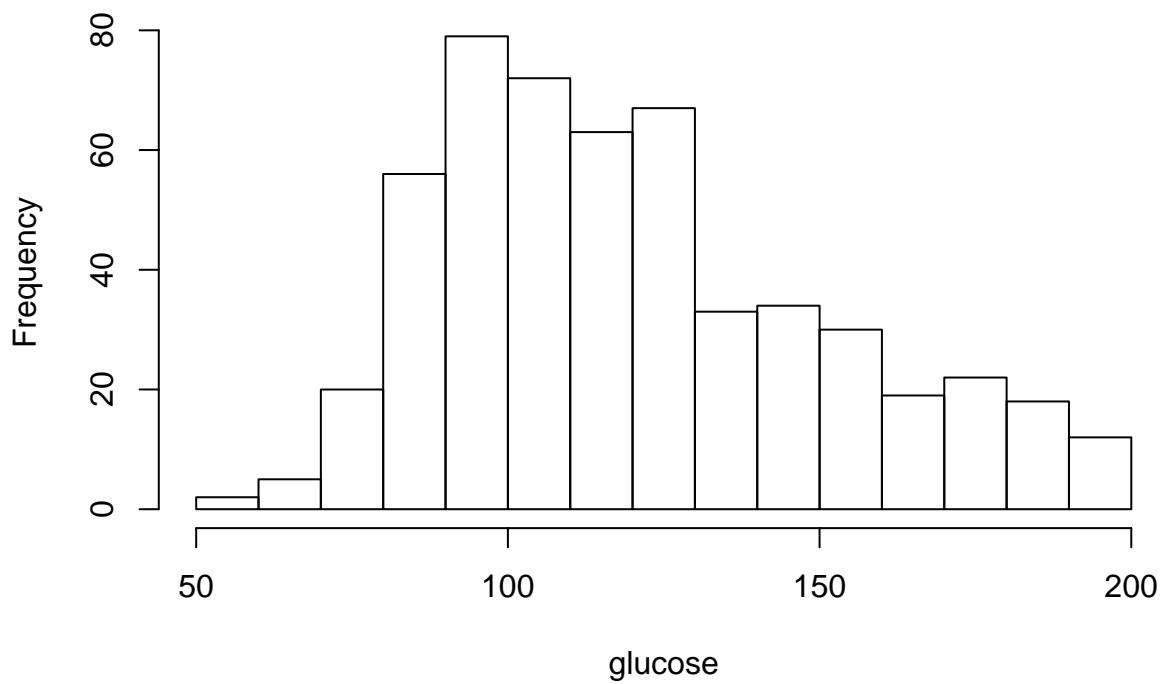
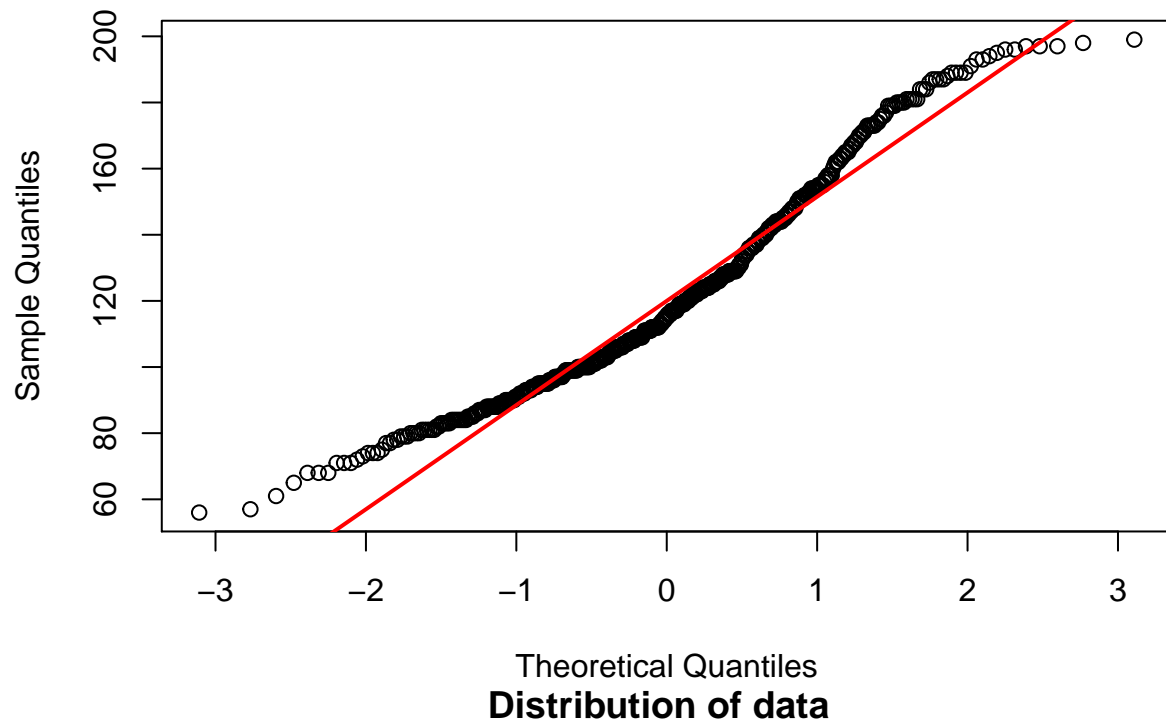


The distribution of glucose value deviates from a normal distribution

Mixture models

Normal Q–Q Plot



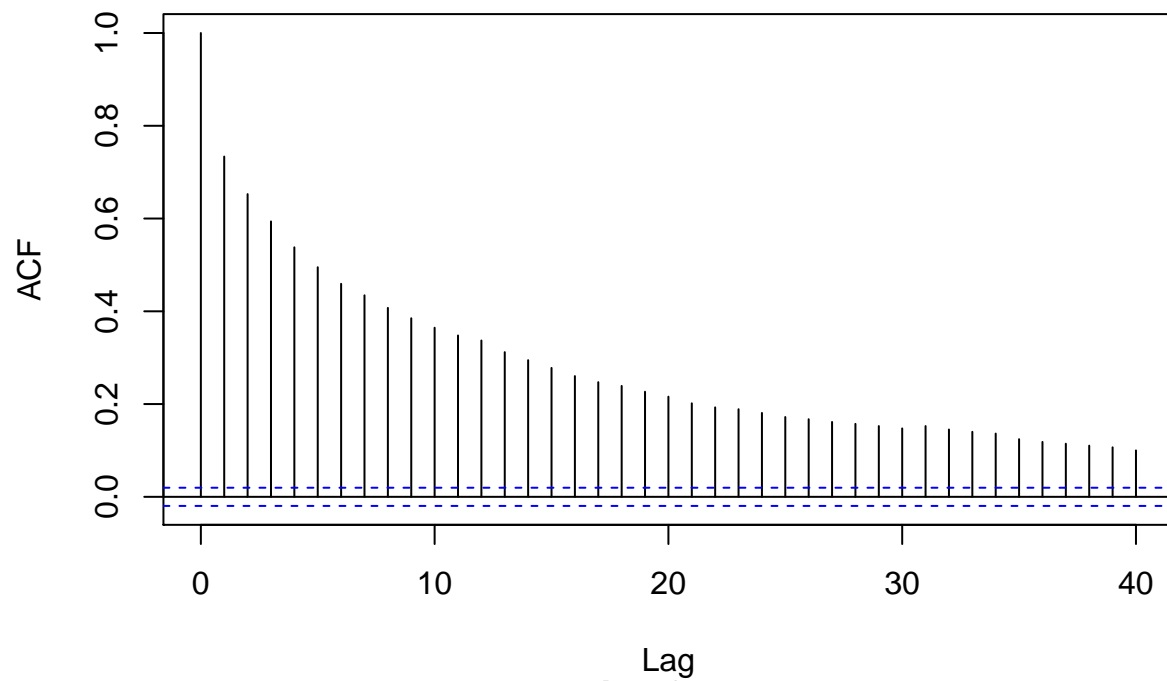
Implement a Gibbs sampler

Run at least 10,000 iterations. Compute and plot the autocorrelation of θ_0 and θ_1 as well as the effective sample sizes.

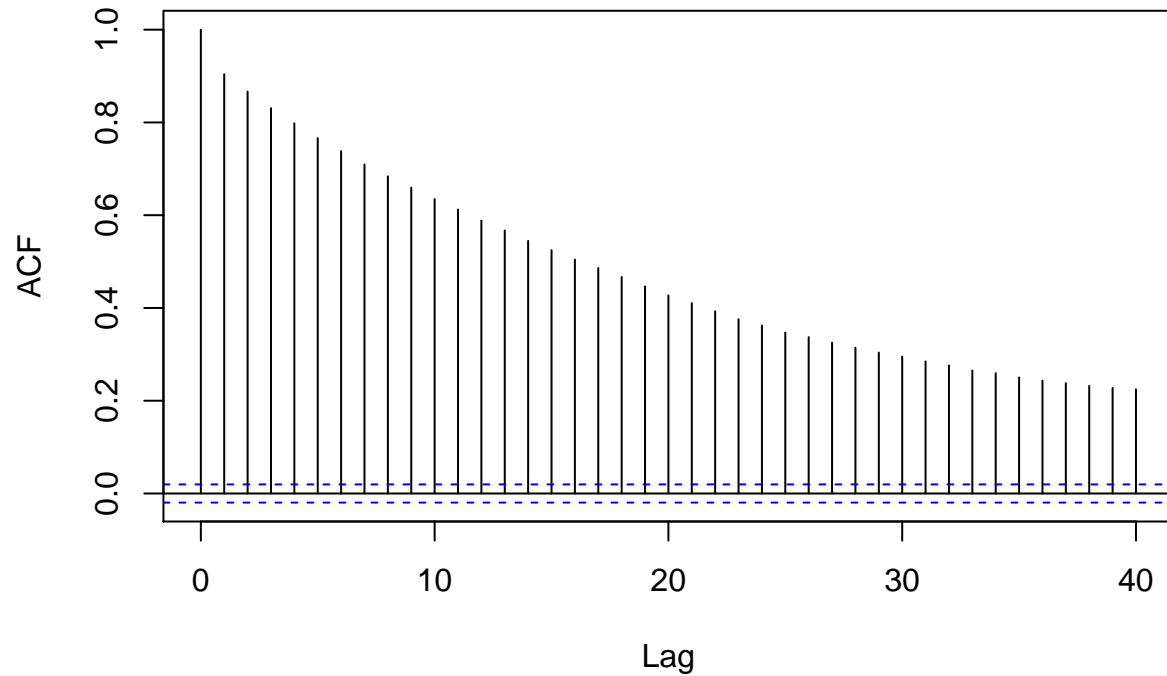
```
##
## Autocorrelations of series 'glucose_final[, 7]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10     11
## 1.000 0.734 0.653 0.594 0.538 0.495 0.459 0.434 0.407 0.385 0.365 0.348
##    12    13    14    15    16    17    18    19    20    21    22    23
## 0.337 0.312 0.295 0.278 0.260 0.247 0.239 0.227 0.216 0.202 0.193 0.189
##    24    25    26    27    28    29    30    31    32    33    34    35
## 0.181 0.172 0.167 0.161 0.157 0.153 0.148 0.153 0.145 0.140 0.136 0.124
##    36    37    38    39    40
## 0.118 0.115 0.110 0.107 0.100

##
## Autocorrelations of series 'glucose_final[, 8]', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10     11
## 1.000 0.904 0.867 0.831 0.798 0.766 0.738 0.710 0.684 0.660 0.635 0.612
##    12    13    14    15    16    17    18    19    20    21    22    23
## 0.588 0.567 0.545 0.525 0.504 0.486 0.467 0.447 0.427 0.411 0.393 0.376
##    24    25    26    27    28    29    30    31    32    33    34    35
## 0.362 0.347 0.337 0.325 0.314 0.304 0.295 0.285 0.276 0.265 0.259 0.250
##    36    37    38    39    40
## 0.243 0.238 0.232 0.228 0.225
```

Autocorrelation for first theta



Autocorrelation for second theta

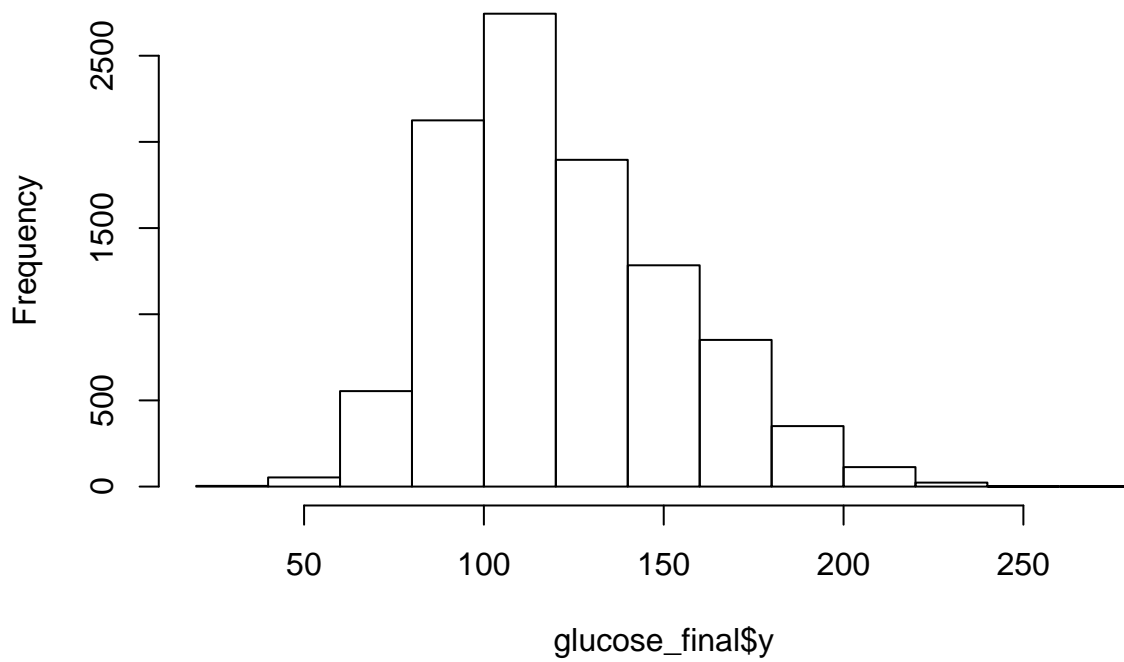


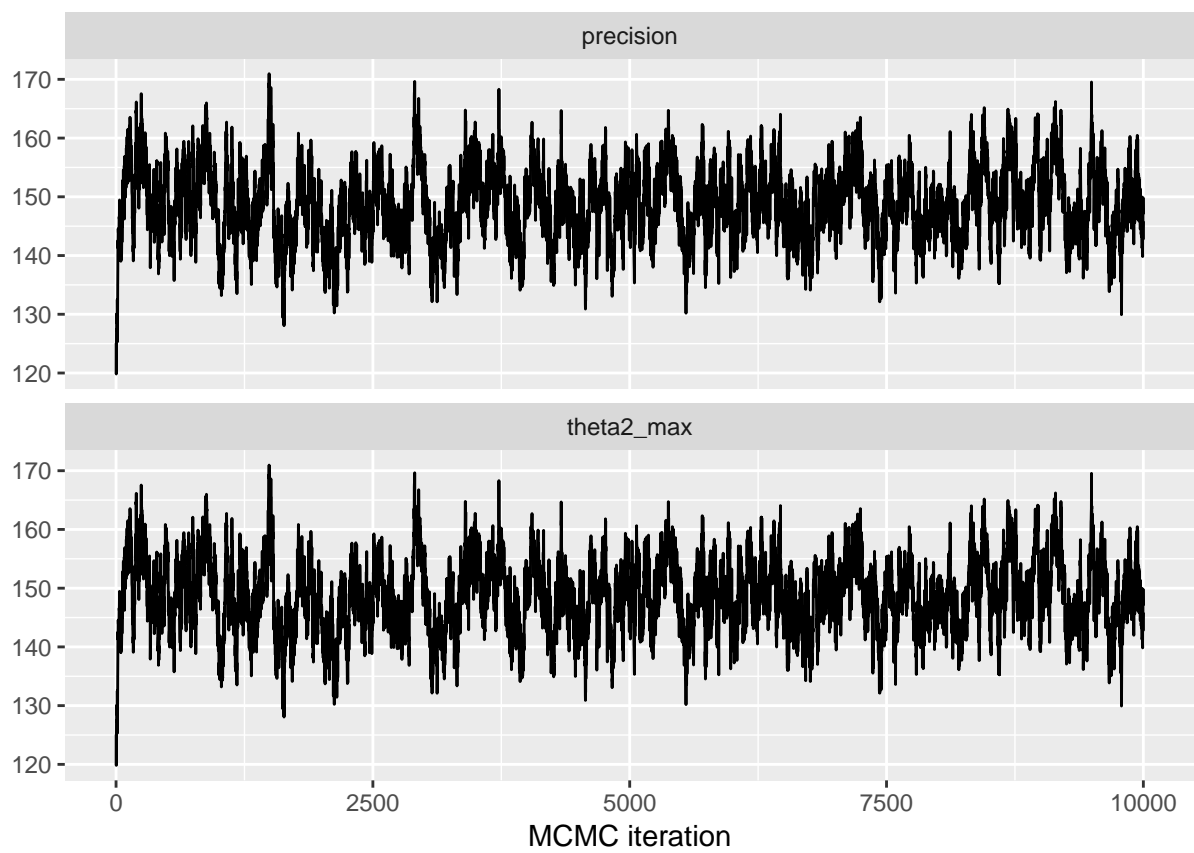
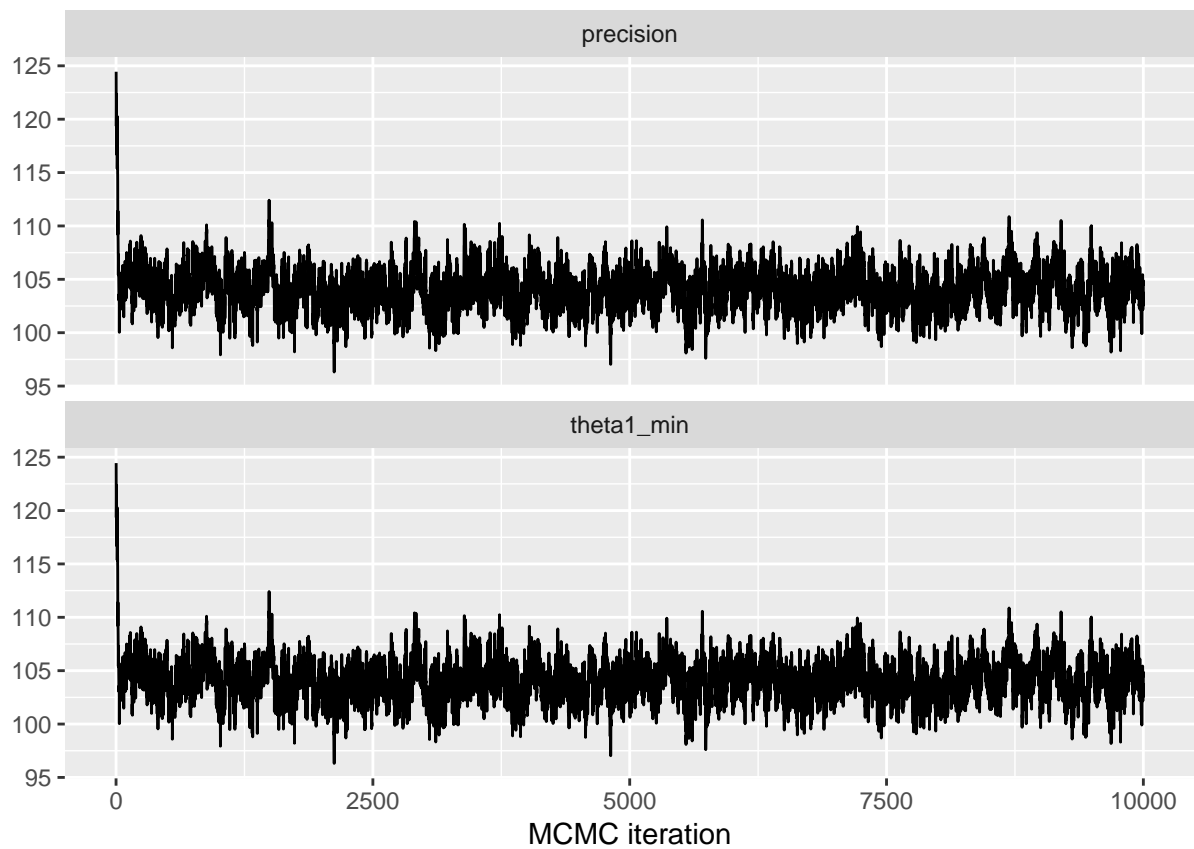
```
##      var1
## 423.9025

##      var1
## 210.4102
```

For each iterations s of the Gibbs sampler, sample

Histogram of sampling data y





Joint posterior is difficult to sample directly, easier to sample from the full conditional distribution of each parameter. We used a Gibbs Sampler generates a dependent sequence of parameter values whose distribution converges to the target joint posterior distribution

The first thetas were arbitrarily chosen initial values, then the thetas generated in the gibbs sampler depended on the initial thetas. For any initial values, the chain is converging to the posterior. Using 10,000 iterations, we used enough samples to approximate our posterior

The original glucose data does not follow a normal distribution (it has two modes, 100, 150), while the empirical distribution of Y approximately follows normal distribution with 121 (approximately) as mean. Based on the iteration results, the average of θ_1 is 104.10 while the average of θ_2 is 148.7, which is coherent to the two modes location of the histogram of glucose data.