
## [69] 2 2 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2
## [103] 2 2 2 2 1 2 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2 1 2 1 1 2 2 1 2 1 2
## [137] 2 1 1 2 2 2 2 1 2 2 2 2 1 2 2 1 2 2 2 2 2 2 2 1 2 1 2 2 2 2 2 2 1
## [171] 2 2 2 2 2 2 2 2 2 1 2 2 2 1 2 1 2 1 2 2 2 2 2 2 1 2 1 2 1 2 1 2 1
## [205] 2 2 2 2 2 2 2 2 1 2 2 2 1 2 2 1 2 2 2 1 2 1 2 1 2 1 2 2 2 2 2 2 2
## [239] 1 1 1 1 2 2 2 2 2 2 1 2 2 1 2 1 1 2 2 1 2 2 2 1 2 2 1 2 1 1 1 2 2
## [273] 1 2 2 2 2 1 2 2 2 2 1 2 2 2 2 2 1 1 2 2 2 2 1 2 2 2 2 1 2 2 2 2 1
## [307] 2 1 2 2 2 2 1 2 1 2 2 2 2 2 2 1 2 2 2 1 1 2 2 2 1 2 2 2 2 2 2 2 2
## [341] 2 2 2 1 2 1 2 2 2 1 2 1 2 2 1 2 2 2 2 2 2 1 2 2 1 2 2 1 2 2 2 2 2
## [375] 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 1 1 2 1 2 2 2 1 1 2 2
## [409] 1 2 1 1 1 2 2 2 2 2 2 2 1 2 1 2 2 1 2 2 1 2 2 1 2 2 2 2 1 2 1 2 2
## [443] 2 2 1 2 2 2 1 1 2 1 2 1 1 1 1 2 1 2 1 2 2 2 1 2 2 2 2 1 1 2 2 2 1 2
## [477] 2 2 2 2 1 2 2 2 2 2 2 2 2 1 2 2 2 2 1 2 2 2 2 1 2 1 2 1 2 1 2 2 2
## [511] 2 2 1 1 1 2 2 2 1 2 2 1 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 1 2 1 2 2
## [545] 1 2 1 2 1 1 1 2 2 2 2 2 1 1 2 2 2 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2
## [579] 2 1 2 1 2 2 2 2 2 2 2 2 1 1 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1
## [613] 1 1 2 2 2 2 1 2 1 2 2 2 2 2 2 1 2 1 2 2 2 1 1 2 2 1 2 2 1 1 2 2 1 2
## [647] 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 1 1 2 2 2 1 2 1 2 2 2 2 1 2 2 1 2
## [681] 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 1 2 1 2 2 1 2 2 2 2 2
## [715] 2 1 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 1 2 1 2 2 2 2
## [749] 1 2 2 2 2 2 2 1 2 2 1 2 2 2 2 2 1 2 1 2 2 2 1 2 1 2 1 2 1 1 2 1 2
## [783] 2 2 2 2 2 1 1 1 2 2 2 1 2 2 2 1 2 2 1 2 2 2 1 2 2 1 2 2 2 2 2 2 1 2
## [817] 2 1 2 2 1 2 2 2 2 2 1 1 2 1 1 2 2 1 1 2 2 1 1 2 2 1 2 2 1 1 2 1 1 1
## [851] 1 2 2 2 1 2 1 2 1 2 2 1 1 1 1 2 1 2 2 2 2 2 2 2 1 2 1 2 2 1 1 2 2 1
## [885] 2 2 1 2 2 1 2 1 2 1 1 1 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 1 1 2 2 2 1 2
## [919] 2 2 1 1 1 1 1 2 2 2 2 2 1 2 2 2 2 2 1 2 1 2 2 2 1 1 1 1 2 1 2 1 1
## [953] 2 1 2 2 1 1 2 2 2 1 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2
## [987] 1 1 2 2 2 2 2 2 2 2 2 2 2 2
```

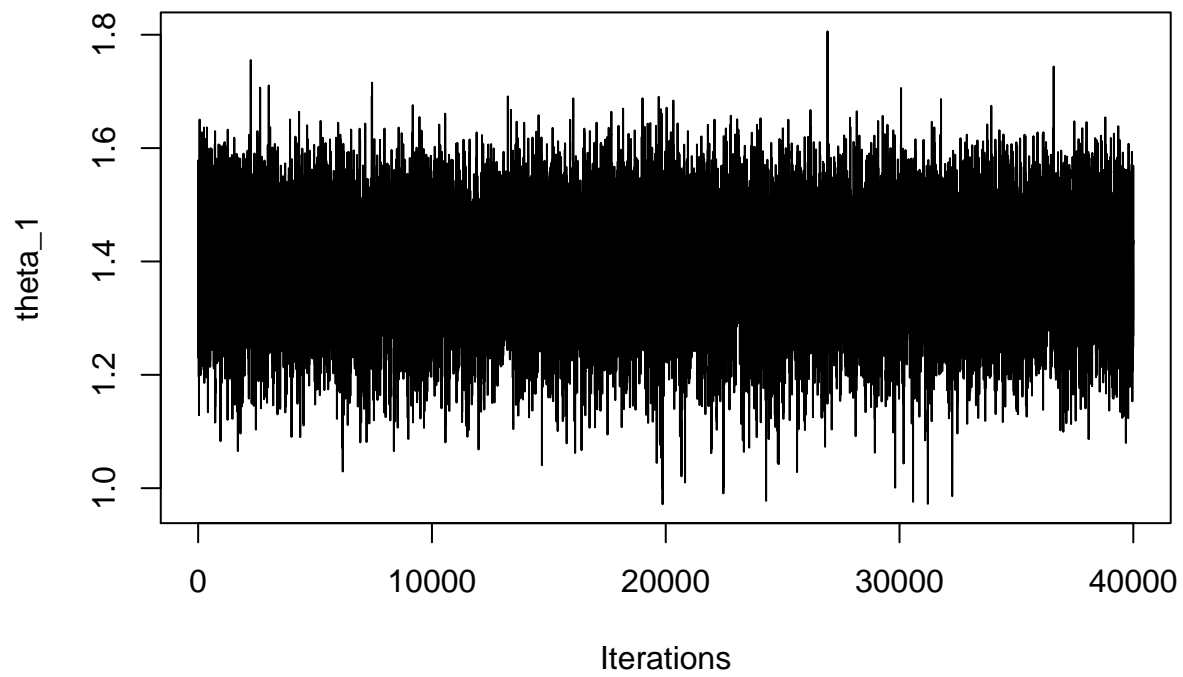
Case 6

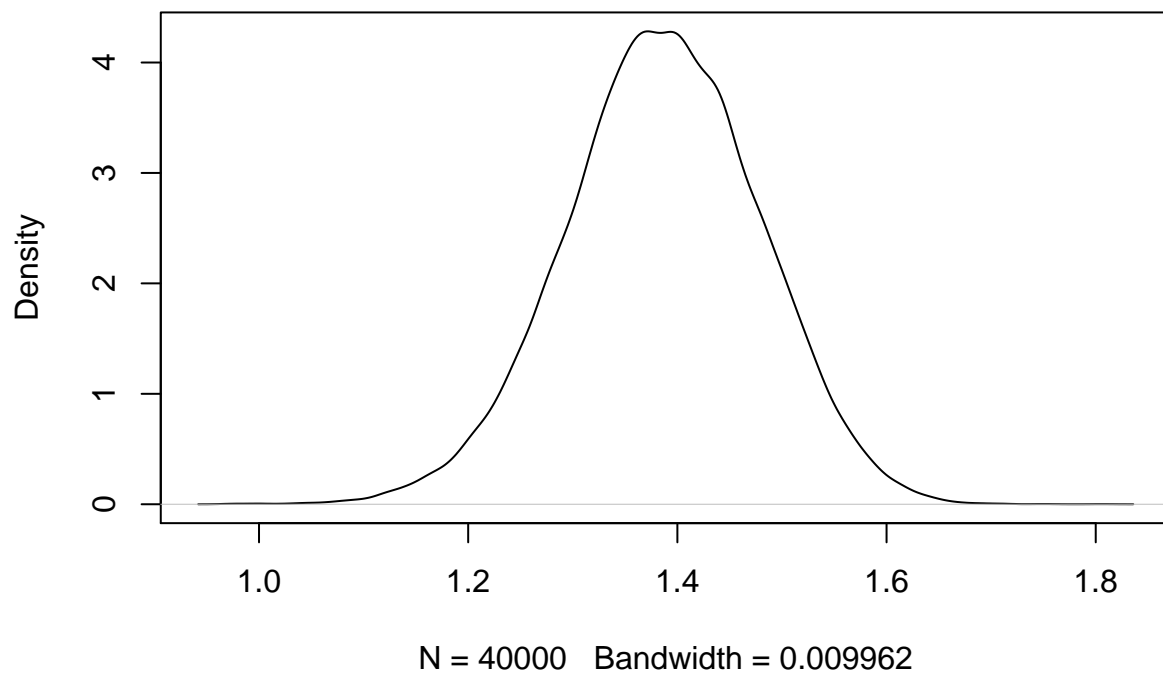
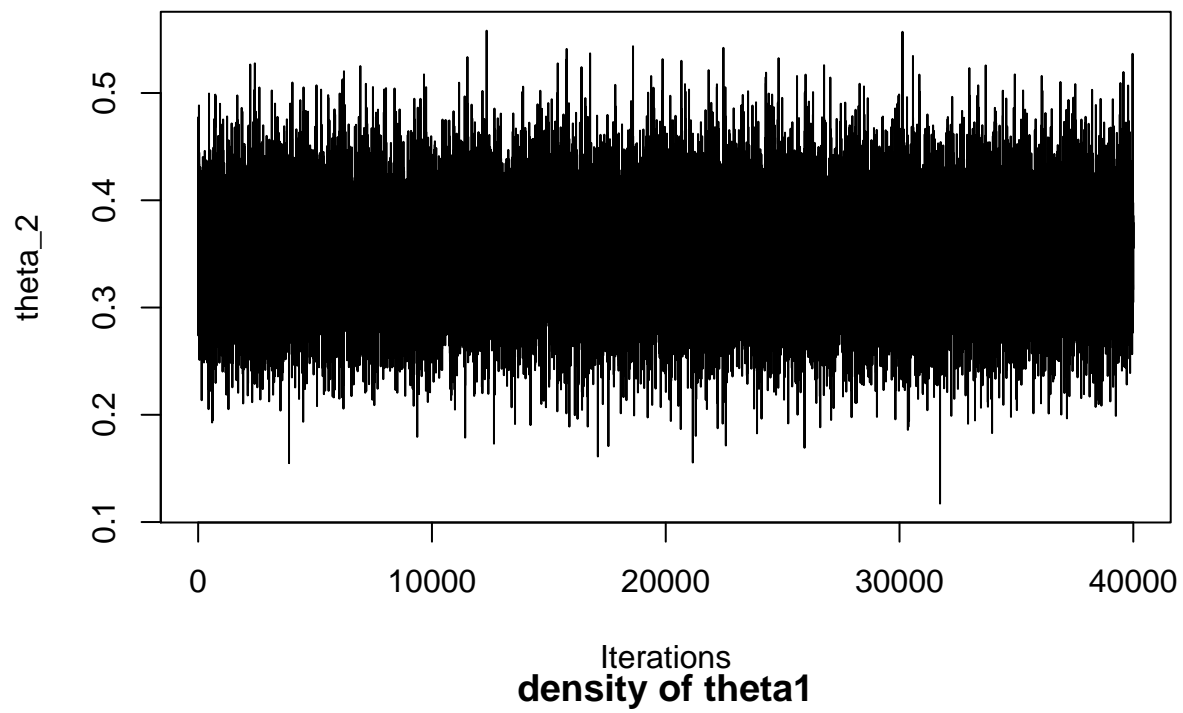
```
mcmc6=mcmc(N=1000, r=0.3, n_iter=50000, theta_ini=c(1.5, 0.5), mu=c(0,1), burnin=10000)
```

density of simulated X

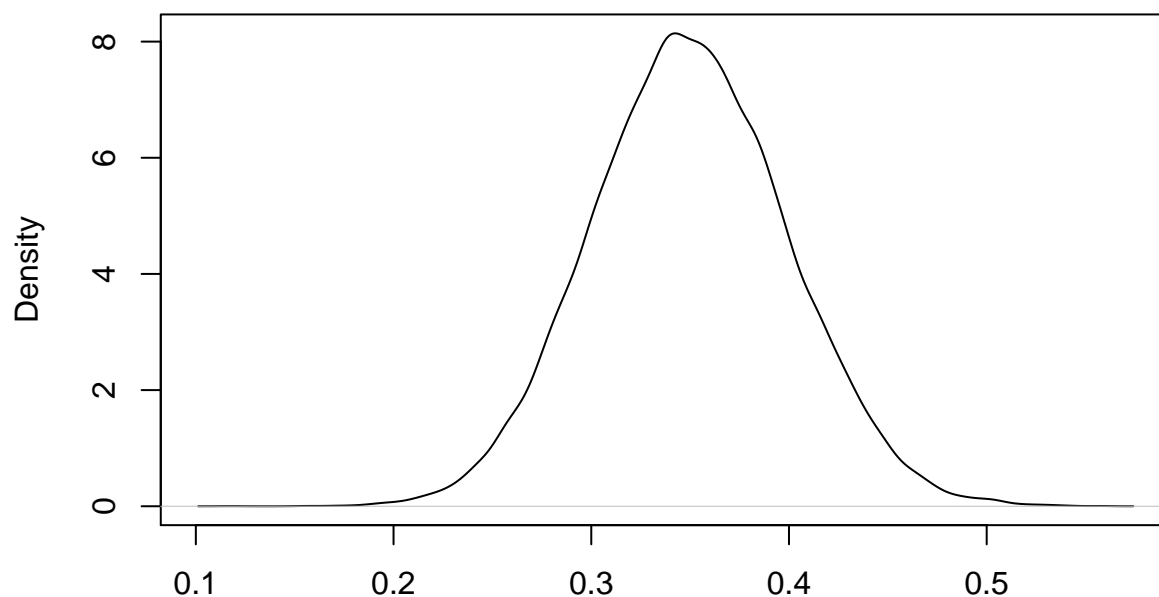


N = 1000 Bandwidth = 0.2479





density of theta2



N = 40000 Bandwidth = 0.005346

mcmc6\$ClassProbs

```
##      [1] 0.133975 0.515575 0.288225 0.728925 0.068000 0.368350 0.188925
##      [8] 0.655125 0.048550 0.308875 0.237250 0.609825 0.083700 0.087300
##     [15] 0.491325 0.283625 0.157475 0.065875 0.855925 0.242825 0.494150
##     [22] 0.054750 0.041500 0.387075 0.143625 0.171350 0.628900 0.302700
##     [29] 0.209300 0.122625 0.511025 0.357200 0.257350 0.615200 0.503625
##     [36] 0.650275 0.751700 0.501675 0.195750 0.536675 0.058050 0.416050
##     [43] 0.626450 0.446250 0.289975 0.429550 0.672200 0.216450 0.083925
##     [50] 0.124875 0.231650 0.093350 0.549175 0.598425 0.577125 0.092575
##     [57] 0.114700 0.309975 0.064400 0.187200 0.097050 0.055350 0.126800
##     [64] 0.378875 0.337100 0.184375 0.147225 0.367125 0.290875 0.244875
##     [71] 0.122600 0.414950 0.379675 0.342575 0.327125 0.203725 0.354675
##     [78] 0.177700 0.271875 0.031975 0.126000 0.288100 0.235300 0.258175
##     [85] 0.273000 0.312975 0.156025 0.548550 0.427525 0.112100 0.398400
##     [92] 0.357500 0.471625 0.148475 0.031225 0.108000 0.021475 0.170600
##     [99] 0.423175 0.622025 0.029600 0.247175 0.205175 0.277175 0.215375
##    [106] 0.377775 0.196125 0.201675 0.376350 0.475275 0.611625 0.165350
##    [113] 0.218100 0.172525 0.699950 0.347375 0.482375 0.481250 0.087325
##    [120] 0.492300 0.186400 0.809900 0.303975 0.711875 0.096300 0.223625
##    [127] 0.003075 0.534025 0.028325 0.556475 0.216050 0.075525 0.229075
##    [134] 0.177800 0.148400 0.248775 0.288875 0.309325 0.101650 0.280975
##    [141] 0.414475 0.164100 0.280575 0.421875 0.141325 0.310350 0.083000
##    [148] 0.655500 0.070150 0.070275 0.279575 0.262625 0.268900 0.439200
##    [155] 0.111275 0.152550 0.109600 0.338625 0.446975 0.303775 0.356425
##    [162] 0.624650 0.481025 0.310300 0.013950 0.130950 0.108825 0.057400
##    [169] 0.380150 0.169550 0.220300 0.609800 0.077850 0.185400 0.534150
##    [176] 0.110875 0.265500 0.339325 0.187275 0.204500 0.244025 0.458375
##    [183] 0.215100 0.457175 0.122325 0.322275 0.354300 0.788275 0.234825
##    [190] 0.389250 0.558300 0.245300 0.568000 0.783275 0.066300 0.280200
```

```

## [197] 0.477850 0.250600 0.140825 0.434600 0.193800 0.165600 0.308675
## [204] 0.684525 0.353875 0.279475 0.065000 0.081025 0.548675 0.102900
## [211] 0.339750 0.652725 0.018875 0.236225 0.144575 0.056025 0.351075
## [218] 0.462650 0.253550 0.210475 0.082450 0.623775 0.078725 0.246475
## [225] 0.271525 0.692025 0.045950 0.300375 0.319025 0.120600 0.310450
## [232] 0.119625 0.284500 0.279950 0.378825 0.188900 0.134100 0.296225
## [239] 0.254450 0.357825 0.572700 0.097350 0.070200 0.211050 0.773850
## [246] 0.790650 0.069075 0.140475 0.131750 0.023600 0.241750 0.216800
## [253] 0.334750 0.258300 0.455625 0.199875 0.186000 0.567075 0.306875
## [260] 0.159200 0.605525 0.134300 0.384100 0.078425 0.307175 0.656525
## [267] 0.249925 0.293725 0.220325 0.558850 0.330775 0.095725 0.036425
## [274] 0.039475 0.241550 0.328825 0.090175 0.338025 0.375925 0.401825
## [281] 0.815800 0.334325 0.405425 0.597725 0.308775 0.278825 0.179300
## [288] 0.062200 0.067350 0.108300 0.170925 0.384750 0.365650 0.621150
## [295] 0.071750 0.663075 0.206850 0.023925 0.107150 0.465850 0.179775
## [302] 0.121875 0.071350 0.807825 0.059925 0.194500 0.561125 0.272150
## [309] 0.682225 0.343100 0.422825 0.596600 0.194925 0.114125 0.356575
## [316] 0.157725 0.069725 0.165625 0.409550 0.128200 0.725600 0.336300
## [323] 0.467050 0.292525 0.316850 0.113175 0.510600 0.132950 0.288775
## [330] 0.295950 0.229700 0.658950 0.090200 0.089900 0.167675 0.220175
## [337] 0.325750 0.170125 0.345400 0.159525 0.316800 0.717025 0.310100
## [344] 0.450475 0.058175 0.449400 0.049125 0.200350 0.116775 0.573175
## [351] 0.125000 0.193400 0.414375 0.038500 0.520650 0.632825 0.272800
## [358] 0.112850 0.054150 0.034775 0.453000 0.128025 0.468950 0.188500
## [365] 0.601925 0.159825 0.053350 0.211700 0.641500 0.320725 0.696025
## [372] 0.615475 0.016125 0.743975 0.523900 0.323550 0.314750 0.253500
## [379] 0.527350 0.521000 0.657400 0.224275 0.384150 0.077200 0.074775
## [386] 0.102675 0.322900 0.693425 0.475475 0.251400 0.349500 0.158475
## [393] 0.238775 0.157375 0.613600 0.078425 0.113650 0.132575 0.075850
## [400] 0.665525 0.059075 0.143475 0.429750 0.761175 0.246925 0.052475
## [407] 0.639575 0.250025 0.537625 0.689225 0.395000 0.632425 0.557625
## [414] 0.141200 0.707175 0.208425 0.024550 0.116125 0.234600 0.185975
## [421] 0.146925 0.148525 0.255075 0.363050 0.048825 0.267325 0.207525
## [428] 0.737325 0.562500 0.421250 0.320675 0.125700 0.081075 0.398000
## [435] 0.327500 0.223075 0.102925 0.909250 0.486075 0.169000 0.427075
## [442] 0.660225 0.657150 0.175525 0.120575 0.113525 0.306925 0.017650
## [449] 0.348700 0.255100 0.329950 0.589575 0.043450 0.157500 0.270475
## [456] 0.581275 0.119825 0.191725 0.893450 0.303625 0.310250 0.171125
## [463] 0.706475 0.144400 0.230075 0.092825 0.118125 0.119825 0.136550
## [470] 0.751825 0.467800 0.254175 0.392875 0.562025 0.770175 0.299700
## [477] 0.339850 0.076500 0.477700 0.039800 0.508675 0.360825 0.036950
## [484] 0.149025 0.072725 0.369250 0.563925 0.149725 0.257800 0.265950
## [491] 0.435500 0.370625 0.196925 0.127475 0.291625 0.110900 0.256475
## [498] 0.639150 0.233250 0.186550 0.056175 0.227750 0.565900 0.285975
## [505] 0.393925 0.479725 0.539925 0.087400 0.199250 0.166300 0.544100
## [512] 0.580350 0.307300 0.060050 0.071500 0.551275 0.272825 0.081475
## [519] 0.053375 0.784625 0.321650 0.624950 0.285225 0.273950 0.439675
## [526] 0.371675 0.404100 0.033900 0.212175 0.207200 0.168950 0.779925
## [533] 0.357025 0.458000 0.627075 0.427725 0.254950 0.163625 0.406500
## [540] 0.224650 0.039200 0.156050 0.262725 0.191675 0.196850 0.093975
## [547] 0.520050 0.080900 0.223075 0.526250 0.212300 0.165175 0.309850
## [554] 0.156950 0.219325 0.662625 0.320600 0.238675 0.441000 0.043325
## [561] 0.162925 0.382925 0.549025 0.572900 0.325250 0.087250 0.077625
## [568] 0.254150 0.160050 0.219950 0.704425 0.040875 0.175850 0.184175

```

##	[575]	0.198600	0.233375	0.215125	0.135050	0.227600	0.055600	0.854125
##	[582]	0.127575	0.070650	0.457025	0.621075	0.151000	0.043550	0.267775
##	[589]	0.631550	0.651025	0.274675	0.359400	0.410425	0.204300	0.528900
##	[596]	0.170225	0.402750	0.658700	0.485800	0.207675	0.274175	0.285600
##	[603]	0.133700	0.593500	0.165125	0.035150	0.048350	0.058375	0.355750
##	[610]	0.159825	0.345000	0.475700	0.622400	0.168425	0.246625	0.120200
##	[617]	0.563850	0.288000	0.133950	0.178025	0.025425	0.140075	0.359375
##	[624]	0.689525	0.433100	0.066025	0.252700	0.313500	0.224300	0.702600
##	[631]	0.172150	0.206375	0.336250	0.153700	0.255850	0.211450	0.270475
##	[638]	0.457925	0.352600	0.205700	0.281100	0.420100	0.097075	0.108450
##	[645]	0.240075	0.394775	0.238800	0.521800	0.172225	0.155650	0.112200
##	[652]	0.477100	0.405800	0.637050	0.591400	0.613975	0.093575	0.133550
##	[659]	0.379500	0.240250	0.549950	0.209325	0.455725	0.683800	0.138400
##	[666]	0.454875	0.370175	0.551200	0.034950	0.403600	0.271450	0.207750
##	[673]	0.105400	0.278675	0.274850	0.354775	0.411725	0.165050	0.381325
##	[680]	0.147400	0.318550	0.496700	0.497050	0.653525	0.600750	0.217800
##	[687]	0.278375	0.719800	0.080500	0.218225	0.083625	0.194050	0.557325
##	[694]	0.767675	0.312475	0.286475	0.816750	0.559050	0.457525	0.836625
##	[701]	0.536900	0.134850	0.196875	0.207100	0.162250	0.052150	0.638550
##	[708]	0.197575	0.290775	0.194925	0.055350	0.272225	0.095275	0.226400
##	[715]	0.146650	0.170900	0.106625	0.175350	0.714600	0.423300	0.269350
##	[722]	0.692700	0.434175	0.280975	0.094075	0.069800	0.082900	0.677850
##	[729]	0.236100	0.253800	0.098025	0.014300	0.293125	0.061075	0.165300
##	[736]	0.291275	0.362650	0.241575	0.077925	0.493850	0.180500	0.852250
##	[743]	0.396950	0.277700	0.424000	0.524550	0.193800	0.245675	0.320925
##	[750]	0.362250	0.441850	0.038800	0.089075	0.416200	0.210125	0.094375
##	[757]	0.380175	0.168775	0.506725	0.253425	0.489250	0.741400	0.513700
##	[764]	0.062450	0.476300	0.203400	0.168000	0.076025	0.335975	0.240175
##	[771]	0.328475	0.286125	0.137575	0.027025	0.214800	0.055150	0.094100
##	[778]	0.127425	0.211325	0.331725	0.224225	0.401775	0.075200	0.487525
##	[785]	0.125625	0.447775	0.249675	0.277400	0.143425	0.575150	0.212475
##	[792]	0.108875	0.331550	0.133225	0.186000	0.443675	0.294525	0.758700
##	[799]	0.158775	0.228050	0.230550	0.110600	0.402875	0.043250	0.205625
##	[806]	0.121625	0.375350	0.384225	0.101025	0.301950	0.462975	0.114575
##	[813]	0.311950	0.170975	0.159500	0.283100	0.387725	0.284875	0.009800
##	[820]	0.722775	0.603650	0.146050	0.847200	0.233225	0.478225	0.154825
##	[827]	0.090025	0.494050	0.703800	0.104050	0.063275	0.559825	0.184500
##	[834]	0.057050	0.107625	0.156225	0.212725	0.037825	0.203050	0.012850
##	[841]	0.153650	0.145400	0.215975	0.326000	0.505800	0.370475	0.476350
##	[848]	0.890250	0.062625	0.433300	0.792075	0.051125	0.313725	0.427550
##	[855]	0.111150	0.324100	0.129450	0.075900	0.011650	0.097575	0.052825
##	[862]	0.384525	0.163175	0.020750	0.477075	0.050225	0.336725	0.090650
##	[869]	0.201225	0.163800	0.585050	0.478125	0.838450	0.378575	0.068950
##	[876]	0.200025	0.027075	0.195825	0.094525	0.293425	0.447375	0.098575
##	[883]	0.235450	0.429050	0.596275	0.485700	0.430025	0.404950	0.363050
##	[890]	0.473200	0.129975	0.872975	0.767575	0.362100	0.205025	0.153025
##	[897]	0.399850	0.546075	0.412575	0.807800	0.523275	0.256875	0.256750
##	[904]	0.187875	0.591875	0.416875	0.067150	0.124875	0.173375	0.476875
##	[911]	0.524375	0.141525	0.070025	0.127025	0.242875	0.244850	0.115975
##	[918]	0.101100	0.524700	0.189250	0.455700	0.219275	0.521625	0.083525
##	[925]	0.262325	0.379500	0.361000	0.331100	0.438350	0.119525	0.154100
##	[932]	0.527950	0.196800	0.452175	0.077300	0.494900	0.056925	0.052150
##	[939]	0.458650	0.246900	0.067075	0.116650	0.365725	0.317400	0.341375
##	[946]	0.119275	0.321650	0.271050	0.266525	0.305350	0.246525	0.617325

```
## [953] 0.358425 0.221600 0.160300 0.710775 0.142625 0.282400 0.542100
## [960] 0.298175 0.050350 0.133475 0.471875 0.301900 0.788925 0.100950
## [967] 0.117200 0.207975 0.110750 0.134050 0.097125 0.146825 0.114425
## [974] 0.073675 0.833675 0.322000 0.232775 0.265750 0.222625 0.178250
## [981] 0.420425 0.389700 0.474375 0.148525 0.032500 0.386350 0.245850
## [988] 0.014350 0.403425 0.034375 0.545475 0.262950 0.010125 0.182375
## [995] 0.397200 0.425525 0.255075 0.820375 0.170475 0.560950
```

```
mcmc6$thetaMean
```

```
## [1] 1.3857014 0.3498236
```

```
mcmc6$thetaSD
```

```
## [1] 0.09247145 0.04945291
```

```
mcmc6$cSim
```

```
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