

wk4-hw kenwan bayes

Biomial output with two groups

Data are panel data containing columns: sex, race, age, education, state and y. The output y is the binary version of the original data. It reflects opinion (positive-1, negative-0) about President Barak Obama during his 2012 campaign for reelection.

Consider problem of identifying responses of two gender groups (column sex).

Decide what is the right model and analyze it using JAGS.

Consider different prior distributions.

Load in data

```
myData = read.csv(paste0(dataPath, "wk4/MScA_32014_BayesianMethods_CourseProjectData.csv"))
head(myData)
```

```
##      sex    race  age      education state y
## 1 1.Male 1.White 18-24    1.NoCollege   GA 0
## 2 1.Male 1.White 25-34    1.NoCollege   AZ 0
## 3 1.Male 1.White 25-34    2.SomeCollege SD 0
## 4 1.Male 1.White 18-24    3.CollegeOrMore SC 0
## 5 1.Male 1.White 18-24    3.CollegeOrMore SC 0
## 6 1.Male 1.White 18-24    3.CollegeOrMore SC 0
```

```
dim(myData)
```

```
## [1] 23223      6
```

```
#positive
sum(myData$y)
```

```
## [1] 8514
```

```
(dataList<-list(y=myData$y,Ntotal=length(myData$y)))
```

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

[illegible]

```
## [2143] 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 1 1 1 0 0 1 0 0 1 0 0 0 0
## [2177] 1 1 0 0 0 0 0 0 1 0 0 0 1 0 0 1 1 0 0 1 0 0 1 0 0 1 0 1 0 0 1 0 0 1
## [2211] 0 1 0 1 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1
## [2245] 1 1 0 0 0 1 0 0 0 1 0 0 1 0 0 1 1 1 0 0 0 1 0 1 1 1 1 1 1 0 1 1 1 1
## [2279] 1 0 1 1 1 0 1 1 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1
## [2313] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 0
## [2347] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1
## [2381] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [2415] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [2449] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [2483] 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [2517] 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [2551] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [2585] 1 1 0 0 1 1 1 0 1 0 1 1 0 1 1 1 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0
## [2619] 1 1 0 0 0 0 0 0 1 0 1 0 1 0 0 1 1 0 1 0 1 1 1 1 0 0 1 1 1 1 0 1 1 0
## [2653] 1 1 1 0 0 1 1 0 1 0 1 0 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 1 0 0 0 0 0
## [2687] 0 1 1 1 1 1 1 1 0 1 1 0 1 1 0 1 1 0 1 1 1 1 0 1 0 1 1 0 1 0 1 0 1 1
## [2721] 0 0 1 0 0 1 0 0 0 1 1 0 0 0 0 0 0 1 1 1 0 1 1 0 1 0 1 0 1 1 1 0 0 1 1
## [2755] 1 0 1 1 0 0 1 0 0 1 1 1 1 0 0 0 0 1 1 1 1 0 1 1 0 0 0 1 0 1 0 1 0 1
## [2789] 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0 1 0 1 1 1 0 1 0 1 0
## [2823] 0 1 0 1 1 0 1 0 0 1 0 1 0 0 0 0 0 0 0 1 1 0 1 1 0 0 1 1 1 0 0 0 0 0
## [2857] 0 0 1 1 1 0 0 1 0 0 0 1 1 0 1 0 0 1 1 0 1 0 0 1 1 0 1 1 0 0 0 0 1 1
## [2891] 0 0 0 0 1 0 0 1 1 0 0 0 0 0 1 0 1 1 1 0 0 1 1 0 0 0 0 0 0 1 1 1 0 0
## [2925] 0 1 0 1 1 1 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 1 1 1 0 1 1 0 1 0 1 1
## [2959] 1 0 0 0 0 0 1 1 0 0 0 0 0 0 1 0 0 1 0 0 0 0 1 1 1 1 1 0 0 0 0 0 0 0
## [2993] 1 0 1 0 0 1 1 0 1 0 0 0 0 0 1 1 1 0 0 0 0 1 1 0 0 0 0 0 1 1 0 0 0 0
## [3027] 0 1 0 1 1 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 1 0 1 1 0 1 0
## [3061] 0 0 0 0 1 1 1 1 0 0 0 1 0 0 1 0 0 0 1 0 0 1 0 0 1 0 1 0 1 0 0 1 1 1
## [3095] 1 1 0 0 0 1 1 0 0 0 1 0 1 0 0 0 0 1 1 1 0 1 1 0 1 0 1 1 1 1 0 1 1 1
## [3129] 1 0 1 0 1 0 0 0 1 0 0 0 1 1 0 0 1 0 1 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0
## [3163] 0 0 0 0 1 0 0 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [3197] 0 1 0 1 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 1 0 1 1 0 1 0 0 0 0 1 0 0 0 0
## [3231] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 1 0 0 0 1 0 0 0 0 0 1 0 0 0 0
## [3265] 0 0 0 0 1 1 0 0 0 0 1 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0
## [3299] 1 1 0 0 0 1 0 0 0 1 0 1 0 0 0 1 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1 0
## [3333] 0 1 0 0 1 1 0 0 0 0 1 1 0 1 0 0 1 0 0 1 1 0 0 0 0 0 1 0 0 1 0 0 0 0
## [3367] 0 1 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 1 0 0 0 0 1 0 0 1 0 0 1 0
```

```
## [3401] 1 1 0 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 1 0
## [3435] 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 1 0 0 0 0 0 0
## [3469] 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 1
## [3503] 0 1 1 0 1 0 0 0 1 0 0 1 1 1 0 1 0 0 0 1 0 0 0 0 1 1 1 1 1 1 0 1 1 1
## [3537] 0 1 0 0 1 0 0 1 1 0 1 1 1 1 0 0 1 1 1 1 0 0 0 1 0 1 0 0 0 1 0 0 0 0
## [3571] 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 1 0 1 0 0 1 1 0 0 1 1 0 0 1 0 0 1 1
## [3605] 1 1 0 0 0 0 1 1 1 0 1 1 0 1 1 0 0 1 0 0 0 0 0 1 1 0 0 1 1 0 0 0 1 0
## [3639] 0 1 0 1 1 1 0 0 0 0 0 1 0 0 0 1 0 0 0 1 0 1 0 0 1 0 1 0 1 1 0 0 0 1
## [3673] 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 1 1 1 0 1 0 1 0 0 0 0 1 0
## [3707] 1 0 0 0 1 1 0 0 0 1 0 1 0 0 0 0 1 0 0 1 1 0 1 0 0 0 0 1 0 0 0 0 0 0
## [3741] 0 1 1 0 1 1 1 1 1 0 0 1 0 1 0 1 1 1 1 0 1 0 0 0 1 0 0 0 0 0 1 0 0 0
## [3775] 0 1 1 1 0 0 1 0 0 0 1 0 1 0 0 0 1 0 1 0 0 0 0 0 1 0 0 0 0 0 0 1 1 1
## [3809] 0 0 0 1 0 1 0 1 0 0 1 0 0 1 0 1 0 0 0 0 0 1 0 0 0 0 0 0 1 0 1 1 0 0
## [3843] 0 0 1 1 0 0 1 1 1 0 0 1 1 0 1 0 0 0 1 0 0 0 0 0 0 1 1 1 1 1 0 0 0 1
## [3877] 1 0 0 0 0 0 0 0 0 0 1 0 1 1 1 0 0 1 1 0 0 1 0 1 0 0 1 1 0 1 0 1 0 1
## [3911] 0 1 0 1 0 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 0 0 1
## [3945] 1 0 0 0 0 0 0 1 1 0 1 1 1 0 1 0 0 0 0 0 0 0 1 1 1 1 0 0 0 1 0 1 1 0
## [3979] 0 0 0 0 0 1 0 0 1 1 0 0 0 0 1 0 1 0 1 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0
## [4013] 0 0 0 0 0 0 0 1 1 0 1 1 0 0 0 1 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 1 0 0
## [4047] 0 0 1 1 0 0 1 1 0 0 0 0 0 1 0 0 0 0 0 0 1 0 1 0 0 0 0 1 1 0 0 0 1 0
## [4081] 0 0 1 1 1 1 0 0 0 0 0 0 0 1 1 1 0 1 0 0 1 0 0 0 1 1 0 0 0 1 0 1 0 0
## [4115] 1 0 1 0 0 1 0 0 1 0 0 1 0 0 0 1 0 0 1 1 1 1 1 0 1 1 1 0 1 0 1 1 1 1
## [4149] 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 0 1 0 1 1 0 1 1 1 1 1 1 1 1 1 1 1
## [4183] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [4217] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 0 1 1 1 0
## [4251] 0 1 0 1 1 1 1 1 1 1 1 0 1 0 1 0 0 0 1 1 0 1 1 1 1 1 0 1 0 1 1 1 1 1
## [4285] 0 1 0 1 1 1 0 1 1 1 0 1 0 1 0 1 0 1 0 1 1 1 1 0 1 1 0 1 1 0 0 0 1 0
## [4319] 0 1 0 0 1 0 0 0 1 0 1 1 1 1 1 0 1 1 1 0 1 0 1 1 1 1 0 0 0 1 0 0 1 0
## [4353] 0 1 0 0 0 1 1 1 0 0 1 0 1 1 1 1 1 1 0 1 0 0 1 0 1 0 1 1 0 1 1 1 0 1
## [4387] 0 0 0 0 1 1 0 1 1 1 0 0 1 0 1 0 0 0 1 1 1 0 0 0 1 1 0 1 0 0 1 0 1 1
## [4421] 1 0 1 1 0 1 1 1 1 1 0 1 0 0 0 0 0 1 0 1 1 1 0 0 1 1 1 1 1 0 1 0 0 0
## [4455] 1 1 1 1 1 1 0 1 0 0 1 0 0 1 1 0 1 1 0 0 0 0 0 1 0 0 0 1 1 0 1 1 1 1
## [4489] 0 0 0 1 1 1 1 1 0 0 0 0 1 0 0 1 0 0 0 1 0 0 1 1 1 1 1 1 0 0 0 0 0 0
## [4523] 1 0 0 1 0 0 1 1 1 0 1 0 0 1 0 0 0 1 0 0 1 0 0 1 1 1 0 0 0 0 0 0 0 1
## [4557] 0 0 1 0 0 1 1 1 0 0 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
## [4591] 1 0 1 1 0 0 0 1 0 1 0 1 1 0 1 1 0 0 0 0 0 0 0 0 1 1 0 1 0 1 0 1 0 0
## [4625] 0 0 1 0 1 1 1 0 1 1 0 1 1 1 1 1 1 0 1 1 1 1 0 1 1 0 1 1 1 0 0 0 0 1
```

```
## [4659] 0 0 0 0 1 1 0 1 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 1 0
## [4693] 1 0 0 0 1 0 0 1 0 1 0 1 0 0 1 1 1 0 1 0 1 1 1 0 0 1 1 1 0 1 1 0 1 1
## [4727] 0 0 0 1 0 1 0 0 1 0 1 0 0 0 1 0 0 0 0 1 1 1 0 0 0 1 1 0 0 1 0 1 1 1
## [4761] 0 0 1 1 0 1 0 1 0 1 1 1 1 1 1 1 0 1 0 0 0 0 0 0 1 1 0 1 0 0 1 1 0 1 0 1
## [4795] 1 1 0 0 0 1 0 1 0 0 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 0 0 1
## [4829] 1 0 0 1 0 0 0 0 1 0 1 0 1 0 1 0 1 0 0 0 0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 1
## [4863] 0 0 0 0 0 0 1 0 0 0 0 1 0 1 1 1 0 0 1 0 1 1 1 1 0 0 0 1 0 0 0 0 1 0
## [4897] 1 0 1 0 0 1 0 0 1 1 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 1 0 0
## [4931] 0 1 0 0 0 0 0 1 1 0 1 0 1 0 0 0 1 0 1 0 1 0 0 1 1 0 0 0 1 1 1 0 0 0
## [4965] 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0 0 0 1 0 1 1 1 1 0 1 0 0 0 0 0 0 1 0 1
## [4999] 0 0 0 0 0 0 1 1 1 1 0 0 1 0 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 1 0 1 1 0 0 0 1
## [5033] 1 0 1 1 1 1 1 0 1 0 1 1 0 1 0 1 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0
## [5067] 0 0 1 1 1 0 1 0 0 1 0 0 1 1 1 0 0 1 1 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 1
## [5101] 0 1 0 1 1 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 1 0 0
## [5135] 0 0 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 1 0 0
## [5169] 0 0 1 0 0 0 1 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 0 0
## [5203] 0 0 1 1 1 0 0 0 0 0 1 0 0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0
## [5237] 0 0 0 0 0 0 1 0 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 1 0
## [5271] 0 0 1 0 1 0 0 0 0 1 0 0 1 1 1 0 1 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 1 0 0
## [5305] 1 0 0 0 1 0 0 0 1 1 0 0 1 0 0 0 1 1 0 1 1 0 1 0 0 0 1 0 0 0 0 0 0 1
## [5339] 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 1 0 0 0 1 0 0 0 0 0 0
## [5373] 0 1 1 1 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 1 1 0 0 1 0 0 1
## [5407] 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 1 0 0 0 1 1 0 1 0 0 0 0 0 0 0 1
## [5441] 1 1 0 0 0 0 1 0 0 1 0 1 0 1 1 1 1 0 1 0 0 0 0 0 1 1 0 0 0 0 1 1 0 1
## [5475] 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 1 0 0 0 0 1
## [5509] 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 1 1 0 1 1 0 0 0 1 0 0 0 0 1 0 0 1 0 0 1
## [5543] 0 1 1 0 1 0 0 1 1 1 0 0 0 0 0 0 1 1 1 0 0 0 0 0 1 1 1 0 0 0 1 0 0 0
## [5577] 1 0 1 0 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 1 1 0 1 0 0 1 0 1 0
## [5611] 1 0 0 0 1 0 1 1 1 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0
## [5645] 0 1 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0
## [5679] 0 0 1 1 0 0 1 0 1 1 0 1 0 0 0 1 0 0 0 0 0 1 0 0 0 0 1 0 0 1 1 0 0 0
## [5713] 0 0 1 1 1 0 1 0 0 0 0 0 0 1 0 0 1 0 1 0 0 0 0 1 0 1 0 0 0 0 1 0 0 0
## [5747] 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 1 0 0 1 0 0 1 1 1
## [5781] 0 1 0 1 1 1 0 1 0 0 0 1 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 0 1 1 0 0 0 0
## [5815] 0 1 0 0 0 1 0 0 1 0 0 1 0 1 0 0 0 1 0 0 0 0 0 1 1 0 1 0 1 0 0 0 0 1
## [5849] 0 1 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 1 1
## [5883] 0 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 1 0 0 0 0 0 0 0 1 0 1
```

```
## [5917] 0 1 0 1 0 1 1 1 1 0 0 0 1 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 1 0 1 0 0 1
## [5951] 0 0 1 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 1 0 0 0 0 0 0 1 1 1 0 0 0 1 0
## [5985] 0 0 0 0 1 1 1 0 1 0 0 0 0 0 0 1 1 0 1 0 1 1 0 0 0 1 0 1 1 0 0 0 1
## [6019] 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0
## [6053] 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 1 0 0 0 0 0 0 1 1 0 1 1 0
## [6087] 0 0 1 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 1
## [6121] 0 1 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 1 0 1 0 1
## [6155] 0 1 0 0 1 0 0 1 0 0 0 0 1 0 0 0 0 0 0 1 1 0 0 1 0 1 0 0 0 0 0 1 0
## [6189] 0 1 0 0 0 1 0 0 0 0 1 0 0 0 1 1 1 0 0 1 0 1 0 0 0 1 0 0 0 0 1 1 0 1
## [6223] 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 1 0 1 0 0 0 1 0 0 0 0 0 1 1 1 1 0 0
## [6257] 1 0 1 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 1 1 0 0 1 0 1 0 0 1 0 0 0 1 0
## [6291] 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 0 1 0 0 1 0 0 0 0 0 1 0
## [6325] 0 0 1 0 0 0 0 1 0 0 1 0 1 0 1 1 0 0 0 0 1 0 0 0 0 1 0 0 0 1 0 1 1 1
## [6359] 0 1 1 0 1 1 0 0 1 0 1 1 1 1 0 0 1 0 0 1 0 1 1 0 1 0 1 0 0 1 0 0 0 0
## [6393] 0 1 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 1 0 0
## [6427] 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0
## [6461] 1 0 1 1 0 0 1 0 0 1 1 1 1 1 0 0 0 1 0 0 0 1 0 1 0 0 0 0 0 1 0 1 1 0
## [6495] 1 0 1 0 0 0 1 0 0 1 0 0 0 1 1 0 1 0 0 0 1 0 0 1 1 1 0 1 1 1 0 0 0 0
## [6529] 0 0 0 0 0 1 0 1 1 0 0 1 0 0 1 1 1 0 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0
## [6563] 0 0 0 1 0 0 0 0 0 1 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0
## [6597] 0 0 0 0 1 0 0 0 0 1 1 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 0 0 0
## [6631] 0 0 1 0 1 0 1 1 0 1 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 1
## [6665] 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 1 1 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 1
## [6699] 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [6733] 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0
## [6767] 0 0 0 0 0 0 1 1 0 0 1 1 0 1 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0 0
## [6801] 0 1 0 0 1 0 0 0 0 0 1 0 0 1 0 0 0 1 1 0 0 0 0 1 0 0 0 0 1 1 0 0 0 1
## [6835] 0 0 1 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 1 0 0
## [6869] 1 0 0 0 0 1 0 0 0 0 0 0 1 0 1 1 0 0 0 0 1 1 0 1 0 1 0 0 0 1 0 0 1 0
## [6903] 0 0 1 0 0 0 1 0 1 0 0 0 1 0 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 1 0 0
## [6937] 0 0 0 0 0 1 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 1 0 0 0 0 1 0 0 0 1 0 0 1
## [6971] 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 1 1 0 1 0 0 1 0 0 0 0 1
## [7005] 0 0 0 0 1 1 1 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0
## [7039] 1 0 1 0 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 1 1
## [7073] 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0
## [7107] 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 0 1 0 0 0 0 1 0 1 0 0 1 1 1
## [7141] 0 1 0 0 1 1 1 0 1 1 0 0 1 1 0 1 0 0 0 0 1 0 0 0 0 0 1 0 0 1 0 1 0 0
```

```
## [7175] 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0
## [7209] 0 0 0 0 1 0 1 0 0 0 0 1 1 0 0 1 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0
## [7243] 0 0 0 1 0 0 0 0 0 1 0 0 0 1 0 1 0 0 0 0 0 1 0 0 1 0 1 0 1 1 1 0 0 1
## [7277] 0 0 0 0 0 1 1 1 0 0 0 1 1 0 1 0 0 0 0 0 0 1 1 0 1 0 0 1 0 0 1 0 0 0
## [7311] 0 1 0 1 0 0 0 0 1 0 0 1 0 0 0 1 1 0 1 0 0 0 0 0 0 0 1 1 0 0 0 0 0 1
## [7345] 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 1 0 1 1 0 0
## [7379] 0 1 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 1 0 0
## [7413] 1 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 1 0 0 1 0 1 0 0 0 0
## [7447] 1 0 0 0 0 1 1 0 0 0 0 1 0 0 0 1 0 1 0 0 1 0 1 1 1 0 1 0 0 0 0 0 1 0
## [7481] 1 1 0 0 0 0 0 0 1 1 1 0 1 0 1 0 1 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 1 0
## [7515] 0 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 0 0 0 1 0
## [7549] 0 1 0 0 1 0 0 0 1 1 1 0 0 1 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 0 0 1
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## [22135] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [22169] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1
## [22203] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
## [22237] 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1
```

```

## [22271] 0 1 0 1 0 0 0 1 0 1 0 0 1 1 1 1 0 1 1 1 1 1 1 1 1 0 1 1 0 1 0 0 1 0
## [22305] 0 1 0 1 0 1 0 0 1 1 0 1 0 0 1 0 1 1 1 1 0 1 0 0 1 0 1 0 0 0 1 1 1 0
## [22339] 1 1 1 0 1 0 1 0 0 0 0 0 1 1 0 1 0 0 0 1 0 0 1 0 1 0 0 1 1 0 0 1 1 1
## [22373] 1 1 0 1 1 0 0 0 0 1 0 0 1 0 1 1 0 1 0 0 0 0 0 1 0 0 0 1 0 0 0 0 1 0
## [22407] 0 0 1 0 1 0 1 1 0 0 0 1 1 1 1 1 1 0 0 1 1 0 1 1 1 1 1 1 1 0 1 0 0 1
## [22441] 0 1 1 1 0 0 0 1 1 0 1 1 1 1 1 1 0 1 1 0 1 0 0 1 1 1 1 1 0 1 0 0 1 1
## [22475] 0 0 1 1 1 1 1 1 1 1 0 1 1 0 1 1 1 0 0 0 1 1 0 1 0 0 1 0 1 1 1 1 1 1
## [22509] 0 0 0 0 1 1 0 1 0 1 1 1 1 1 1 0 0 1 0 0 0 0 0 1 1 1 0 0 1 1 1 1 1 0
## [22543] 0 0 1 0 1 0 0 1 0 1 0 1 0 1 1 1 0 1 1 1 1 1 0 1 0 0 0 1 0 0 1 0 1 0
## [22577] 0 1 1 1 1 0 0 1 0 1 1 1 1 1 1 1 0 0 1 1 0 1 0 1 0 1 1 0 1 1 1 1 0 0
## [22611] 0 0 0 1 1 1 0 0 1 0 0 1 1 1 1 1 1 1 0 0 1 0 0 1 1 0 0 0 0 0 0 1 0 1
## [22645] 1 0 0 1 1 1 1 0 0 1 1 0 1 0 0 0 0 0 1 0 0 0 0 1 0 1 1 0 1 1 1 1 0 1
## [22679] 0 0 1 1 0 1 1 0 1 0 1 0 1 1 1 0 1 1 0 1 0 1 1 1 1 1 0 0 0 1 1 1 1 1
## [22713] 1 1 1 1 0 0 0 1 1 1 0 0 0 0 1 0 0 1 0 1 0 1 1 0 0 0 0 0 1 0 1 1 0 1
## [22747] 0 0 1 1 1 0 1 1 0 0 0 0 1 0 0 1 0 1 1 0 1 1 0 1 1 0 0 0 0 1 0 1 0
## [22781] 0 0 0 1 0 0 0 0 1 1 1 1 1 0 1 1 1 1 1 0 0 1 0 0 0 0 0 1 1 1 0 0 1 0
## [22815] 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 0 1 1 1
## [22849] 0 1 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0
## [22883] 1 0 0 1 0 1 0 0 1 0 1 0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 1 1 1 1 1 0 1 0
## [22917] 1 0 1 1 1 0 1 1 1 1 0 1 1 1 1 1 1 0 0 1 1 1 0 1 1 1 1 0 1 1 0 1 1 1
## [22951] 0 1 1 0 0 1 1 1 1 1 1 0 0 1 0 1 0 1 1 1 0 1 1 1 0 1 0 0 0 1 0 1 1 1
## [22985] 1 1 1 1 1 1 0 0 1 0 1 1 1 0 0 0 0 0 1 1 1 0 1 0 1 1 0 0 1 0 1 0 1 1
## [23019] 1 0 0 1 1 0 1 1 1 1 0 1 1 1 1 1 1 1 1 0 1 0 0 0 0 0 1 1 0 0 1 0 1 1
## [23053] 0 1 1 0 1 0 1 0 0 1 1 1 1 1 0 1 1 1 0 0 1 0 0 1 1 1 1 0 0 1 1 1 1 1
## [23087] 0 0 0 1 0 1 0 1 1 0 1 0 1 1 1 0 0 1 1 0 1 1 0 0 1 0 1 0 1 0 1 1 0 1
## [23121] 0 1 1 0 0 1 0 1 0 1 0 1 1 0 1 0 1 0 0 1 0 1 1 0 0 1 0 0 0 1 1 0 1 0
## [23155] 0 1 1 1 0 1 0 0 1 1 1 0 0 0 1 1 0 0 1 0 1 0 1 1 1 1 0 0 0 1 1 1 1 1
## [23189] 1 0 0 1 0 1 0 0 0 1 0 0 0 0 1 0 0 0 0 1 1 0 0 1 1 1 0 0 1 0 0 1 0 1
## [23223] 0
##
## $Ntotal
## [1] 23223

```

```

y<-myData$y
(Ntotal<-length(y))

```

```
## [1] 23223
```

In aggregate only around 30% have positive sentiment of obama in 2012.

Let's use a binomial model.

```
# model init
modelString=""
model {
  for (i in 1:length(Ntotal)) {
    y[i]~dbern(theta)
  }
  theta~dbeta(1,1)
}
"

writeLines(modelString,con=paste0(dataPath,"wk4/Tempmodel.txt"))
```

Initialize MCMC.

```
MLE=sum(myData$y)/length(myData$y)
(init1<-MLE)
```

```
## [1] 0.3666193
```

```
(init2<-MLE*(1+.01))
```

```
## [1] 0.3702855
```

```
(init3<-MLE*(1-.01))
```

```
## [1] 0.3629531
```

```
# fx
initsList<-function(){
  thetaInit<-sample(c(init1,init2,init3),1,replace=T)
  return(list(theta=thetaInit))
}

initsList()
```

```
## $theta
## [1] 0.3702855
```

Now JAGS

```
jagsModel<-jags.model(file="Tempmodel.txt",data=dataList,n.chains=3,n.adapt=500)
```

```
## Compiling model graph
##   Resolving undeclared variables
##   Allocating nodes
## Graph information:
##   Observed stochastic nodes: 1
##   Unobserved stochastic nodes: 1
##   Total graph size: 23226
##
## Initializing model
```

Run

```
update(jagsModel,n.iter=600)

codaSamples<-coda.samples(jagsModel,variable.names=c("theta"),n.iter=3334)
list.samplers(jagsModel)
```

```
## $`bugs::ConjugateBeta`
## [1] "theta"
```

```
head(codaSamples)
```

```
## [[1]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta
## [1,] 0.1213590
## [2,] 0.6772252
## [3,] 0.3596347
## [4,] 0.3044383
## [5,] 0.3921546
## [6,] 0.3243165
## [7,] 0.3022703
##
## [[2]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta
## [1,] 0.2304206
## [2,] 0.1528788
## [3,] 0.0573860
## [4,] 0.3129044
## [5,] 0.5480119
## [6,] 0.6407252
## [7,] 0.1380623
##
## [[3]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
```

```
##          theta
## [1,] 0.01211703
## [2,] 0.63642603
## [3,] 0.19173860
## [4,] 0.52285702
## [5,] 0.41412858
## [6,] 0.47666132
## [7,] 0.49672403
##
## attr(,"class")
## [1] "mcmc.list"
```

```
summary(codaSamples)
```

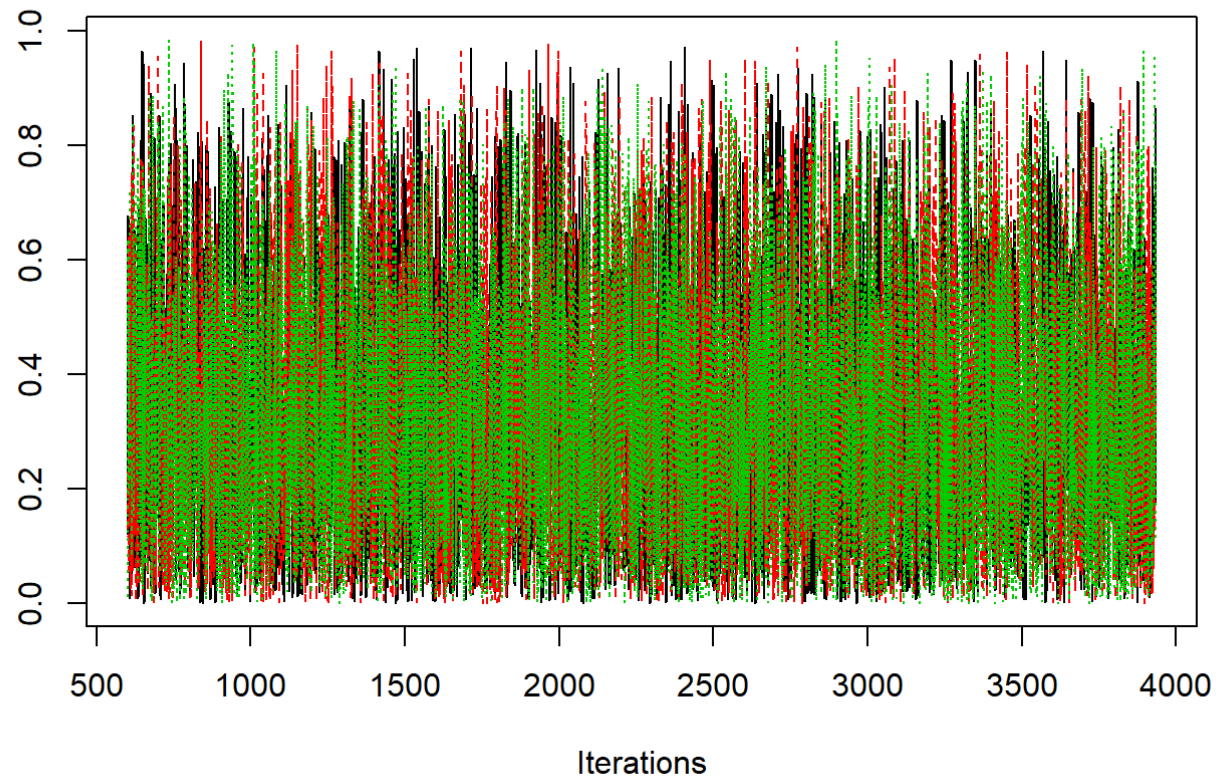
```
##
## Iterations = 601:3934
## Thinning interval = 1
## Number of chains = 3
## Sample size per chain = 3334
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean           SD      Naive SE Time-series SE
##      0.333099      0.235615      0.002356      0.002378
##
## 2. Quantiles for each variable:
##
##      2.5%      25%      50%      75%      97.5%
## 0.01183 0.13380 0.29234 0.50441 0.84075
```

So the mean value has a pretty high std error. We can see in the theta values as well how spread the theta estimates can be.

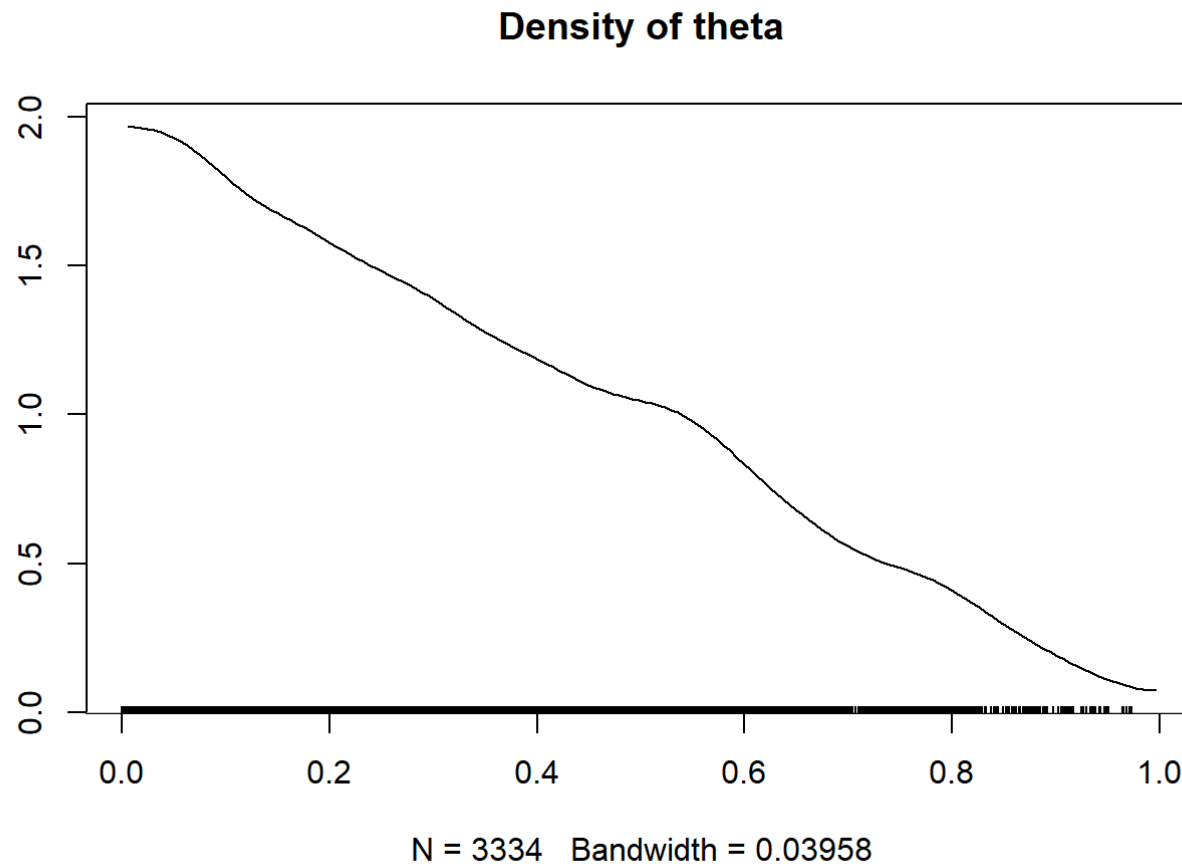
More diagnostics.

```
coda::traceplot(codaSamples)
```


Trace of theta

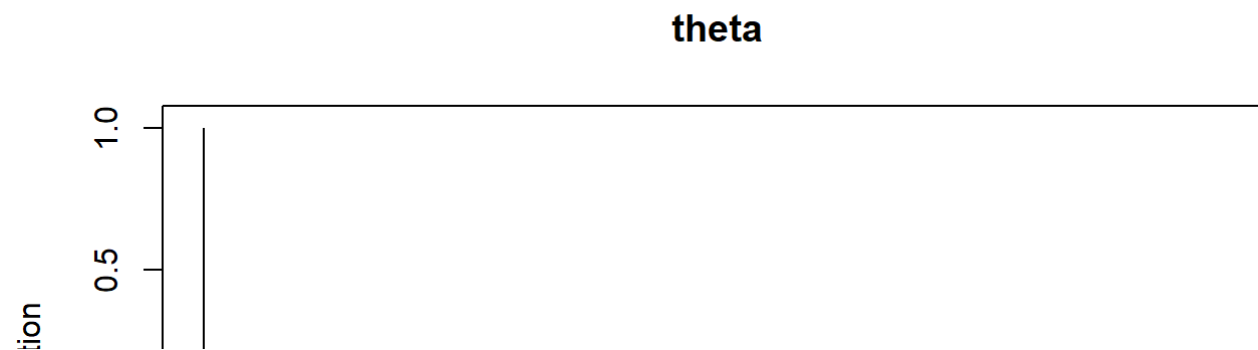
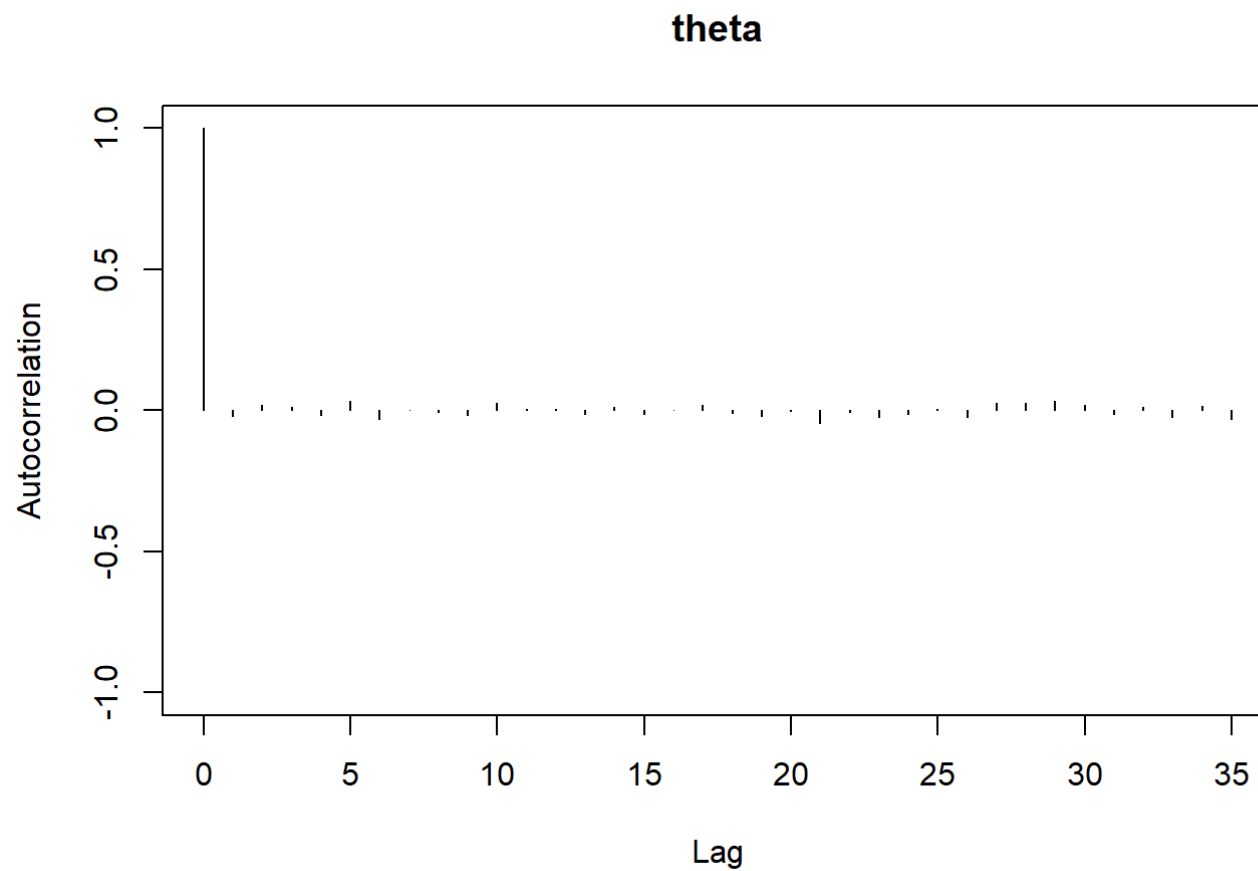


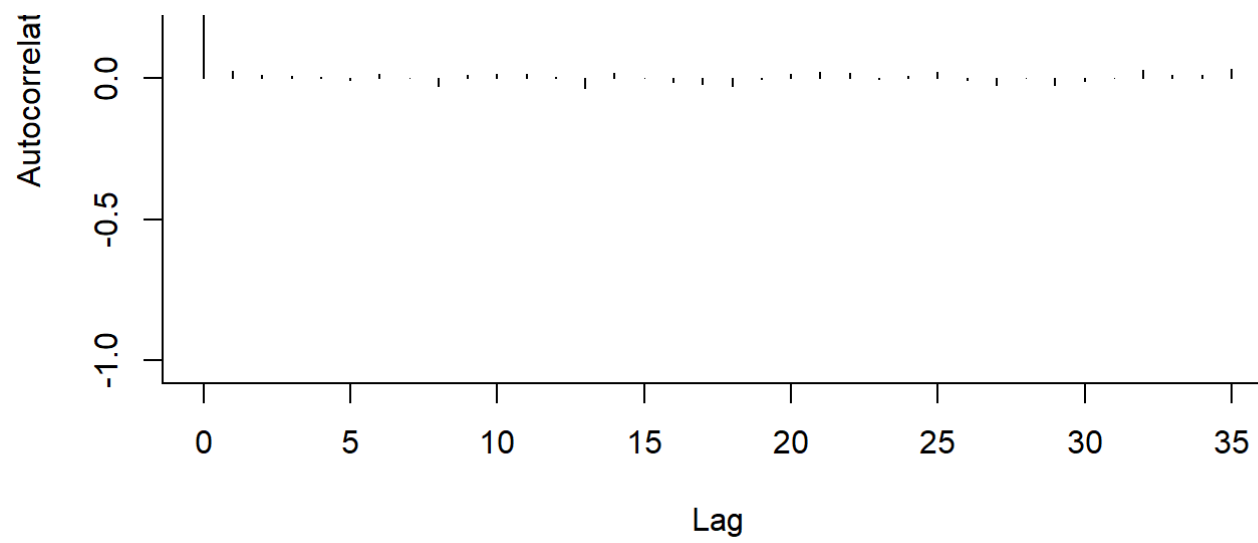
```
densplot(codaSamples)
```

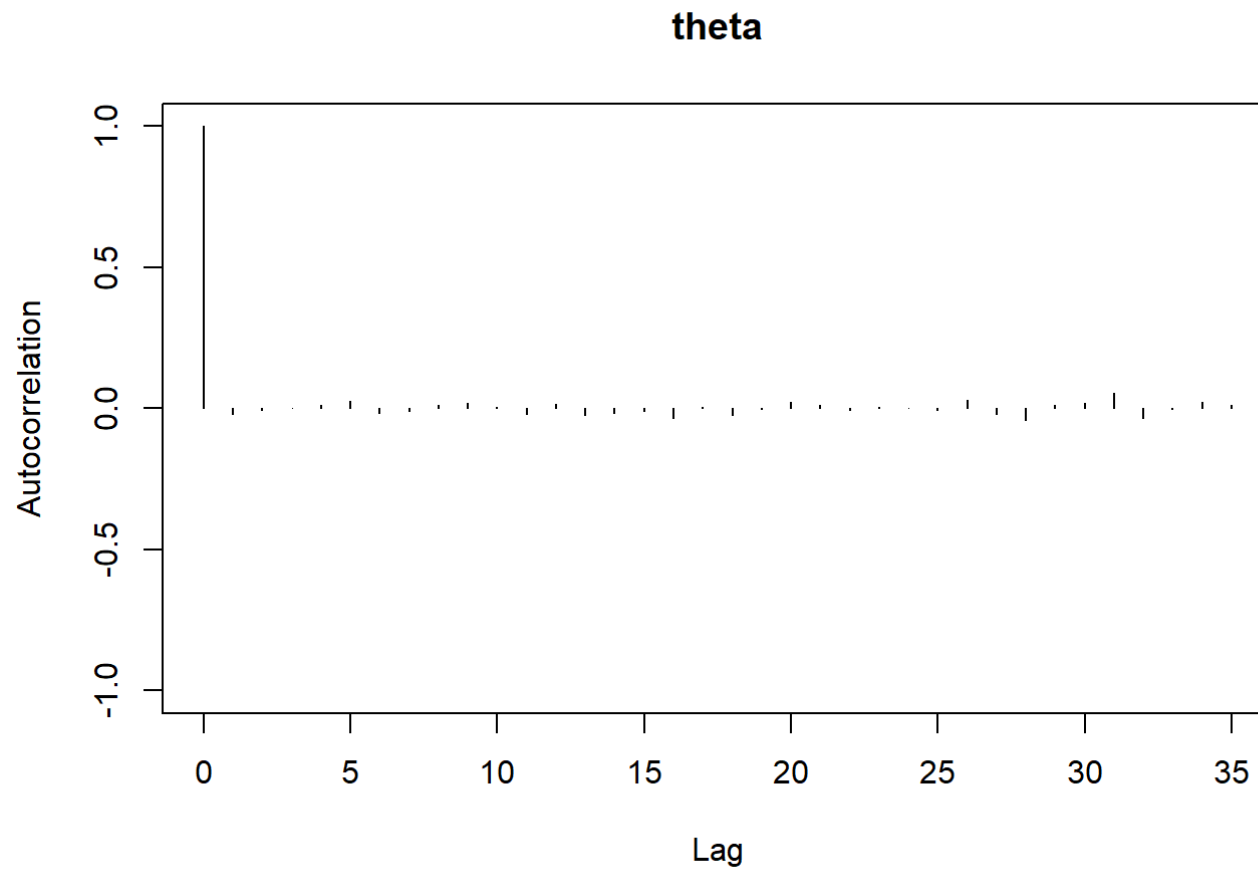


We can see in the density plot that we have no gaussian shape to theta.

```
autocorr.plot(codaSamples,ask=F)
```





```
effectiveSize(codaSamples)
```

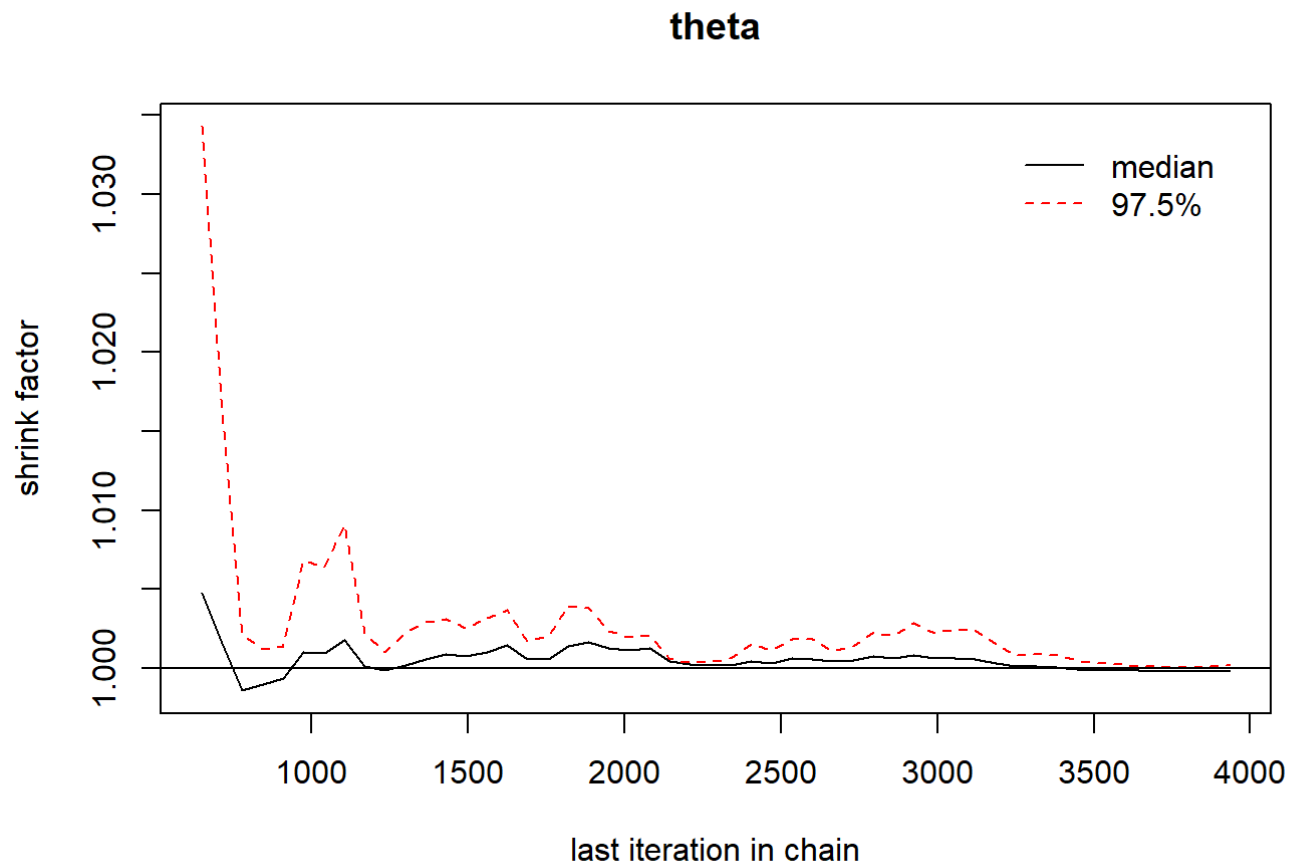
```
##      theta  
## 9828.257
```

Don't see autocorrelation, though, so don't believe we have convergence issues.

```
gelman.diag(codaSamples)
```

```
## Potential scale reduction factors:  
##  
##      Point est. Upper C.I.  
## theta          1          1
```

```
gelman.plot(codaSamples)
```



Gelman shrinkage suggests convergence was fine as well.

```
lapply(codaSamples,mean)
```

```
## [[1]]  
## [1] 0.338489  
##  
## [[2]]  
## [1] 0.3286866  
##  
## [[3]]  
## [1] 0.3321222
```

```
sum(y)/Ntotal
```

```
## [1] 0.3666193
```

```
# posterior densities vs theortical  
(l<-min(unlist(codaSamples))-.05)
```

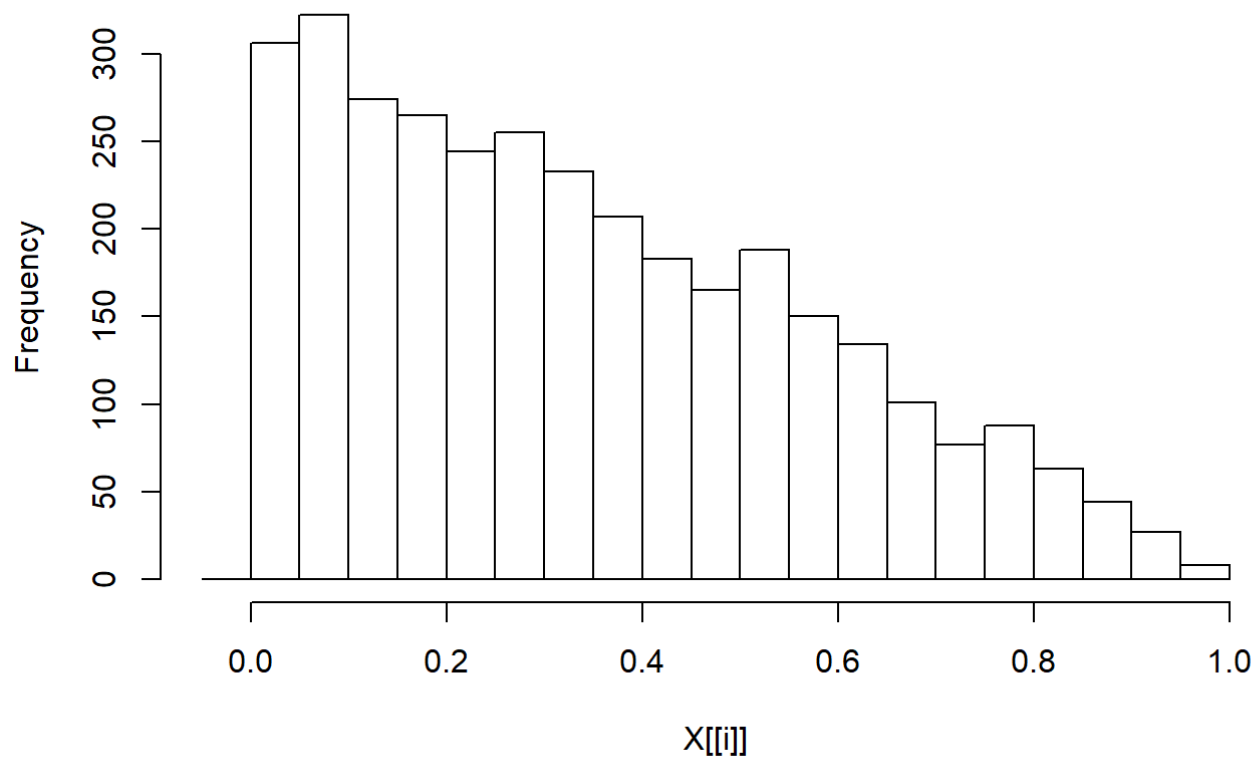
```
## [1] -0.04995079
```

```
(h<-max(unlist(codaSamples))+.05)
```

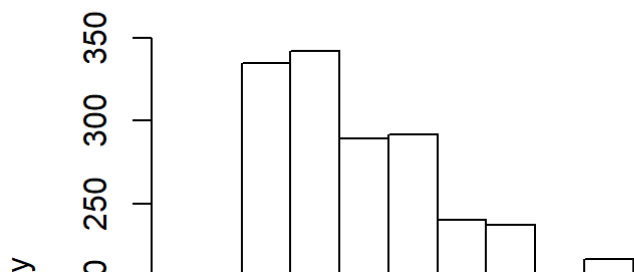
```
## [1] 1.03551
```

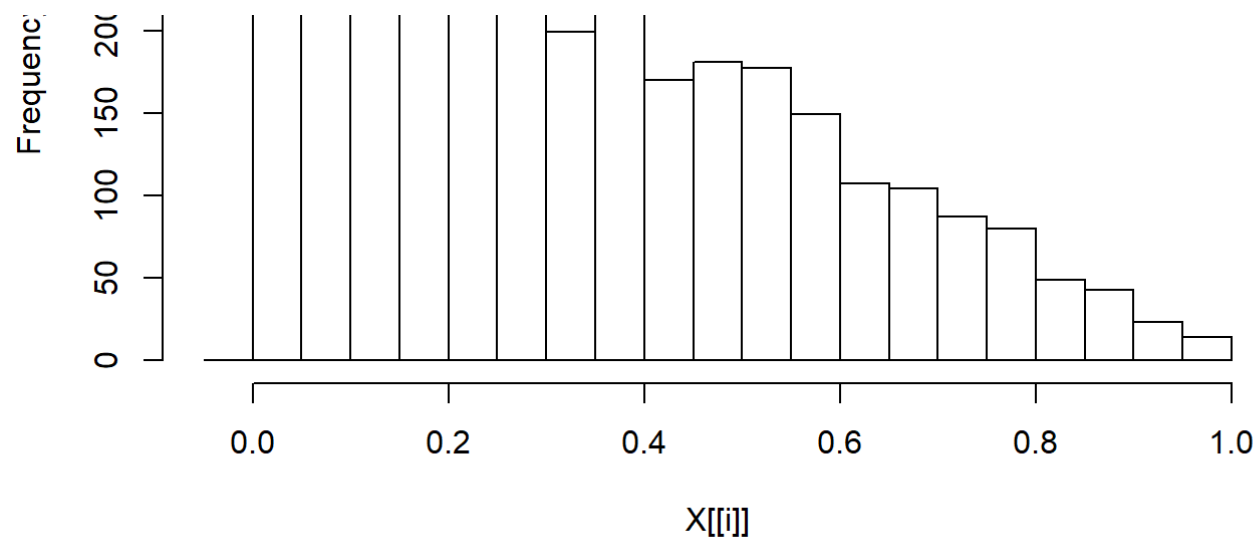
```
histBreaks<-seq(l,h,by=.05)  
postHist<-lapply(codaSamples,hist,breaks=histBreaks)
```

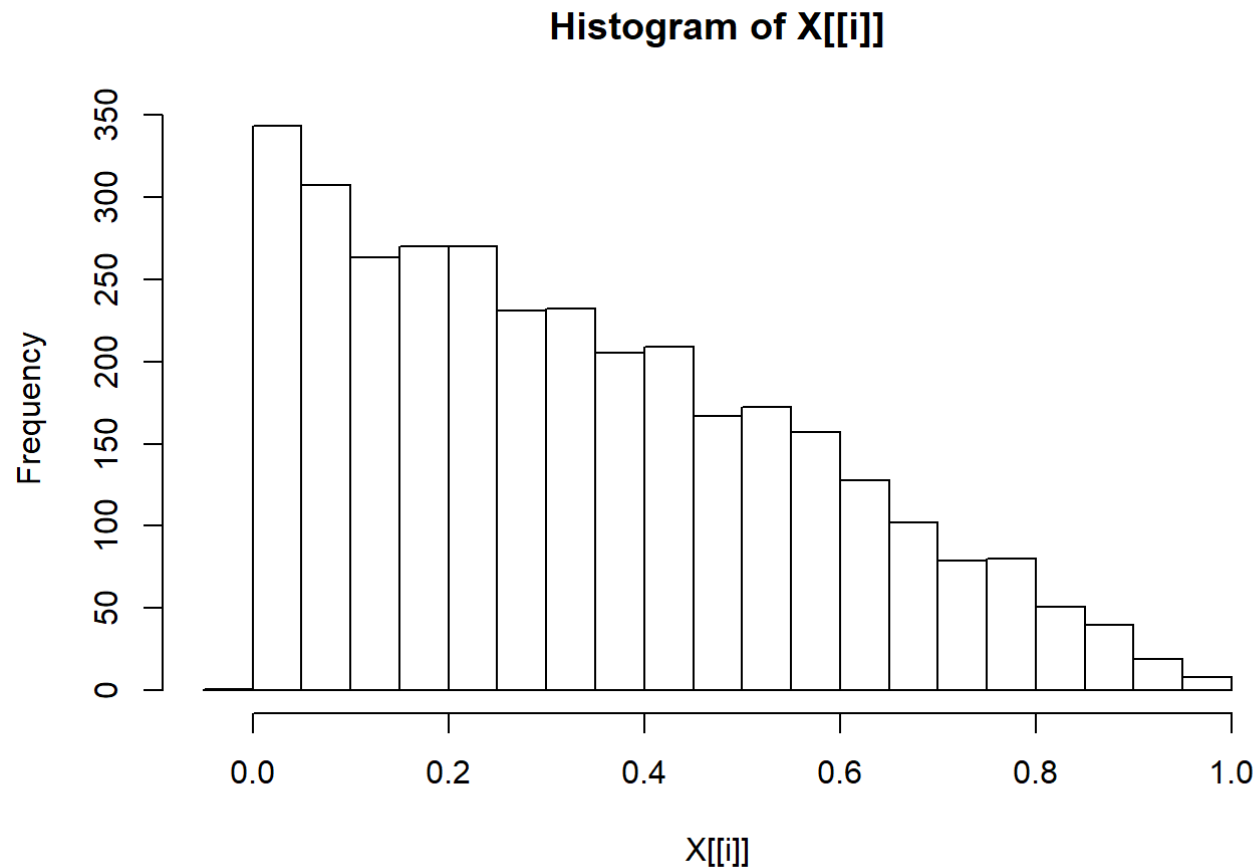

Histogram of X[[i]]



Histogram of X[[i]]







We can see that our simple binomial breaks down.

Most likely we have two different groups (republican vs democratic). They have the same prior, but different thetas.

However we don't have that information. Let's see if one based solely upon race would work.

```
unique(myData$race)
```

```
## [1] 1.White    2.Black    3.Hispanic 4.Other
## Levels: 1.White 2.Black 3.Hispanic 4.Other
```

```
unique(as.numeric(myData$race))
```

```
## [1] 1 2 3 4
```

```
unique(myData$education)
```

```
## [1] 1.NoCollege      2.SomeCollege    3.CollegeOrMore
## Levels: 1.NoCollege 2.SomeCollege 3.CollegeOrMore
```

```
#string
(s<-as.numeric(myData$race))
```

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

##	[6869]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[6903]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[6937]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[6971]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7005]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7039]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7073]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7107]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7141]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7175]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7209]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7243]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7277]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7311]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7345]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7379]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7413]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7447]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7481]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7515]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7549]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7583]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7617]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7651]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7685]	1	1	1	1																					

##	[8127]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8161]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8195]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8229]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8263]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8297]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8331]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8365]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8399]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8433]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8467]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8501]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8535]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8569]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8603]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8637]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8671]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8705]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8739]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8773]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8807]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8841]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8875]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8909]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8943]	1	1	1	1																					

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

```
(Nsubj=length(unique(s)))
```

```
## [1] 4
```

```
(dataList<-list(y=y,s=s,Ntotal=Ntotal,Nsubj=Nsubj))
```

##	\$y
##	[1] 0 0 0 0 0 0 1 0 1 0 0 1 0 0 1 0 1 0 0 0 1 0 0 0 1 0 1 0 0 0 0 0 0
##	[35] 0 0 1 0 0 0 0 1 0 0 0 0 1 0
##	[69] 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0
##	[103] 1 1 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 1
##	[137] 0 0 1 1 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0
##	[171] 1 0 0 1 0 1 0 1 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0
##	[205] 1 1 0 1 0 1 0 0 0 0 0 0 1 0 0 1 0 1 0 1 1 1 0 0 0 1 0 0 0 0 0 0 1
##	[239] 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 0 0 0 0 0 0 0 0
##	[273] 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0
##	[307] 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 1 1
##	[341] 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0
##	[375] 0 1 0 0 0 0 0 0 0 1 1 0
##	[409] 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 1 0 1 0 0 1 1 0 0 0 1 0 0 0 0 0 0 1
##	[443] 1 0 0 0 1 0 1 0 1 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 1 0 1 0 0 0 1 0 0
##	[477] 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 0 0 0 1 0 1 1
##	[511] 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 0 1 1
##	[545] 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0
##	[579] 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0
##	[613] 0 0 0 0 0 0 0 1 0 0 0 1 0 0 1 0 0 1 1 0 1 0 0 0 0 1 1 0 0 1 0 0
##	[647] 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0
##	[681] 0 0 1 1 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 0
##	[715] 0 0 0 1 0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 1 0
##	[749] 0 0 0 1 0 0 0 0 0 0 1 1 1 0 0 0 1 0 1 1 0 0 0 0 0 1 0 0 0 0 0 0
##	[783] 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0


```
## [817] 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 0 0 1 0 0 1 0 0 0
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##	[8093]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8127]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8161]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8195]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8229]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8263]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8297]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8331]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8365]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8399]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8433]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8467]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8501]	1	1	1	1																					

[illegible]

##	[20265]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20299]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20333]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20367]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20401]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20435]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20469]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20503]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20537]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20571]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20605]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20639]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20673]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20707]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20741]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20775]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20809]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20843]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20877]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20911]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20945]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[20979]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[21013]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[21047]	1	1	1	1	1</																					


```
## [22781] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22815] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22849] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22883] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22917] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22951] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22985] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23019] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23053] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23087] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23121] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23155] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23189] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23223] 4
##
## $Ntotal
## [1] 23223
##
## $Nsubj
## [1] 4
```

```
# model

modelString = "
model {
  for ( i in 1:Ntotal ) {
    y[i] ~ dbern( theta[s[i]] )
  }
  for ( sIdx in 1:Nsubj ) {      # Different thetas from same prior
    theta[sIdx] ~ dbeta( 1 , 1 ) # N.B.: 2,2 prior; change as appropriate.
  }
}
" # close quote for modelString
writeLines( modelString , con="TEMP2model.txt" )
```

Initialize MCMC.

```
MLE=sum(myData$y)/length(myData$y)
(init1<-MLE)
```

```
## [1] 0.3666193
```

```
(init2<-MLE*(1+.01))
```

```
## [1] 0.3702855
```

```
(init3<-MLE*(1-.01))
```

```
## [1] 0.3629531
```

```
# fx
initsList<-function(){
  thetaInit<-sample(c(init1,init2,init3),1,replace=T)
  return(list(theta=thetaInit))
}

initsList()
```

```
## $theta
## [1] 0.3629531
```

Now JAGS

```
jagsModel<-jags.model(file="TEMP2model.txt",data=dataList,n.chains=3,n.adapt=500)
```

```
## Compiling model graph
## Resolving undeclared variables
```

```
## Allocating nodes
## Graph information:
## Observed stochastic nodes: 23223
## Unobserved stochastic nodes: 4
## Total graph size: 46453
##
## Initializing model
```

Run

```
update(jagsModel,n.iter=600)

codaSamples<-coda.samples(jagsModel,variable.names=c("theta"),n.iter=3334)
list.samplers(jagsModel)
```

```
## $`bugs::ConjugateBeta`
## [1] "theta[4]"
##
## $`bugs::ConjugateBeta`
## [1] "theta[3]"
##
## $`bugs::ConjugateBeta`
## [1] "theta[2]"
##
## $`bugs::ConjugateBeta`
## [1] "theta[1]"
```

```
head(codaSamples)
```

```
## [[1]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta[1] theta[2] theta[3] theta[4]
```

```
## [1,] 0.3030885 0.9340568 0.5313925 0.5033952
## [2,] 0.3067324 0.9560662 0.4924604 0.4931066
## [3,] 0.3038674 0.9524611 0.5382909 0.5083937
## [4,] 0.2996785 0.9321132 0.4955894 0.4999585
## [5,] 0.3066848 0.9456557 0.5376985 0.5005850
## [6,] 0.3030603 0.9454279 0.5243446 0.5069534
## [7,] 0.3030202 0.9453276 0.5304038 0.5027273
##
## [[2]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta[1]  theta[2]  theta[3]  theta[4]
## [1,] 0.3065541 0.9428559 0.5350566 0.5053597
## [2,] 0.3055860 0.9431563 0.5136666 0.5168950
## [3,] 0.2999482 0.9388451 0.5057221 0.5360391
## [4,] 0.3078730 0.9323992 0.5411187 0.5154892
## [5,] 0.3056800 0.9417376 0.5358905 0.5107522
## [6,] 0.3021780 0.9377043 0.5465552 0.5041402
## [7,] 0.3063987 0.9422419 0.5016009 0.5052771
##
## [[3]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta[1]  theta[2]  theta[3]  theta[4]
## [1,] 0.2972942 0.9390375 0.5273351 0.5137896
## [2,] 0.3054516 0.9408742 0.5238374 0.5076798
## [3,] 0.3028822 0.9398501 0.5087252 0.5194587
## [4,] 0.2953563 0.9482380 0.5043649 0.4967933
## [5,] 0.3019010 0.9417849 0.5105387 0.5039694
## [6,] 0.3057711 0.9575114 0.5173636 0.5057964
## [7,] 0.2988699 0.9445329 0.5198818 0.5073096
##
```



```
## attr(,"class")
## [1] "mcmc.list"
```

```
summary(codaSamples)
```

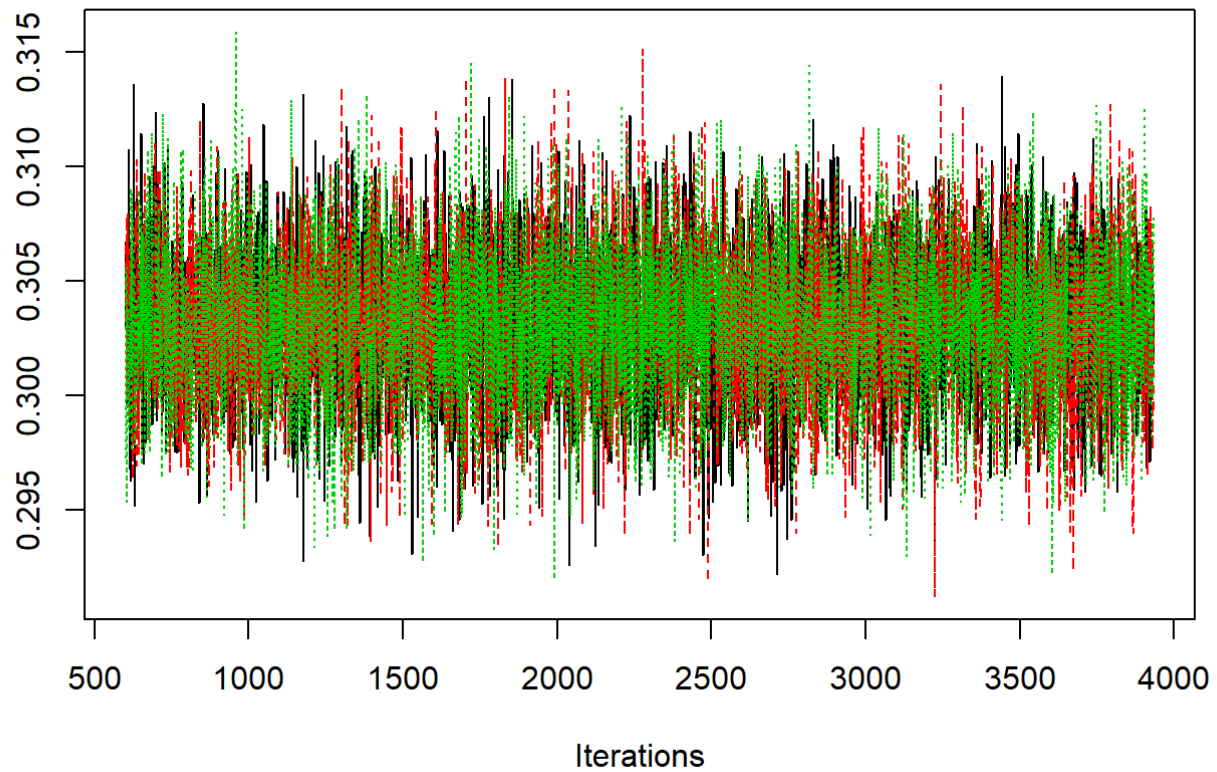
```
##
## Iterations = 601:3934
## Thinning interval = 1
## Number of chains = 3
## Sample size per chain = 3334
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean          SD Naive SE Time-series SE
## theta[1] 0.3032 0.003271 3.271e-05    3.271e-05
## theta[2] 0.9418 0.005944 5.944e-05    5.770e-05
## theta[3] 0.5268 0.016371 1.637e-04    1.637e-04
## theta[4] 0.5091 0.014156 1.416e-04    1.494e-04
##
## 2. Quantiles for each variable:
##
##           2.5%    25%    50%    75%   97.5%
## theta[1] 0.2968 0.3010 0.3032 0.3054 0.3096
## theta[2] 0.9298 0.9379 0.9420 0.9459 0.9530
## theta[3] 0.4949 0.5157 0.5269 0.5377 0.5596
## theta[4] 0.4820 0.4994 0.5090 0.5186 0.5372
```

There we go! Look at the mean and sd for each. Naive SE is much lower e4 vs e2 in the first.

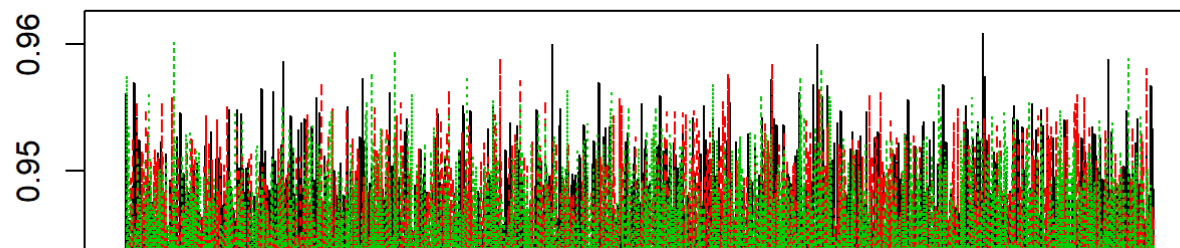
White (group1) has a very different mean theta as does black.

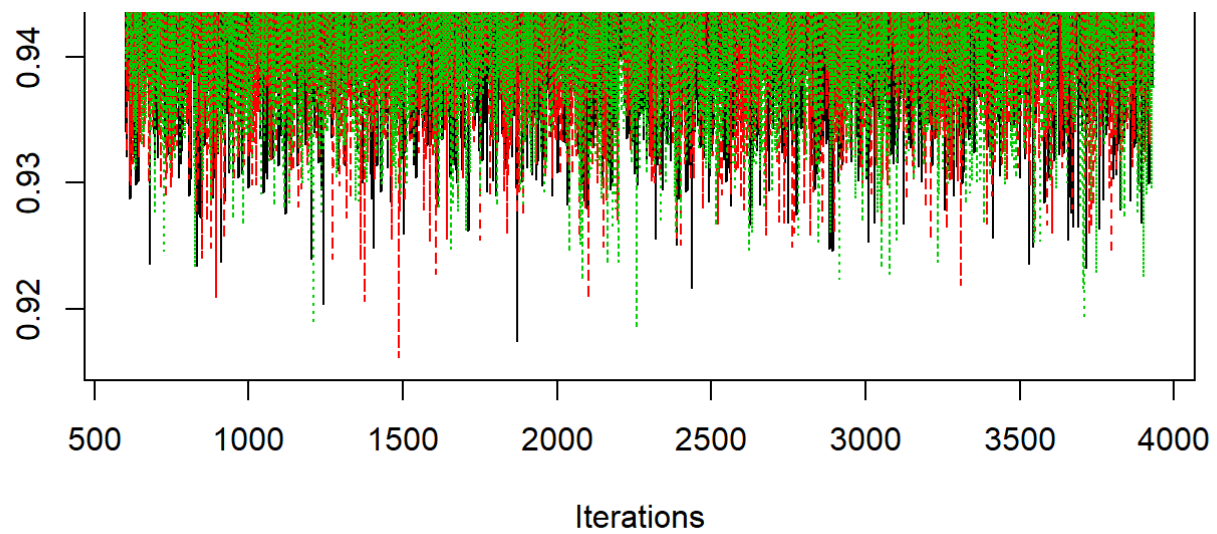
```
coda::traceplot(codaSamples)
```


Trace of theta[1]

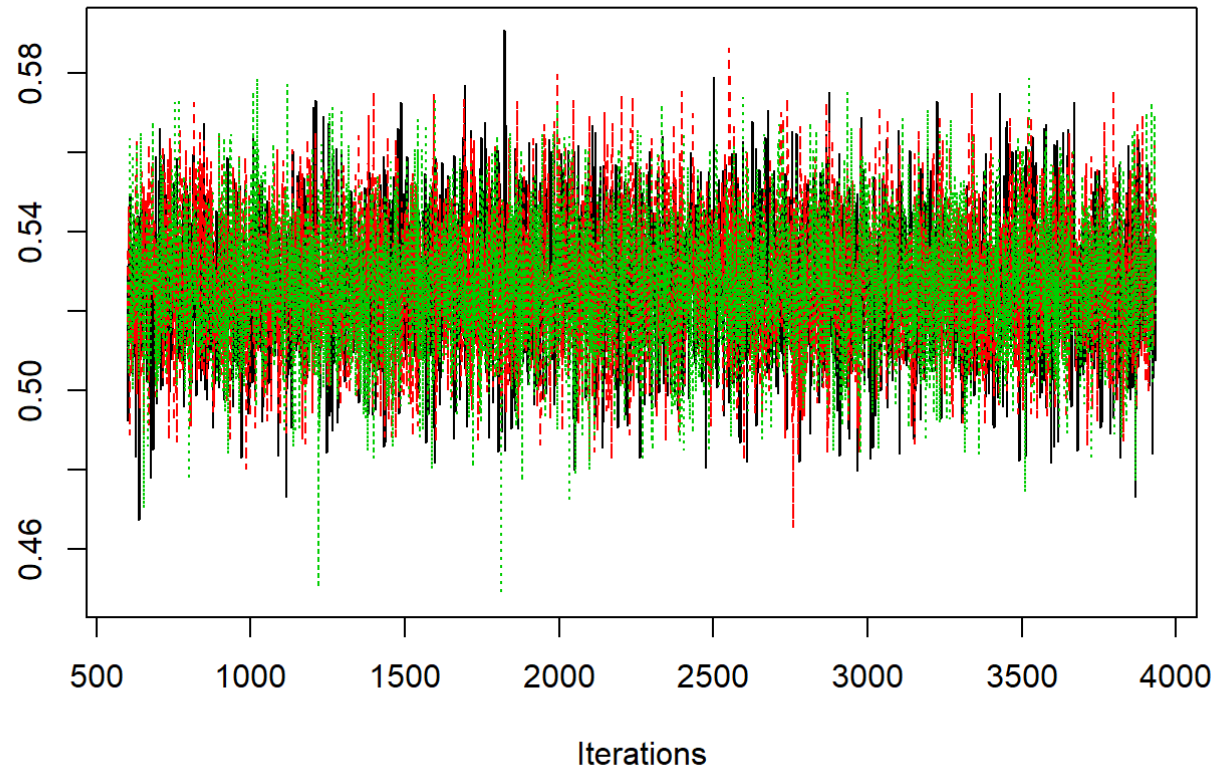


Trace of theta[2]

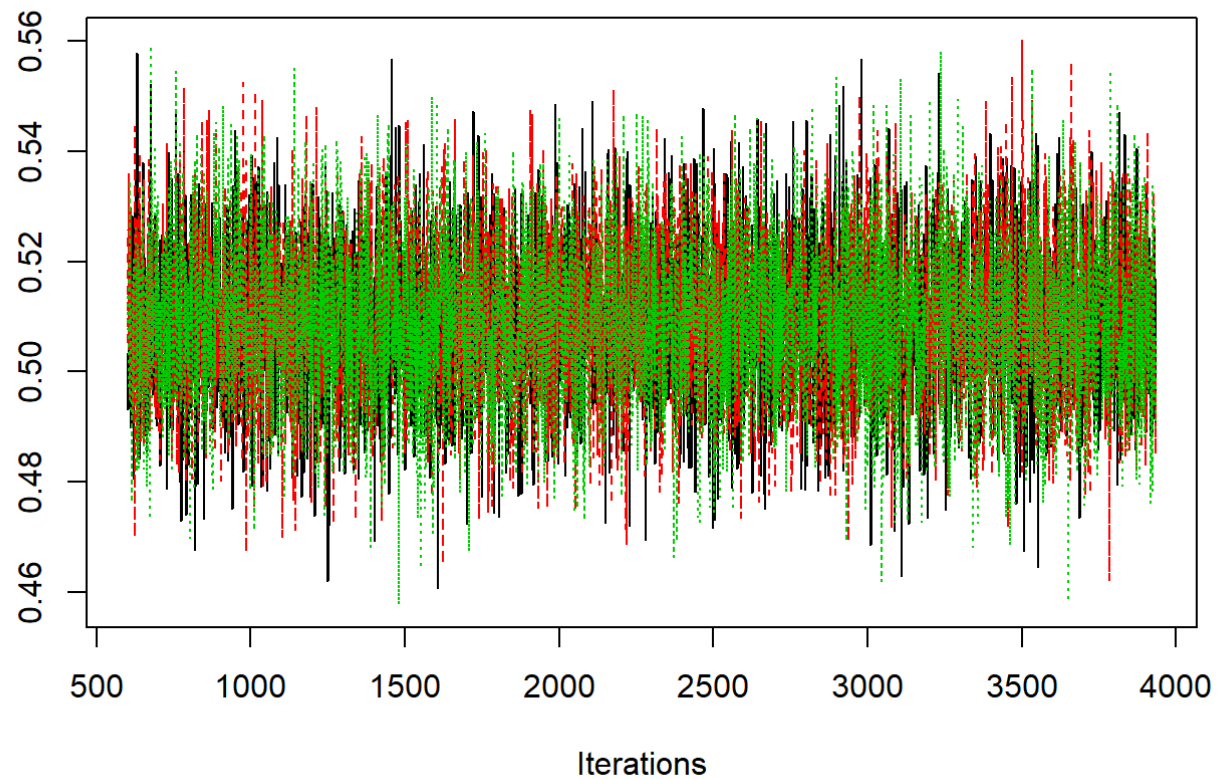




Trace of theta[3]

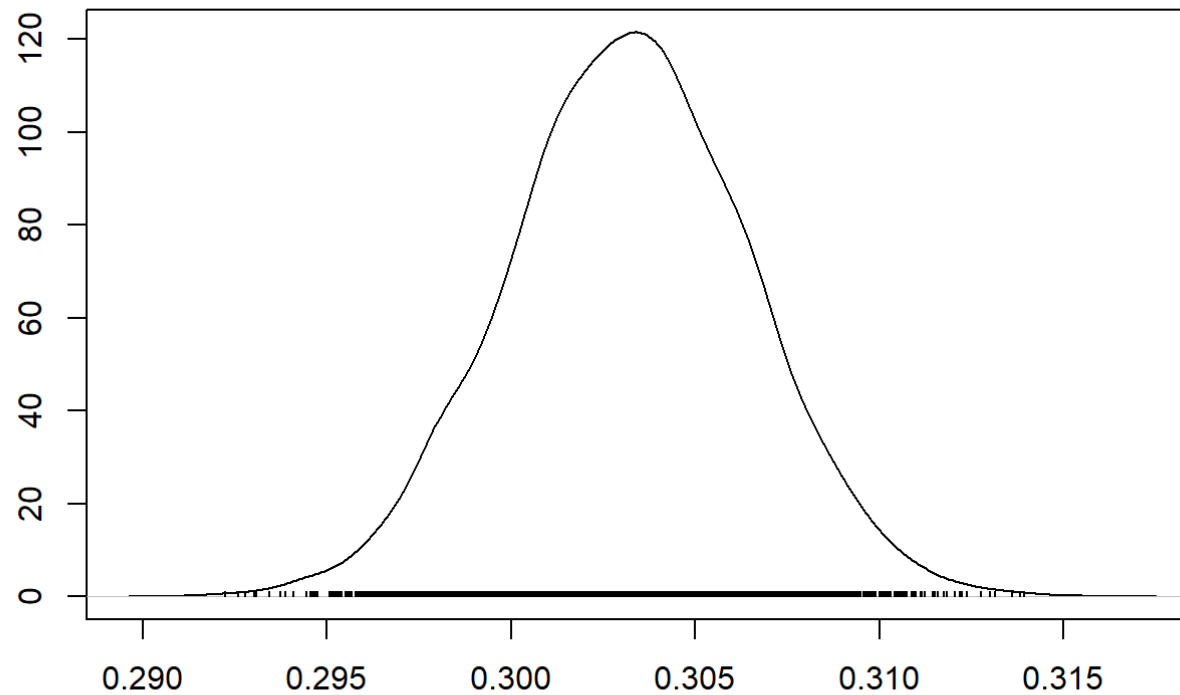


Trace of theta[4]



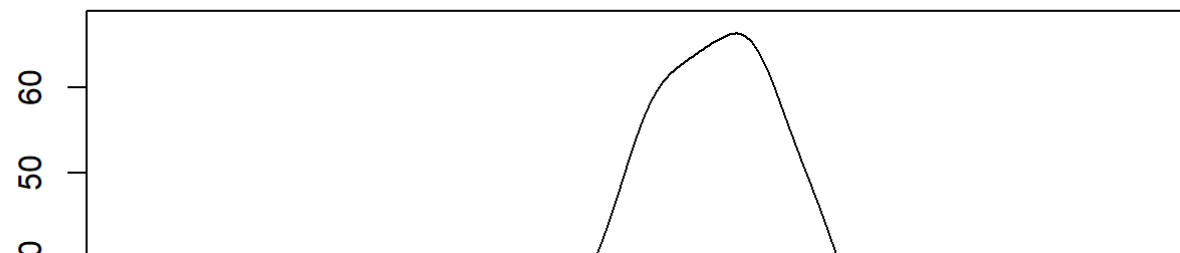
```
densplot(codaSamples)
```

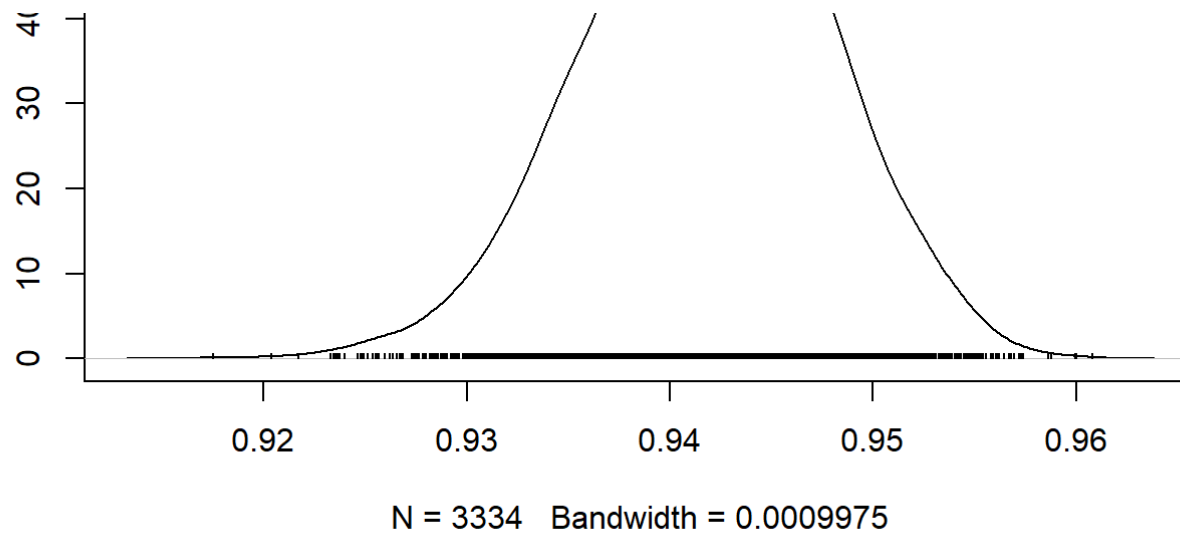

Density of theta[1]



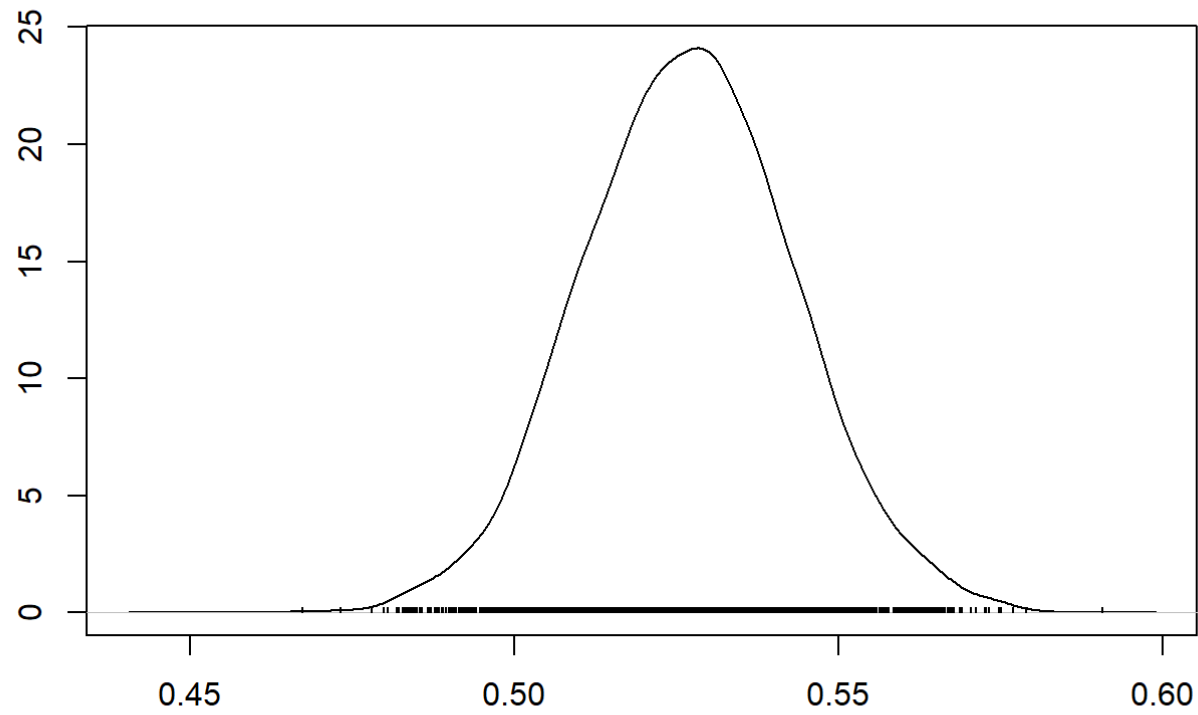
N = 3334 Bandwidth = 0.0005495

Density of theta[2]

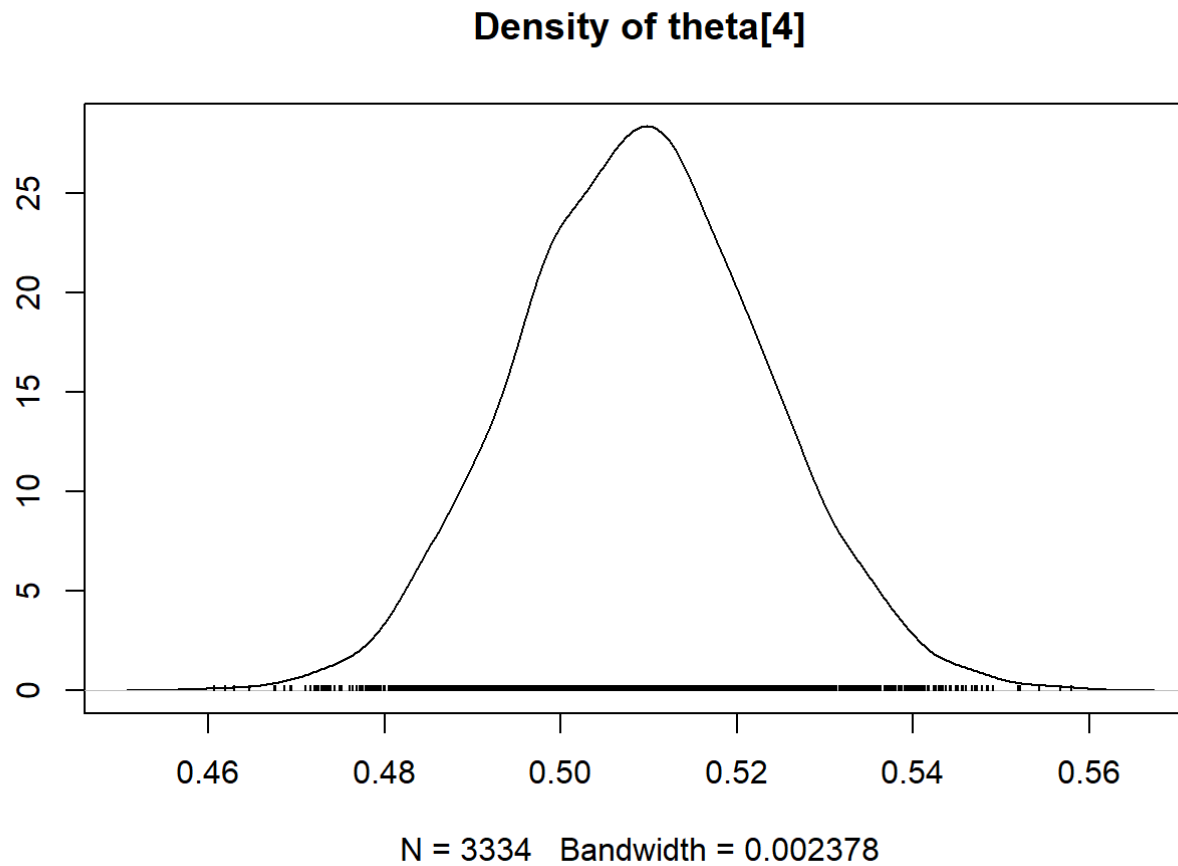




Density of theta[3]

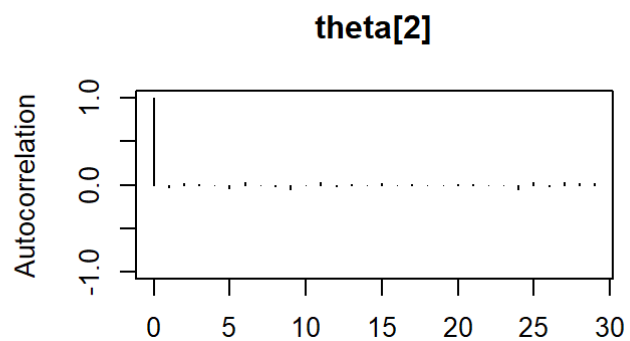
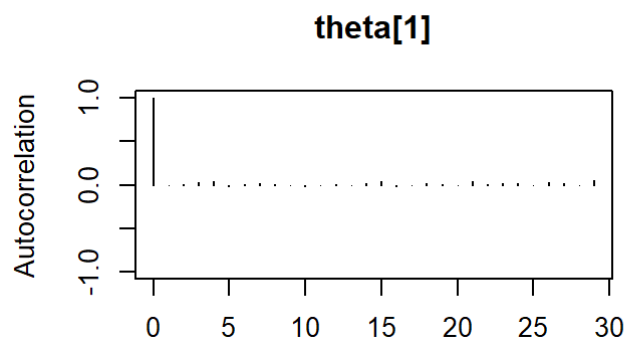
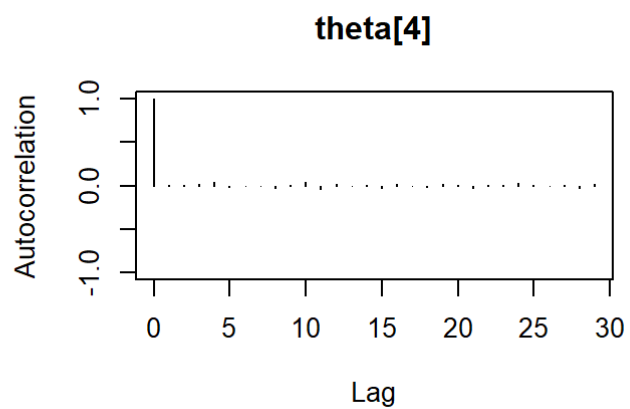
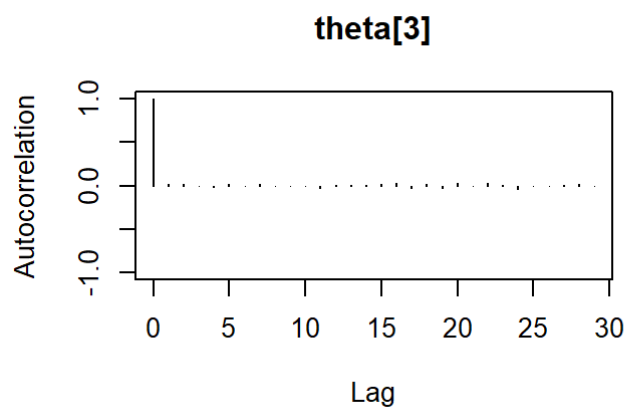
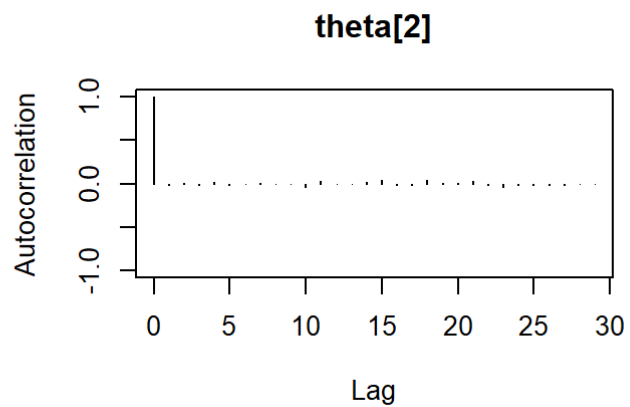
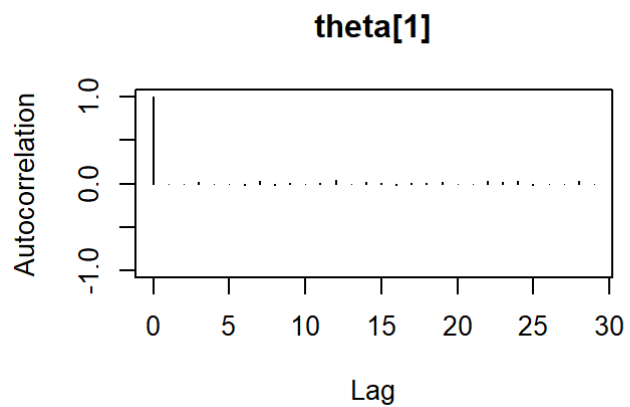


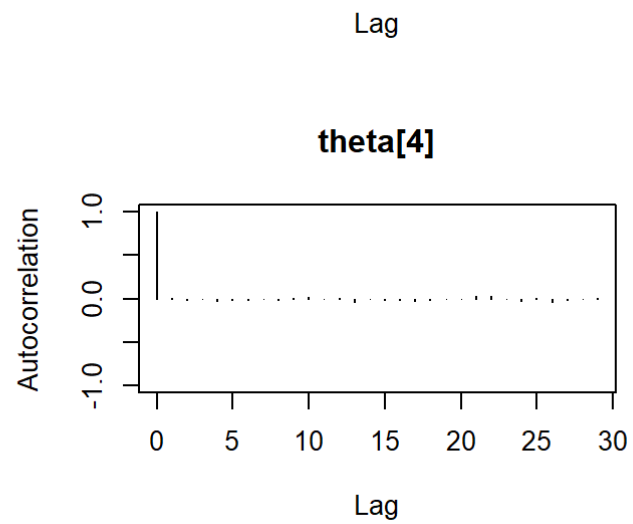
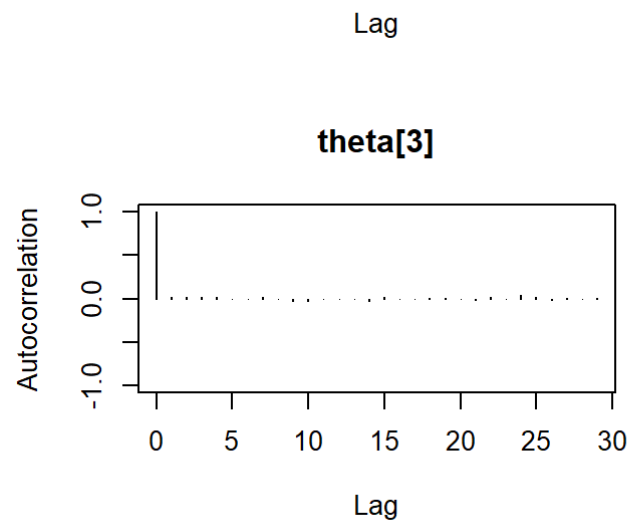
N = 3334 Bandwidth = 0.00275

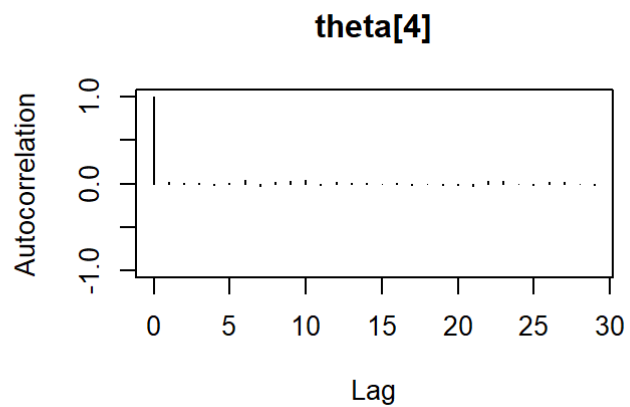
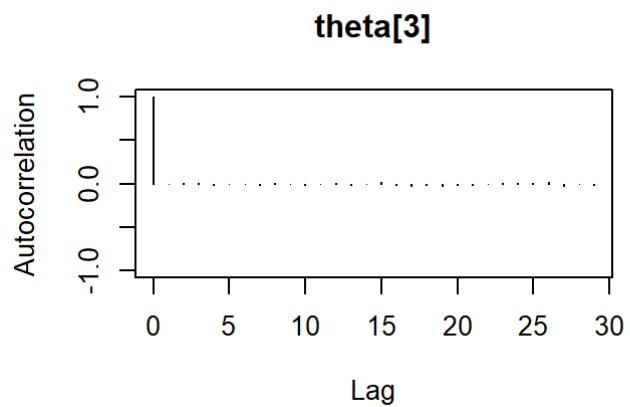
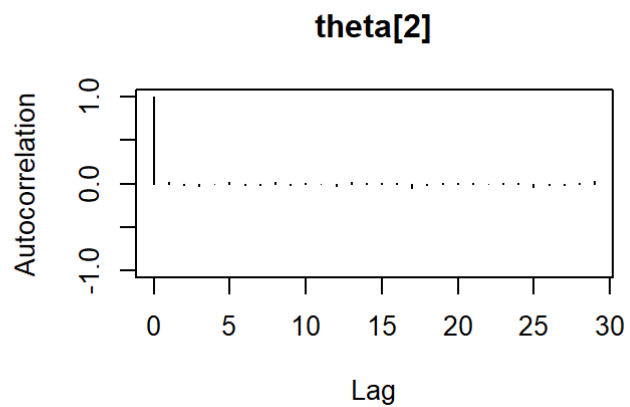
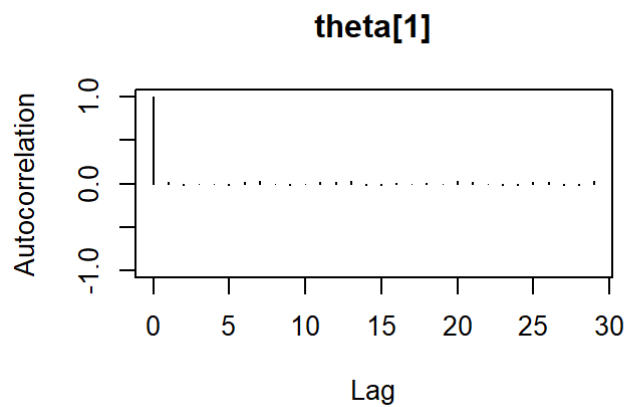


Shape is better now too.

```
autocorr.plot(codaSamples,ask=F)
```





```
effectiveSize(codaSamples)
```

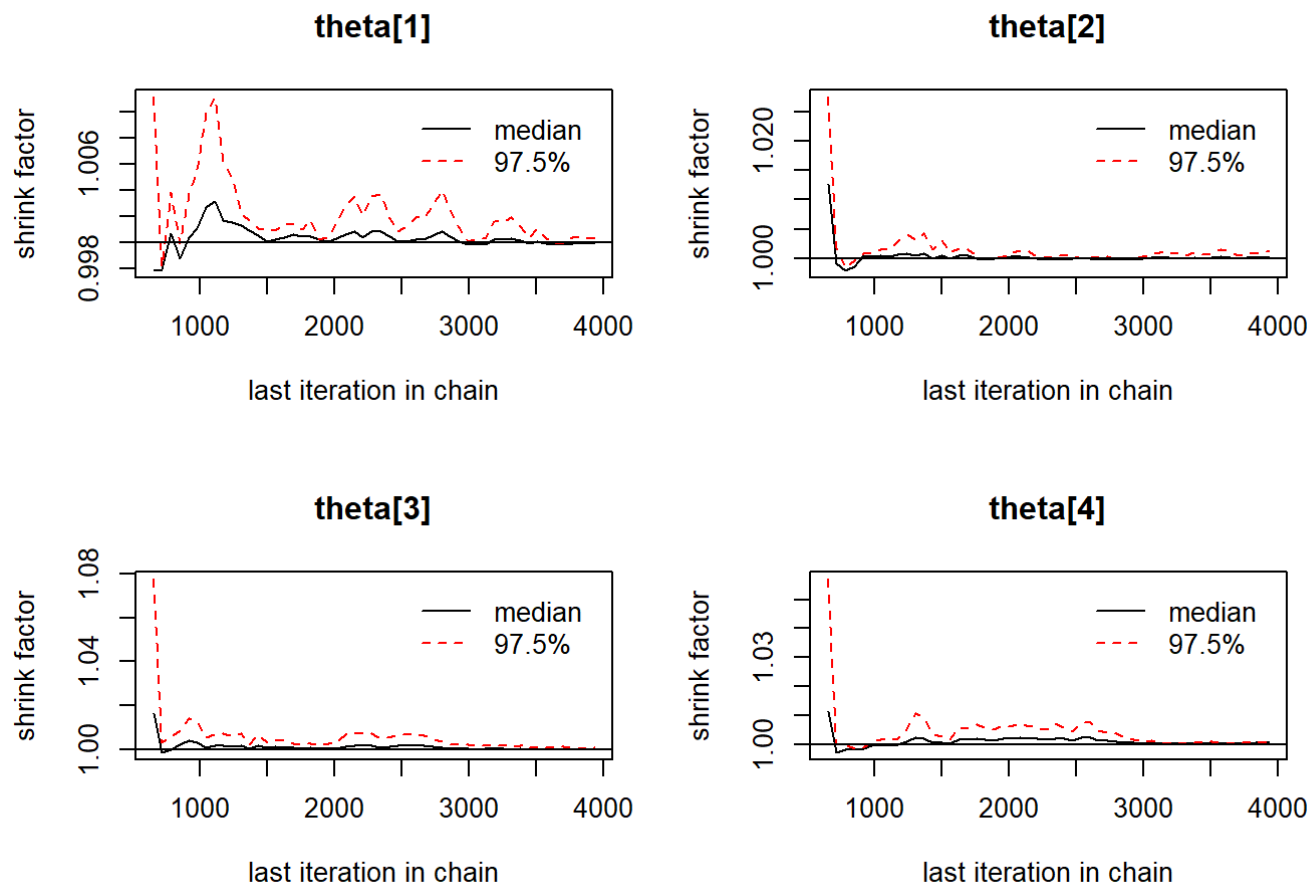
```
## theta[1] theta[2] theta[3] theta[4]  
## 10002.000 10689.456 10002.000 9193.502
```

Don't see autocorrelation, though, so don't believe we have convergence issues.

```
gelman.diag(codaSamples)
```

```
## Potential scale reduction factors:  
##  
##      Point est. Upper C.I.  
## theta[1]      1      1  
## theta[2]      1      1  
## theta[3]      1      1  
## theta[4]      1      1  
##  
## Multivariate psrf  
##  
## 1
```

```
gelman.plot(codaSamples)
```

Gelman shrinkage suggests convergence was fine as well.

```
matrix(unlist(lapply(codaSamples, function(z) apply(z, 2, mean))), ncol=3)
```

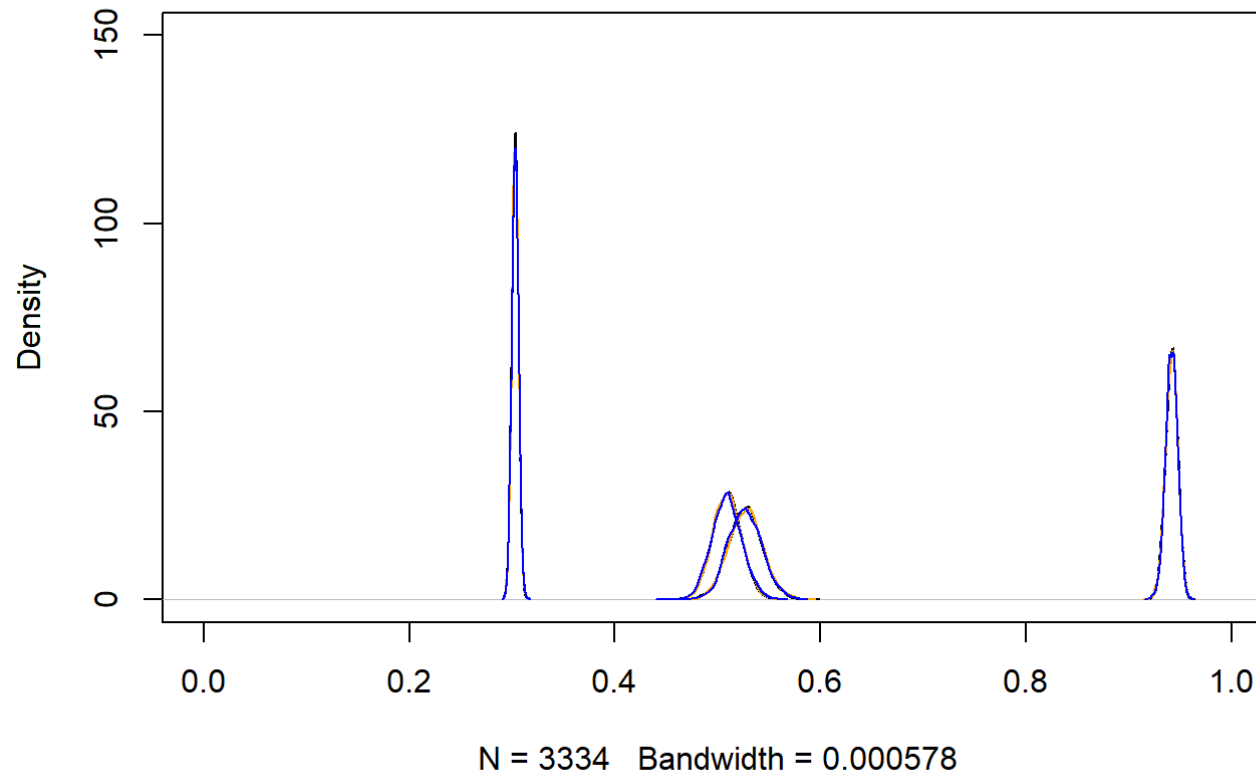
```
##           [,1]      [,2]      [,3]
## [1,] 0.3031530 0.3032098 0.3032070
## [2,] 0.9418897 0.9417659 0.9417381
## [3,] 0.5266226 0.5273744 0.5265507
## [4,] 0.5090243 0.5093565 0.5089986
```

```
plot(density(codaSamples[[1]][,1]),xlim=c(0,1),ylim=c(0,150))
lines(density(codaSamples[[1]][,2]))
lines(density(codaSamples[[1]][,3]))
lines(density(codaSamples[[1]][,4]))

lines(density(codaSamples[[2]][,1]),col="orange")
lines(density(codaSamples[[2]][,2]),col="orange")
lines(density(codaSamples[[2]][,3]),col="orange")
lines(density(codaSamples[[2]][,4]),col="orange")

lines(density(codaSamples[[3]][,1]),col="blue")
lines(density(codaSamples[[3]][,2]),col="blue")
lines(density(codaSamples[[3]][,3]),col="blue")
lines(density(codaSamples[[3]][,4]),col="blue")
```

`density.default(x = codaSamples[[1]][, 1])`



HDI

```
(HDIofChainsHierarchi<-lapply(codaSamples,function(z) cbind(Theta1=HDIofMCMC(codaSamples[[1]][,1]),  
                                                             Theta2=HDIofMCMC(codaSamples[[1]][,2]),Theta3=HDIofMCMC(codaSamples[[1]][,3]  
                                                             ),Theta4=HDIofMCMC(codaSamples[[1]][,4]))))
```

```
## [[1]]  
##      Theta1  Theta2  Theta3  Theta4  
## [1,] 0.2970161 0.930312 0.4963746 0.4818544
```

```
## [2,] 0.3097525 0.953644 0.5604941 0.5357983
##
## [[2]]
##      Theta1  Theta2  Theta3  Theta4
## [1,] 0.2970161 0.930312 0.4963746 0.4818544
## [2,] 0.3097525 0.953644 0.5604941 0.5357983
##
## [[3]]
##      Theta1  Theta2  Theta3  Theta4
## [1,] 0.2970161 0.930312 0.4963746 0.4818544
## [2,] 0.3097525 0.953644 0.5604941 0.5357983
```

lastly we'll apply different priors

```
# model

modelString = "
model {
  for ( i in 1:Ntotal ) {
    y[i] ~ dbern( theta[s[i]] )
  }
  for ( sIdx in 1:Nsubj ) {      # Different thetas from same prior
    theta[sIdx] ~ dbeta( 2 , 2 ) # N.B.: 2,2 prior; change as appropriate.
  }
}
" # close quote for modelString
writeLines( modelString , con="TEMP3model.txt" )
```

Initialize MCMC. different MLE starts as well.

```
MLE=sum(myData$y)/length(myData$y)
(init1<-MLE)
```

```
## [1] 0.3666193
```

```
(init2<-MLE*(1+.5))
```

```
## [1] 0.5499289
```

```
(init3<-MLE*(1-.5))
```

```
## [1] 0.1833096
```

```
# fx
initsList<-function(){
  thetaInit<-sample(c(init1,init2,init3),1,replace=T)
  return(list(theta=thetaInit))
}

initsList()
```

```
## $theta
## [1] 0.1833096
```

Now JAGS

```
jagsModel<-jags.model(file="TEMP3model.txt",data=dataList,n.chains=3,n.adapt=500)
```

```
## Compiling model graph
##   Resolving undeclared variables
##   Allocating nodes
## Graph information:
##   Observed stochastic nodes: 23223
##   Unobserved stochastic nodes: 4
##   Total graph size: 46453
##
## Initializing model
```

Run

```
update(jagsModel,n.iter=600)

codaSamples2<-coda.samples(jagsModel,variable.names=c("theta"),n.iter=3334)
list.samplers(jagsModel)
```

```
## $`bugs::ConjugateBeta`
## [1] "theta[4]"
##
## $`bugs::ConjugateBeta`
## [1] "theta[3]"
##
## $`bugs::ConjugateBeta`
## [1] "theta[2]"
##
## $`bugs::ConjugateBeta`
## [1] "theta[1]"
```

```
head(codaSamples2)
```

```
## [[1]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta[1] theta[2] theta[3] theta[4]
## [1,] 0.3008888 0.9441205 0.5096466 0.5134515
## [2,] 0.2983233 0.9321275 0.5257460 0.5104000
## [3,] 0.3065480 0.9328446 0.5452737 0.4956012
## [4,] 0.3082422 0.9314006 0.5181317 0.5188223
## [5,] 0.3038987 0.9454740 0.5336088 0.4941717
## [6,] 0.3072468 0.9356794 0.4874112 0.5076686
## [7,] 0.3054155 0.9387204 0.5539516 0.4903971
```

```
##
## [[2]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta[1]  theta[2]  theta[3]  theta[4]
## [1,] 0.3030158 0.9531507 0.4945028 0.5252954
## [2,] 0.3024704 0.9466159 0.5173050 0.4991904
## [3,] 0.3078422 0.9356413 0.5169022 0.5137349
## [4,] 0.3026312 0.9354807 0.5039927 0.4963363
## [5,] 0.3018021 0.9510659 0.5146849 0.5129824
## [6,] 0.3005368 0.9354169 0.5462577 0.5221503
## [7,] 0.3014969 0.9397634 0.5333465 0.5072619
##
## [[3]]
## Markov Chain Monte Carlo (MCMC) output:
## Start = 601
## End = 607
## Thinning interval = 1
##      theta[1]  theta[2]  theta[3]  theta[4]
## [1,] 0.2979898 0.9415313 0.5267408 0.5256390
## [2,] 0.3054920 0.9423810 0.5623973 0.5083398
## [3,] 0.3053512 0.9535714 0.5412924 0.4943838
## [4,] 0.3030128 0.9507765 0.5263734 0.4678860
## [5,] 0.3058773 0.9387976 0.4892401 0.5210938
## [6,] 0.3044001 0.9384094 0.5421302 0.4970130
## [7,] 0.3011772 0.9456219 0.5028576 0.4910047
##
## attr(,"class")
## [1] "mcmc.list"
```

Let's compare the two runs: run one with 1,1 prior of beta distribution and the second with 2,2 and wider MLE inits.

```
#run1
summary(codaSamples)
```

```
##
## Iterations = 601:3934
## Thinning interval = 1
## Number of chains = 3
## Sample size per chain = 3334
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##           Mean          SD Naive SE Time-series SE
## theta[1] 0.3032 0.003271 3.271e-05      3.271e-05
## theta[2] 0.9418 0.005944 5.944e-05      5.770e-05
## theta[3] 0.5268 0.016371 1.637e-04      1.637e-04
## theta[4] 0.5091 0.014156 1.416e-04      1.494e-04
##
## 2. Quantiles for each variable:
##
##           2.5%    25%    50%    75%   97.5%
## theta[1] 0.2968 0.3010 0.3032 0.3054 0.3096
## theta[2] 0.9298 0.9379 0.9420 0.9459 0.9530
## theta[3] 0.4949 0.5157 0.5269 0.5377 0.5596
## theta[4] 0.4820 0.4994 0.5090 0.5186 0.5372
```

```
#run2
summary(codaSamples2)
```

```
##
## Iterations = 601:3934
## Thinning interval = 1
## Number of chains = 3
## Sample size per chain = 3334
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
```

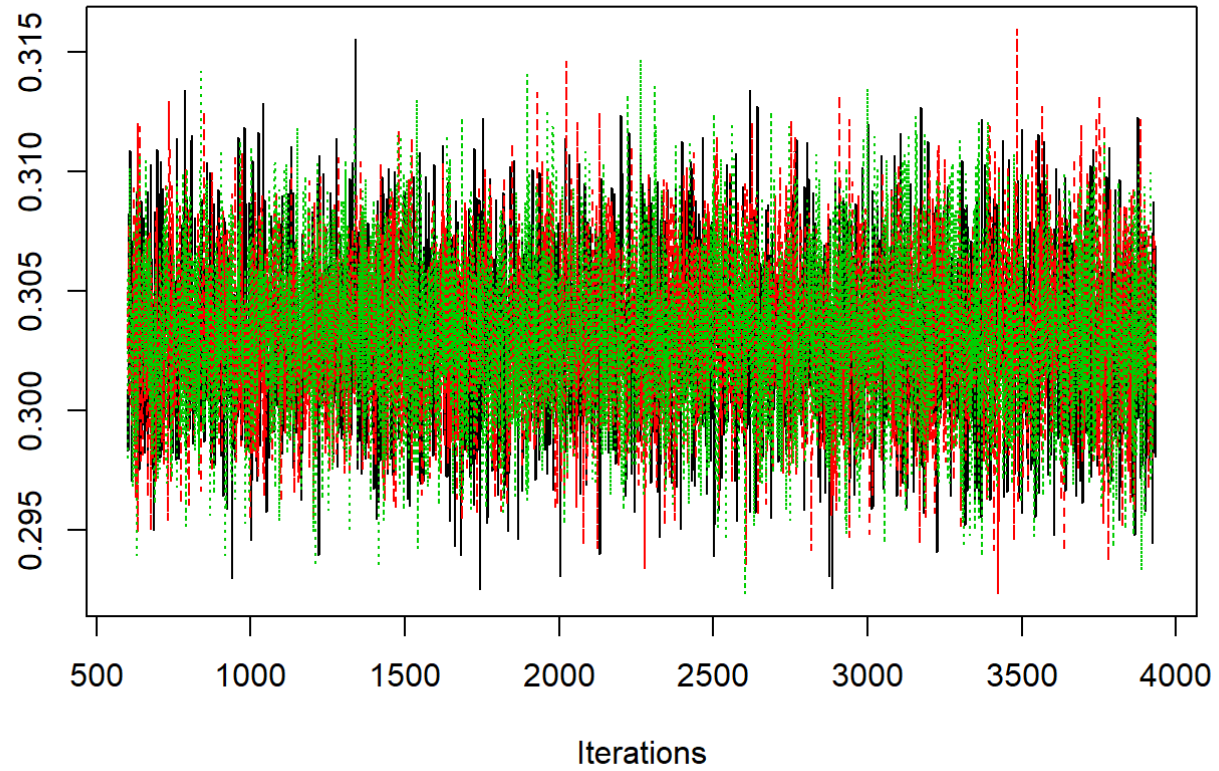


```
##           Mean      SD Naive SE Time-series SE
## theta[1] 0.3032 0.003293 3.292e-05      3.293e-05
## theta[2] 0.9412 0.005886 5.886e-05      6.071e-05
## theta[3] 0.5265 0.016361 1.636e-04      1.598e-04
## theta[4] 0.5091 0.013981 1.398e-04      1.411e-04
##
## 2. Quantiles for each variable:
##
##           2.5%    25%    50%    75%  97.5%
## theta[1] 0.2969 0.3010 0.3032 0.3054 0.3097
## theta[2] 0.9292 0.9373 0.9413 0.9453 0.9523
## theta[3] 0.4944 0.5155 0.5266 0.5374 0.5584
## theta[4] 0.4818 0.4998 0.5093 0.5184 0.5366
```

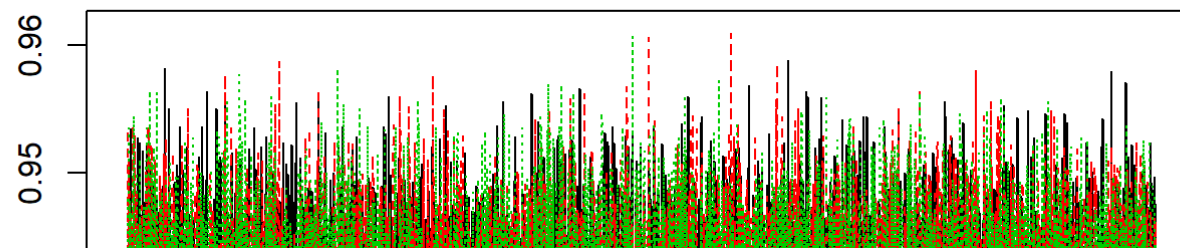
Both iterations have no problem converging.

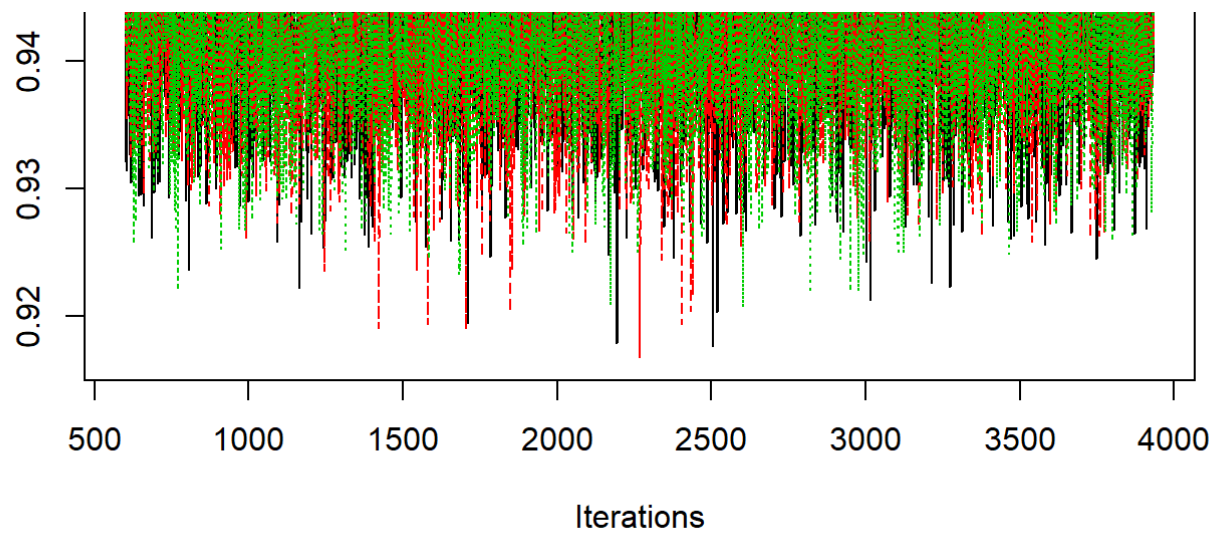
```
coda::traceplot(codaSamples2)
```

Trace of theta[1]

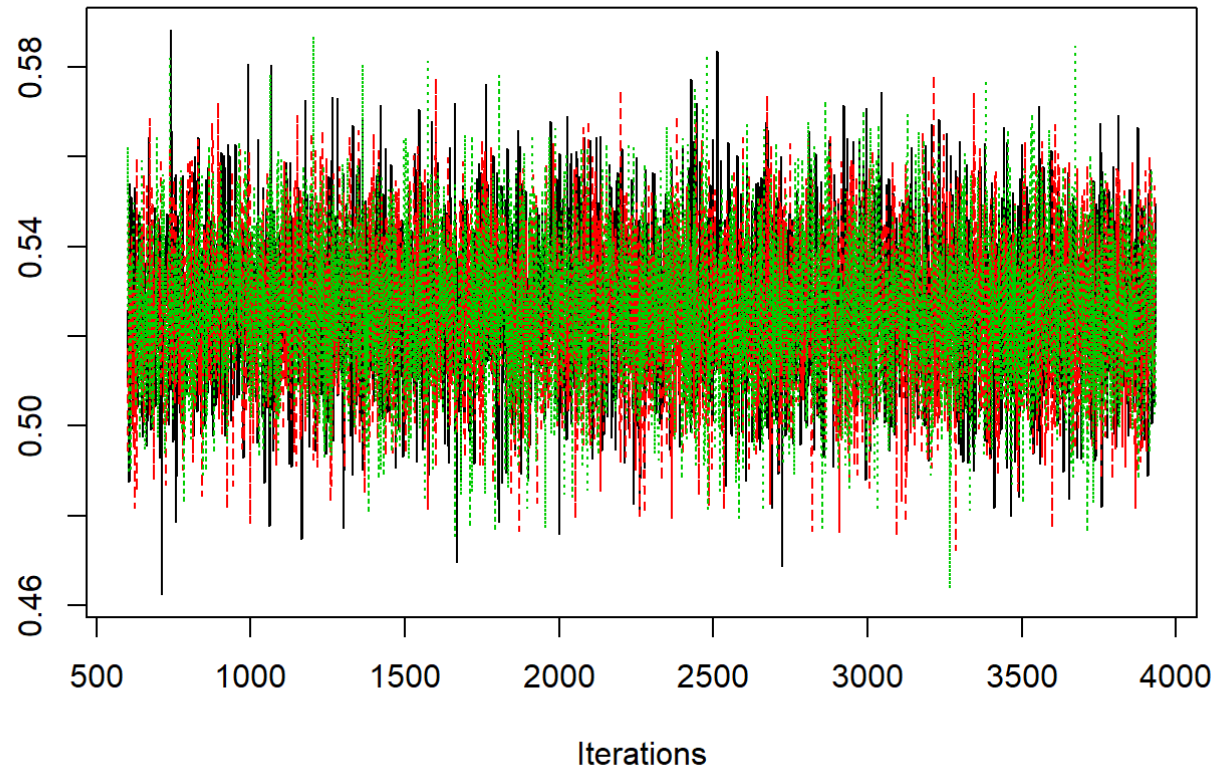


Trace of theta[2]

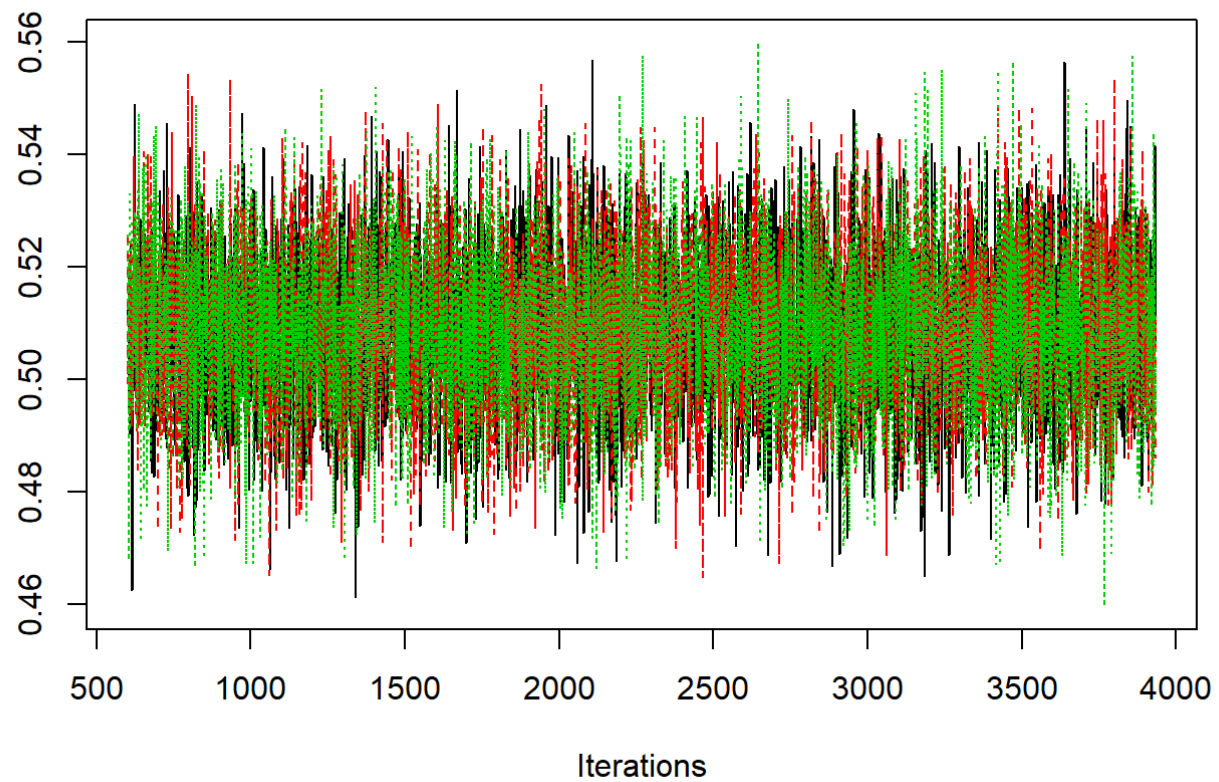




Trace of theta[3]

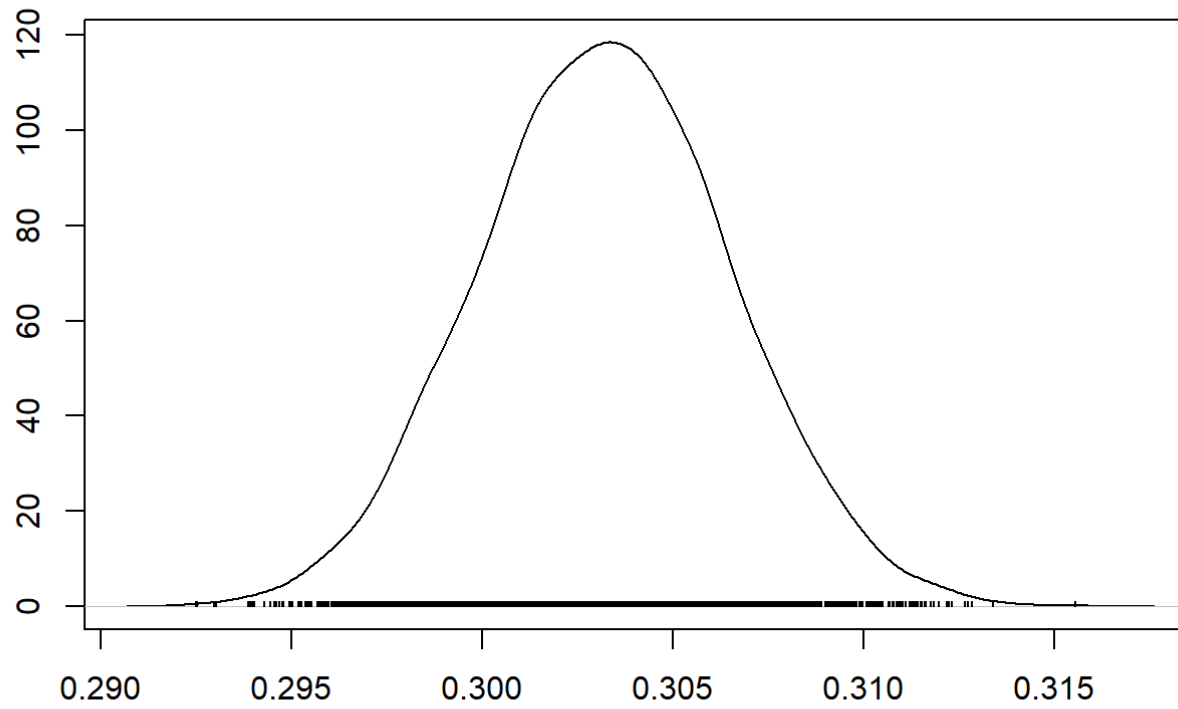


Trace of theta[4]



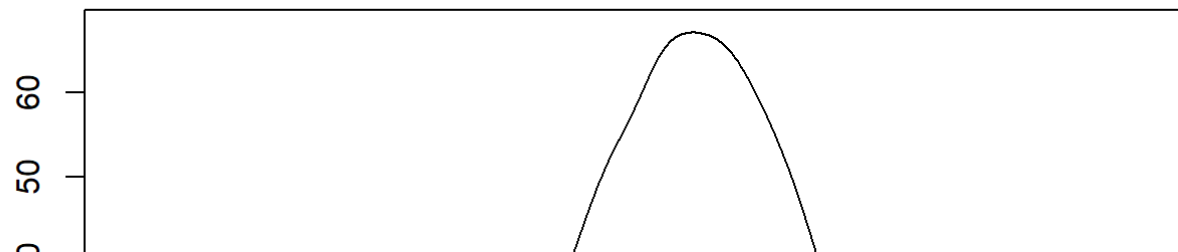
```
densplot(codaSamples2)
```

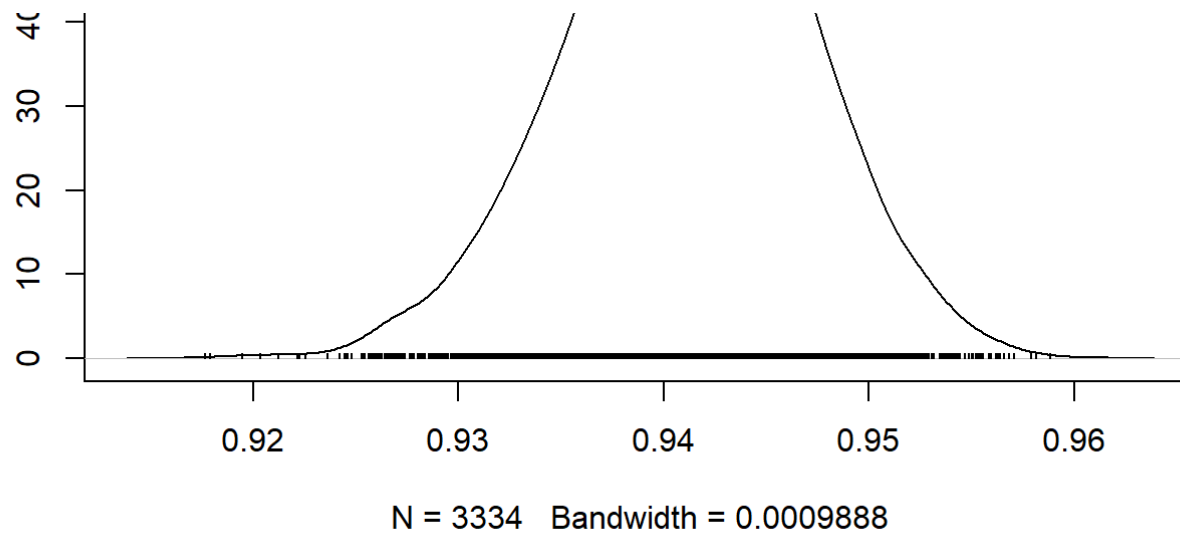

Density of theta[1]

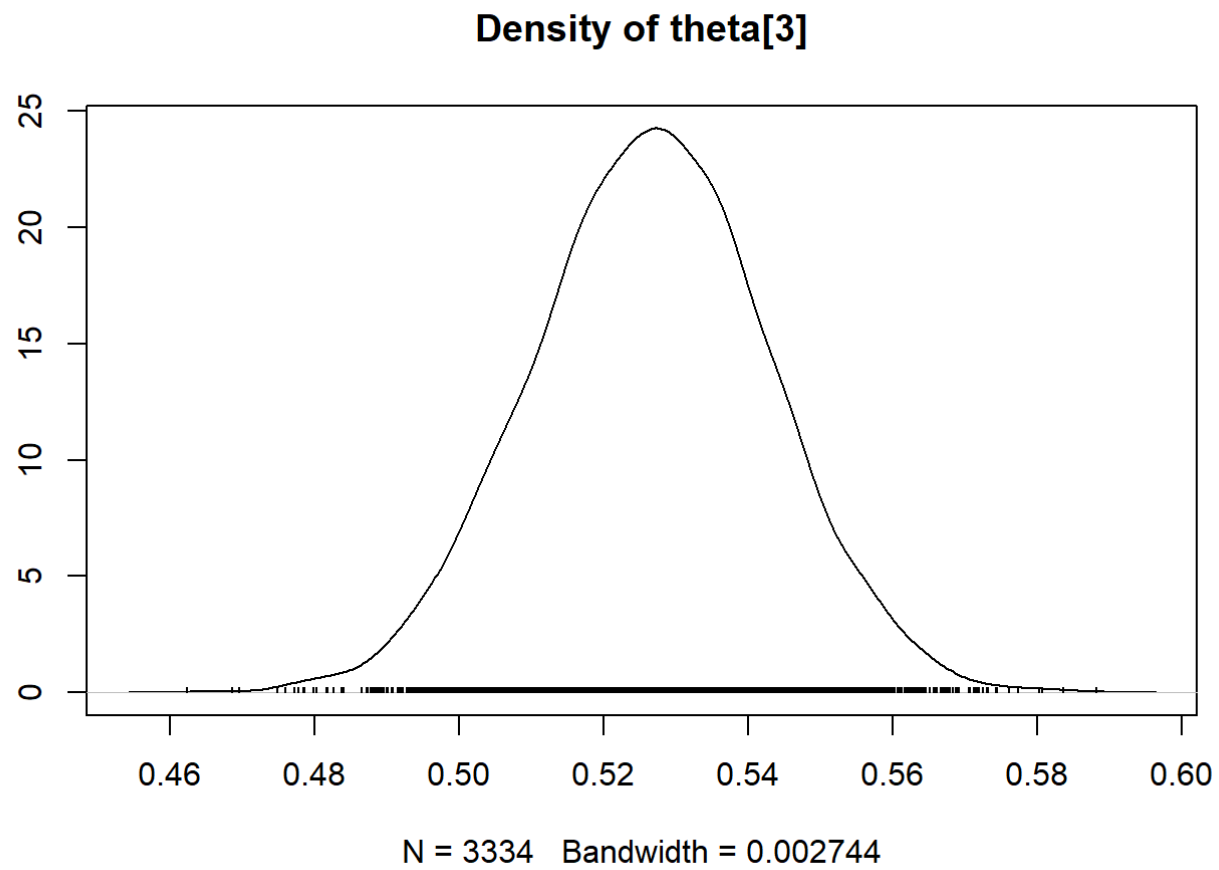


N = 3334 Bandwidth = 0.0005532

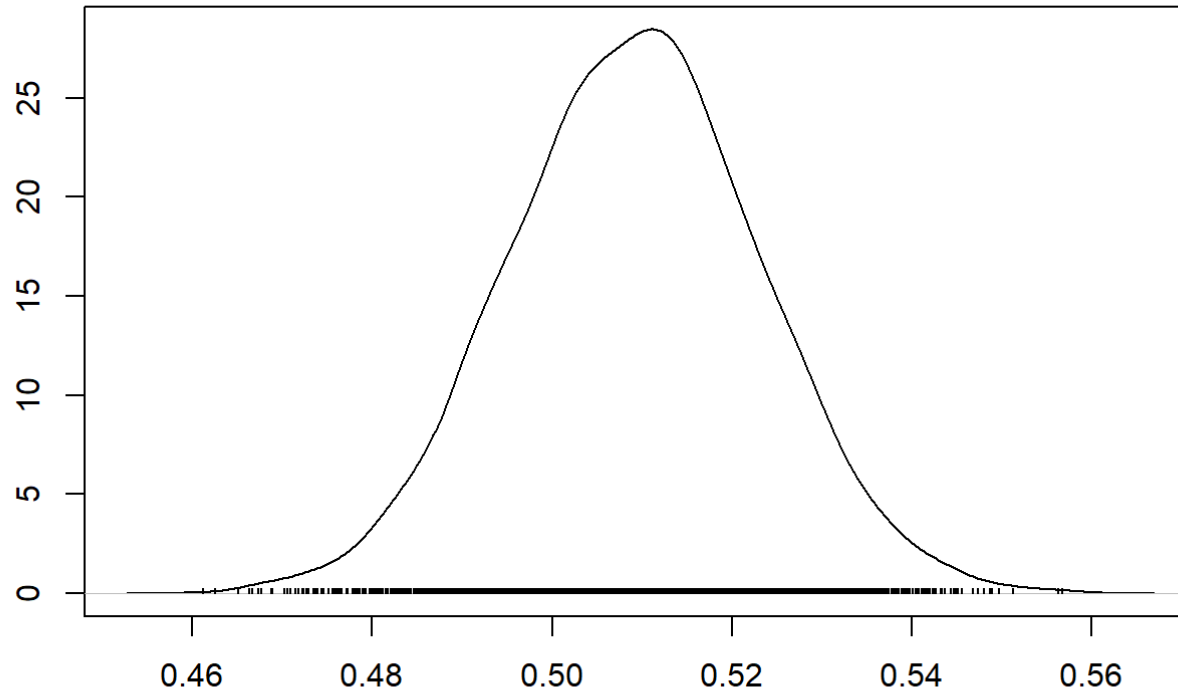
Density of theta[2]





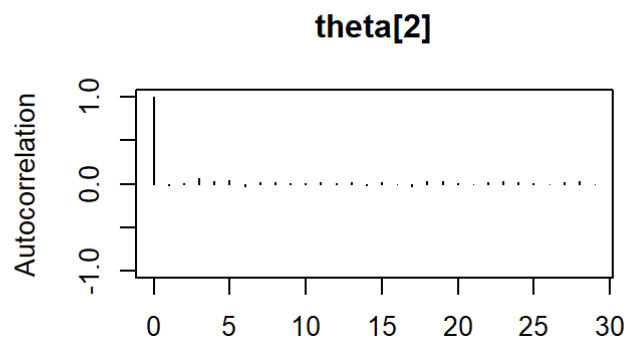
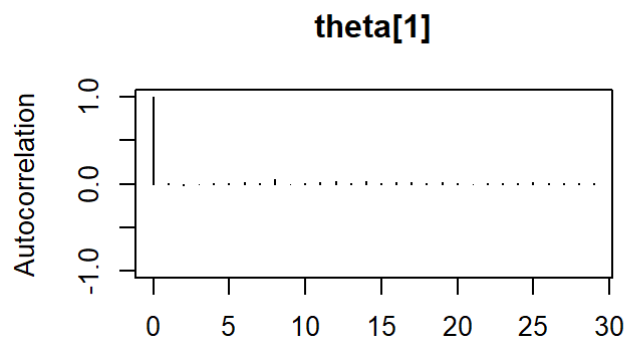
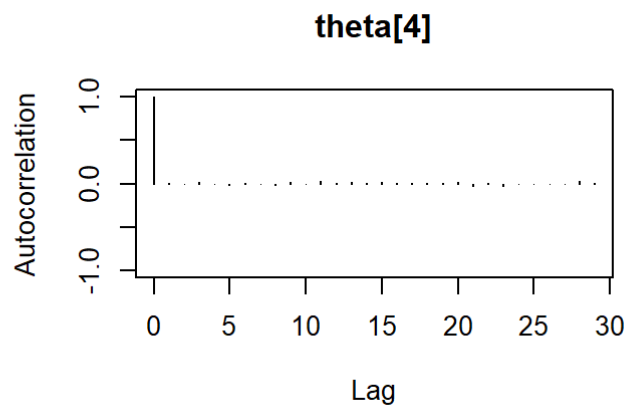
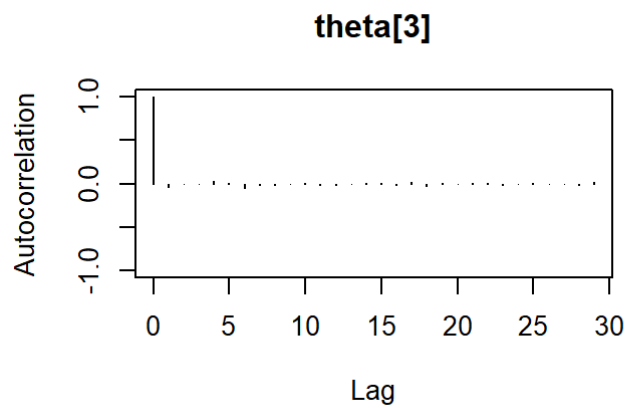
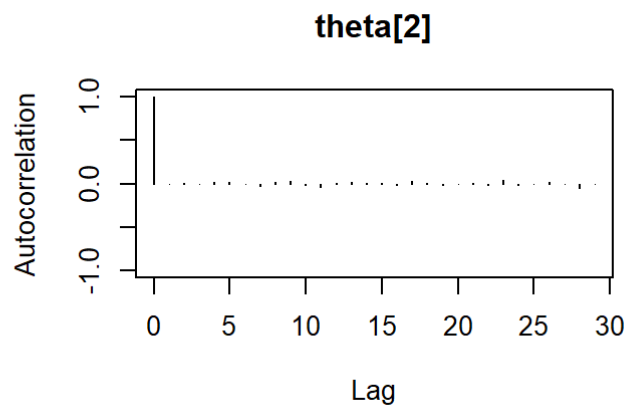
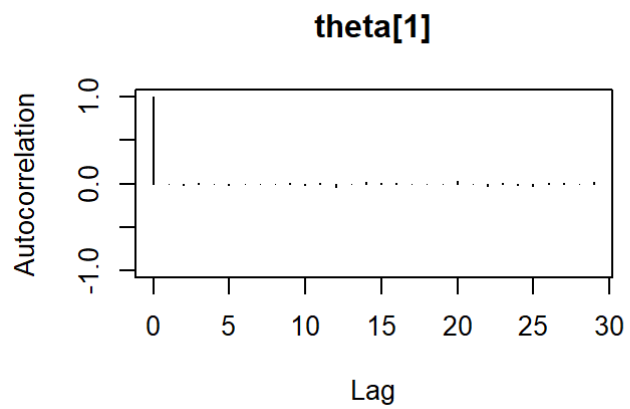


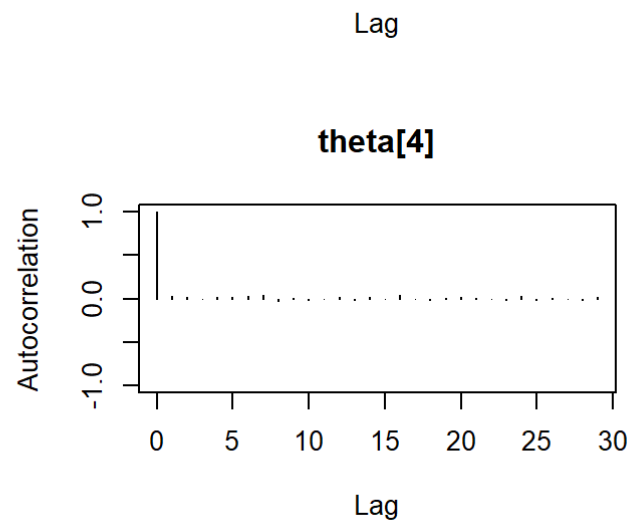
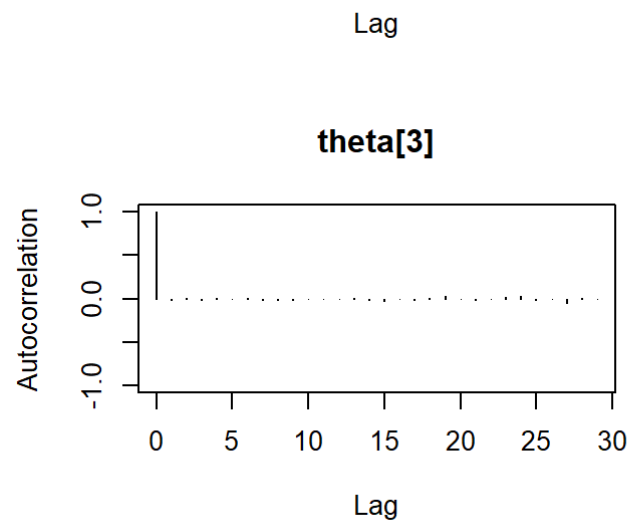
Density of theta[4]

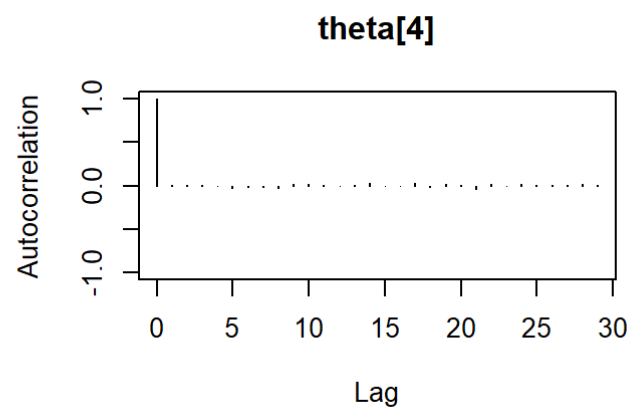
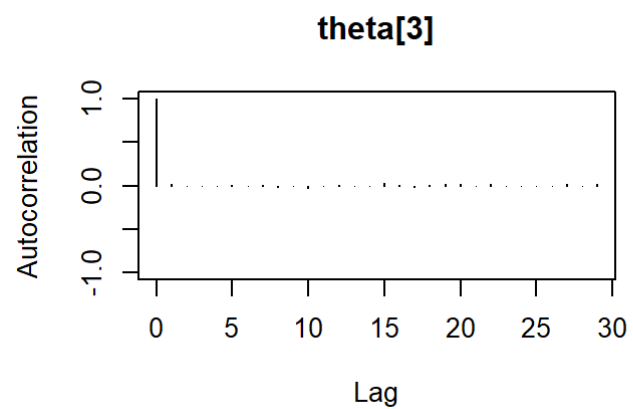
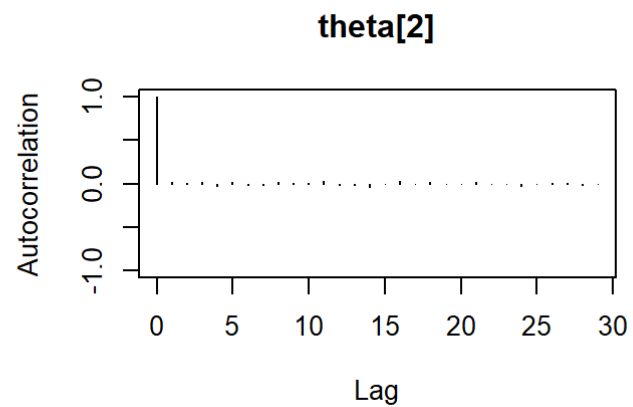
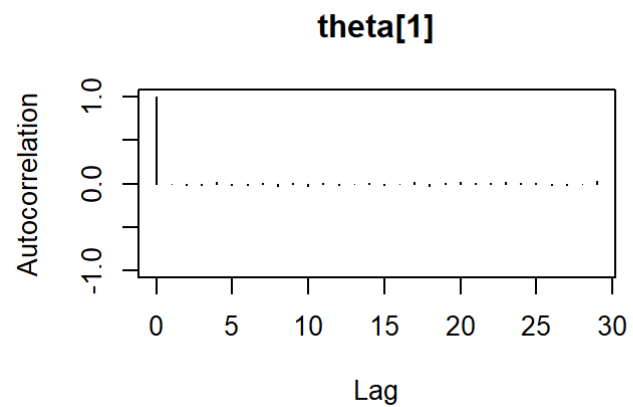


N = 3334 Bandwidth = 0.002334

```
autocorr.plot(codaSamples2,ask=F)
```





```
effectiveSize(codaSamples2)
```

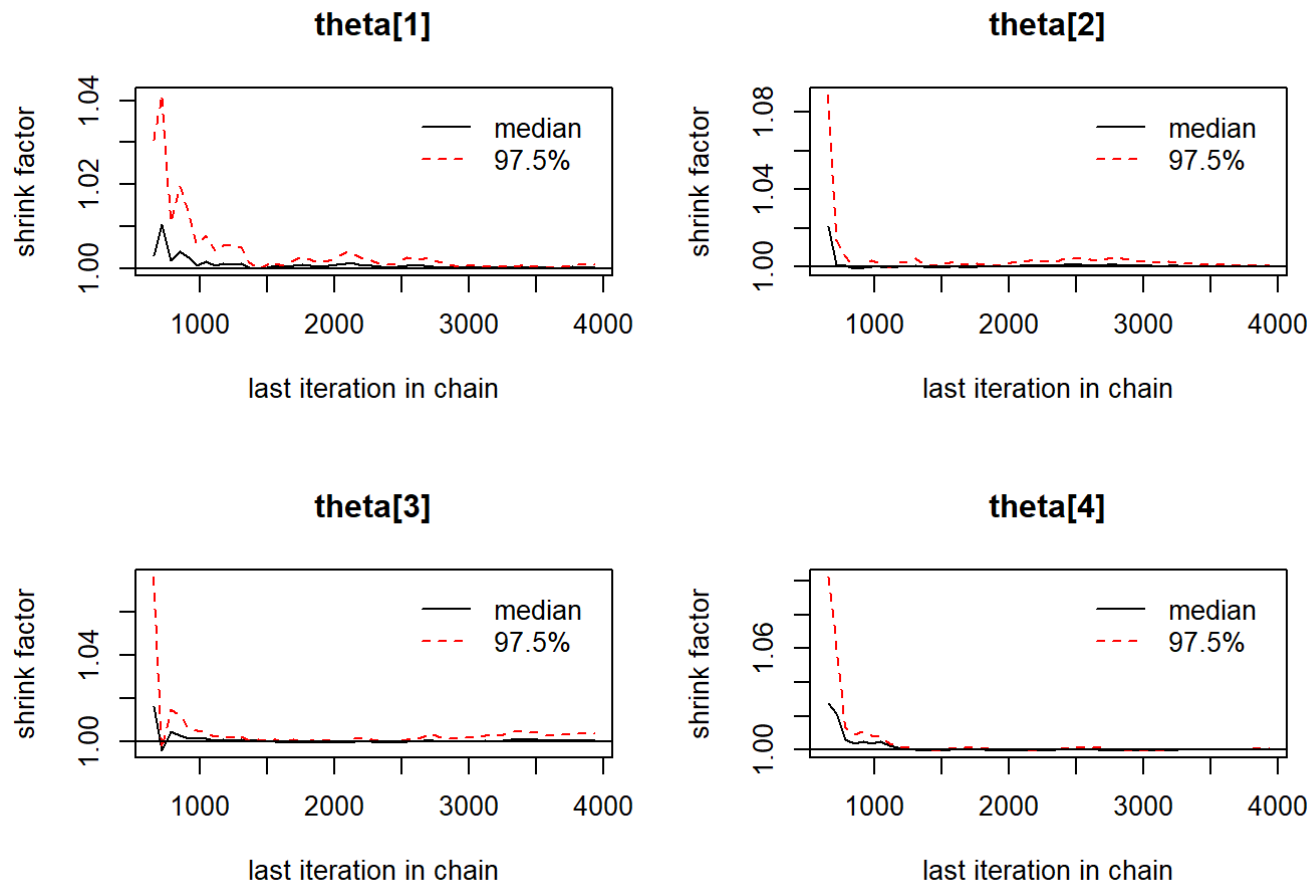
```
## theta[1] theta[2] theta[3] theta[4]  
## 10002.000 9464.044 10524.563 9825.537
```

Gelman shrinkage

```
gelman.diag(codaSamples2)
```

```
## Potential scale reduction factors:
##
##      Point est. Upper C.I.
## theta[1]      1      1
## theta[2]      1      1
## theta[3]      1      1
## theta[4]      1      1
##
## Multivariate psrf
##
## 1
```

```
gelman.plot(codaSamples2)
```



Let's plot them together.

```
matrix(unlist(lapply(codaSamples2,function(z) apply(z,2,mean))),ncol=3)
```

```
##           [,1]      [,2]      [,3]
## [1,] 0.3032009 0.3032636 0.3032240
## [2,] 0.9411542 0.9411260 0.9412753
## [3,] 0.5270567 0.5262903 0.5260945
## [4,] 0.5089577 0.5093074 0.5091614
```


[illegible]

##	[1123]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1157]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1191]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1225]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1259]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1293]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1327]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1361]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1395]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1429]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1463]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1497]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1531]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1565]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1599]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1633]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1667]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1701]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1735]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1769]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1803]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1837]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1871]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1905]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[1939]	1	1	1	1																					

##	[2381]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
##	[2415]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
##	[2449]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
##	[2483]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
##	[2517]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
##	[2551]	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
##	[2585]	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
##	[2619]	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
##	[2653]	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
##	[2687]	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
##	[2721]	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
##	[2755]	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
##	[2789]	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
##	[2823]	4	4	4	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[2857]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[2891]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[2925]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[2959]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[2993]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[3027]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[3061]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[3095]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[3129]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[3163]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[3197]	1	1	1	1																					

[illegible]

[illegible]

##	[7413]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7447]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7481]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7515]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7549]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7583]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7617]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7651]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7685]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7719]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7753]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7787]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7821]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7855]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7889]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7923]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7957]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[7991]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8025]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8059]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8093]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8127]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8161]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8195]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[8229]	1	1	1	1																					

[illegible]

[illegible]

[illegible]

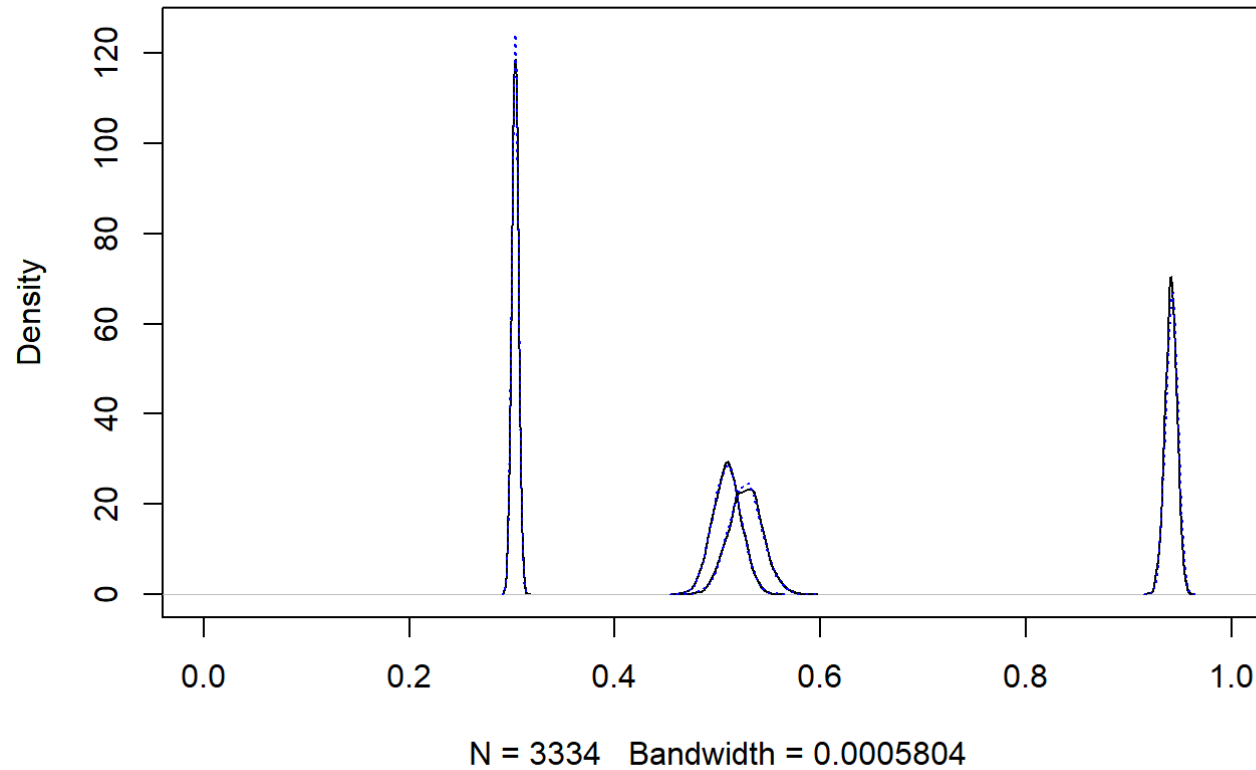
##	[18735]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[18769]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[18803]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[18837]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[18871]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[18905]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[18939]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[18973]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19007]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19041]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19075]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19109]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19143]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19177]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19211]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19245]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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##	[19313]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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##	[19415]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
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##	[19483]	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
##	[19517]	1	1	1	1	1</																					


```
## [22509] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
## [22543] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
## [22577] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
## [22611] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
## [22645] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
## [22679] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22713] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22747] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22781] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22815] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22849] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22883] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22917] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22951] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [22985] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23019] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23053] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23087] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23121] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23155] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23189] 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
## [23223] 4
```

```
plot(density(codaSamples2[[1]][,1]),xlim=c(0,1),ylim=c(0,125),main = "Density comparison of thetas, blue is second")
lines(density(codaSamples2[[1]][,2]))
lines(density(codaSamples2[[1]][,3]))
lines(density(codaSamples2[[1]][,4]))

lines(density(codaSamples[[1]][,1]),col="blue",lty="dotted")
lines(density(codaSamples[[1]][,2]),col="blue",lty="dotted")
lines(density(codaSamples[[1]][,3]),col="blue",lty="dotted")
lines(density(codaSamples[[1]][,4]),col="blue",lty="dotted")
```

Density comparison of thetas, blue is second



Discussion

We can see that the two runs ended up with nearly identical theta distributions regardless of prior and MLE start values. There is such a clear split based upon race that the posteriors converge quickly and separate neatly aside from latinos and “others”.