Lab 3 report

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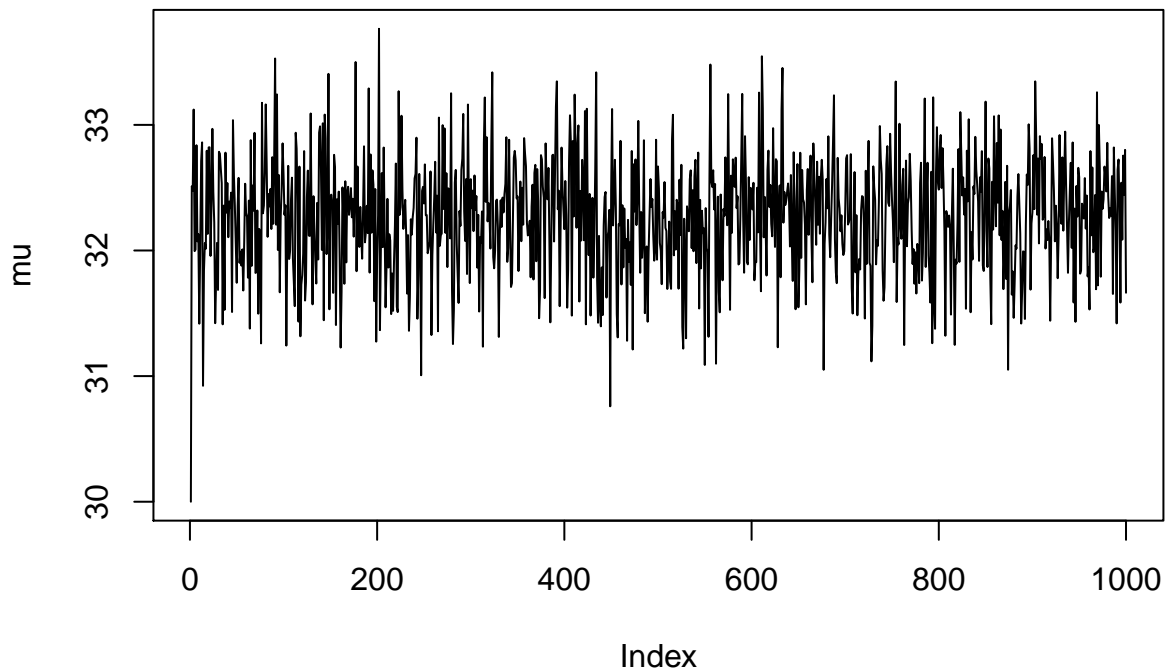
Assignment 1

1.a

Assuming that the daily precipitation are independent normally distributed with parameters μ and σ^2 we use a Gibbs sampler to simulate from the joint posterior $p(\mu, \sigma^2 | y_1, .., y_n)$
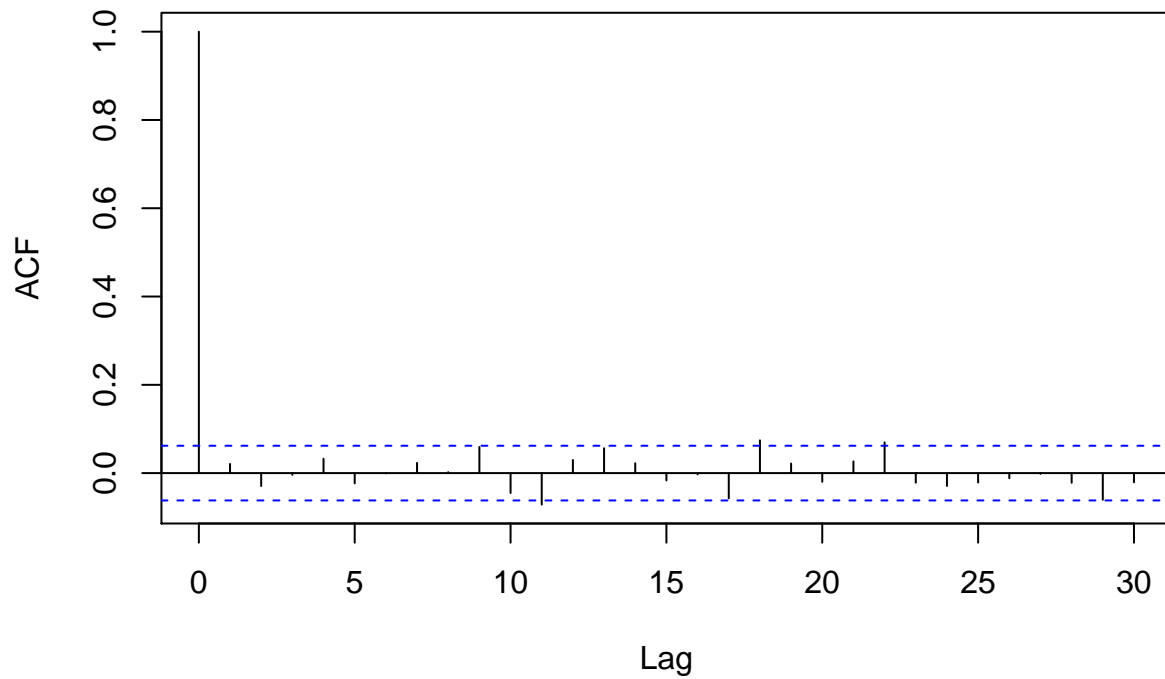
Let see if the sampler converges, starting with the traceplot of μ:

Traceplot of mu

From the traceplot μ seems to converge to a value between 32 and 33. For further analysis we compute the ACF and the inefficiency factor:
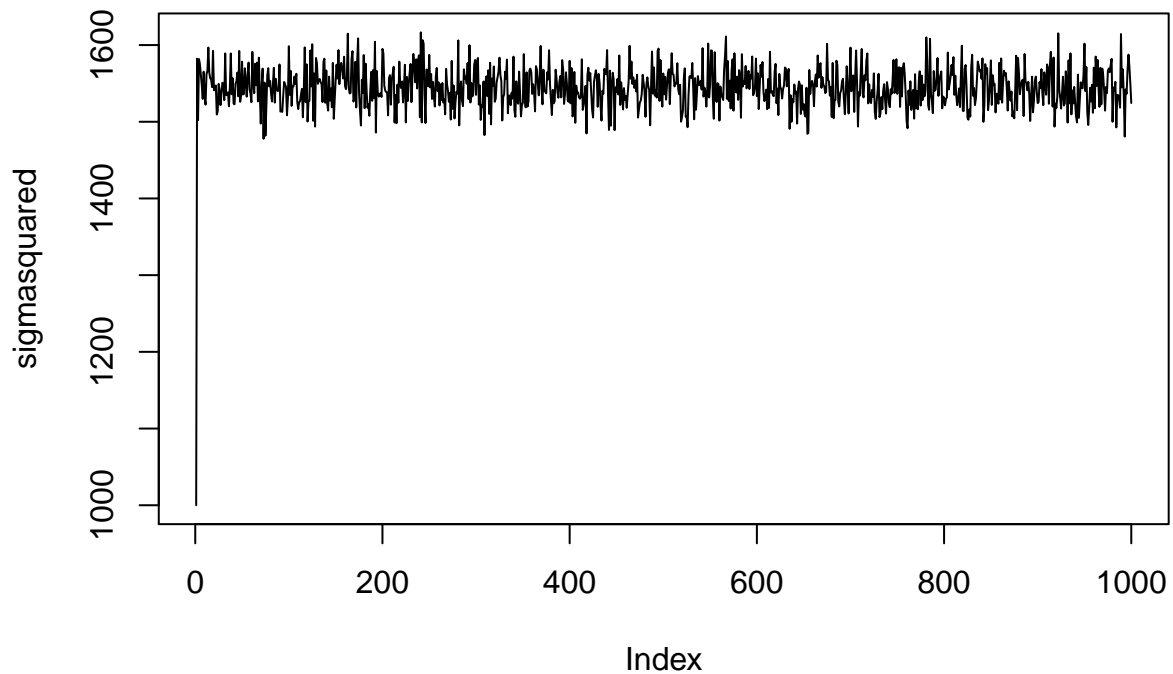
ACF of traceplot of mu


```
## [1] 0.9594156
```

They both shows that the sampler is very efficience since the draws seem to be independent.
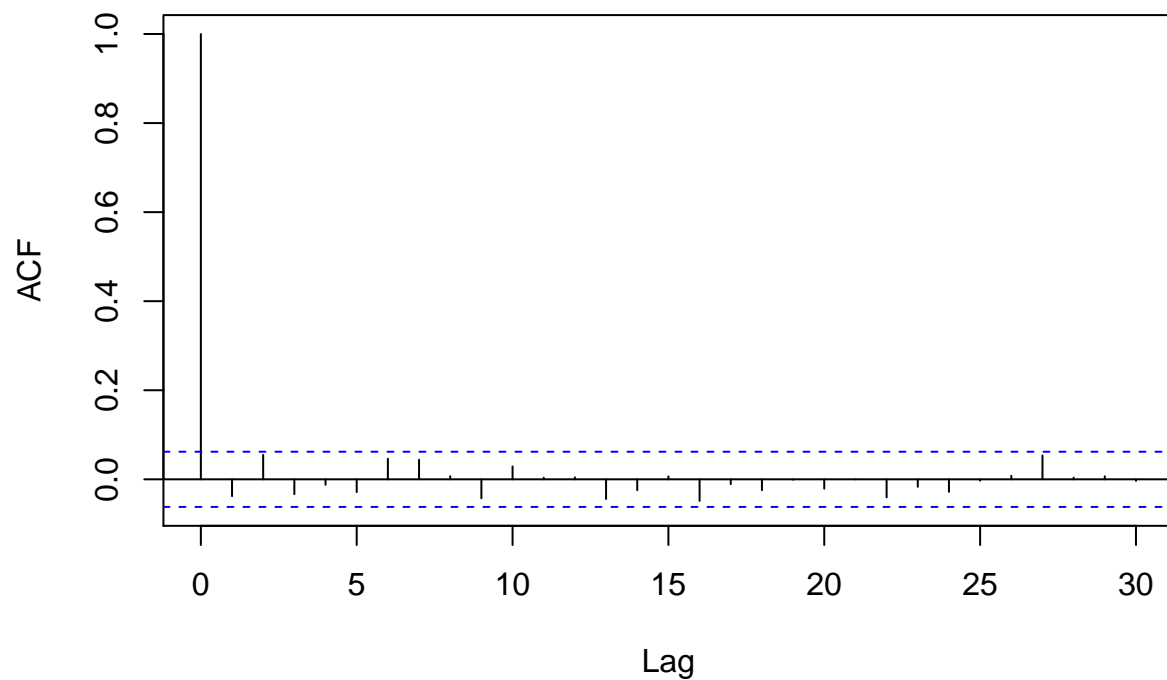
The traceplot of σ^2:

Traceplot of sigma squared

Also σ^2 seems to converge, to a value around 1550. The ACF and inefficiency factor:
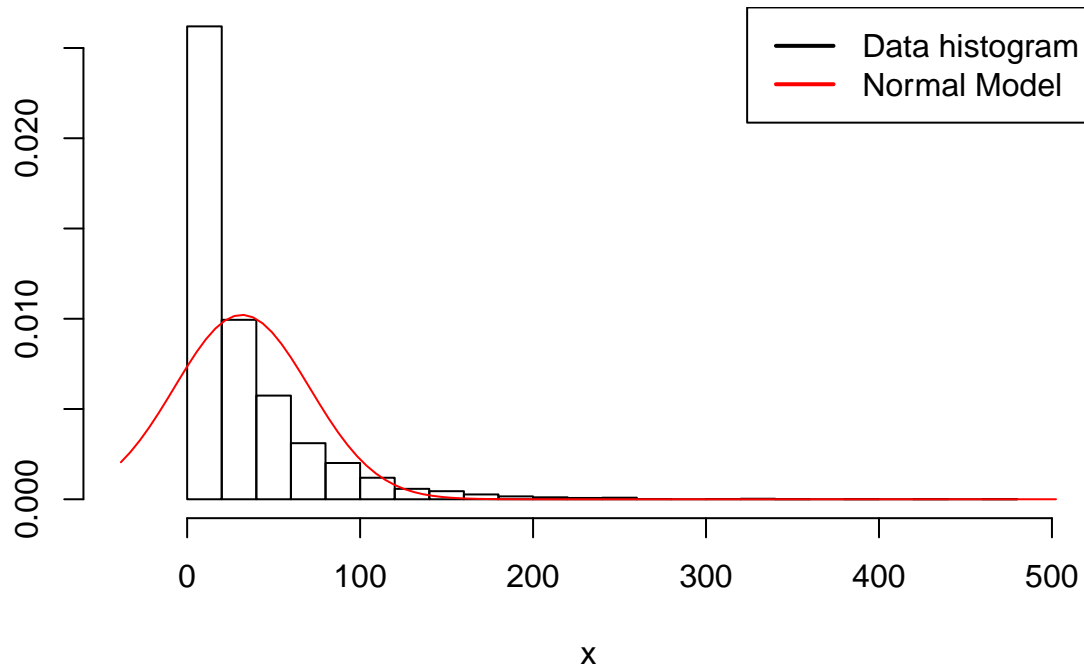
ACF of traceplot of sigma squared


```
## [1] 0.6918382
```

As for μ, we can say that the draws seem to be independent. In general the Gibbs sampler is very good.

In this final plot we report the histogram of the data together with the normal distribution using the posterior mean values for the two parameters:
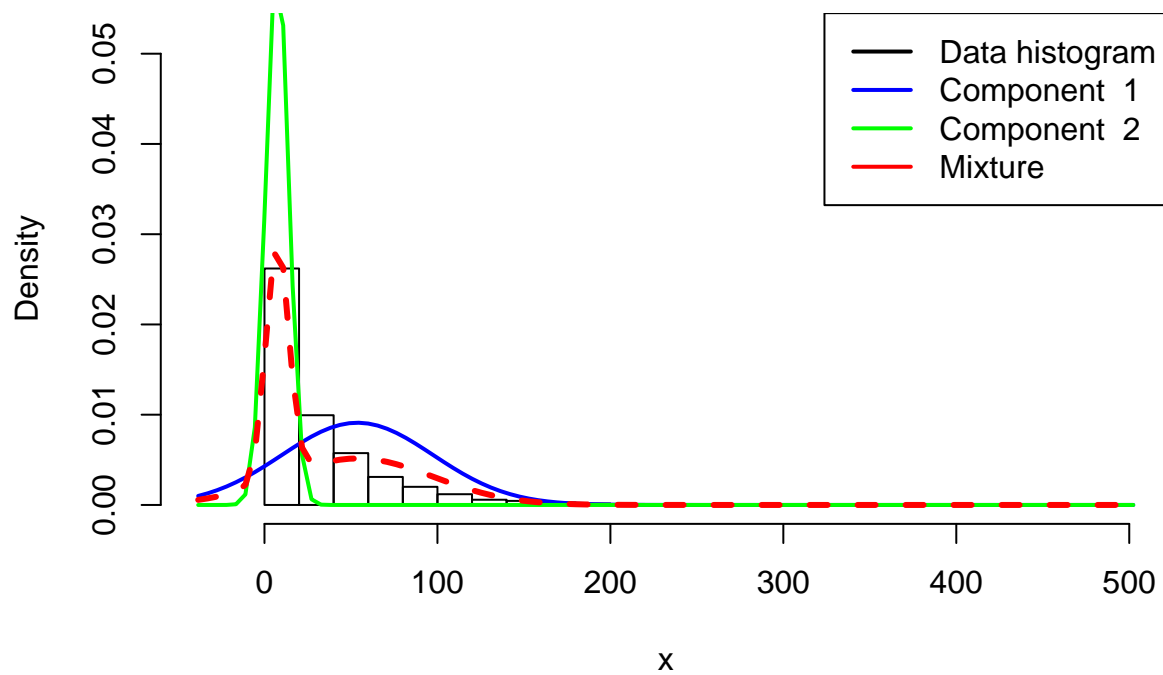
Histogram of Japan daily precipitation

1.b

Using mixture normal model, here we present the plot for the last iteration with the two components.
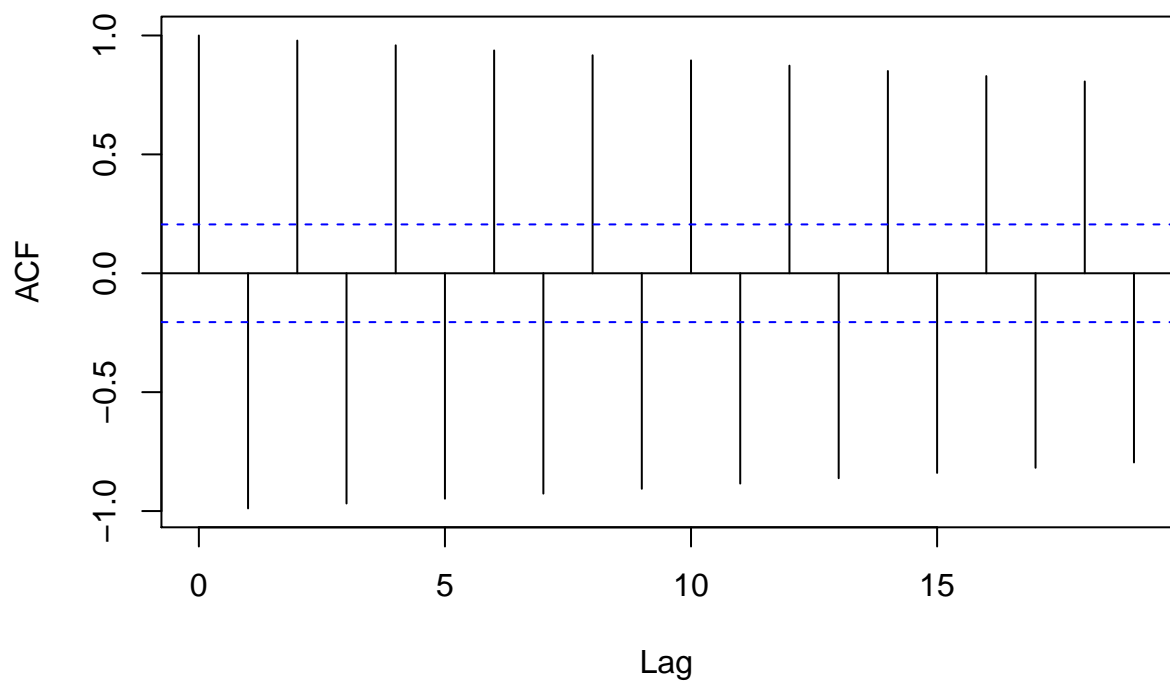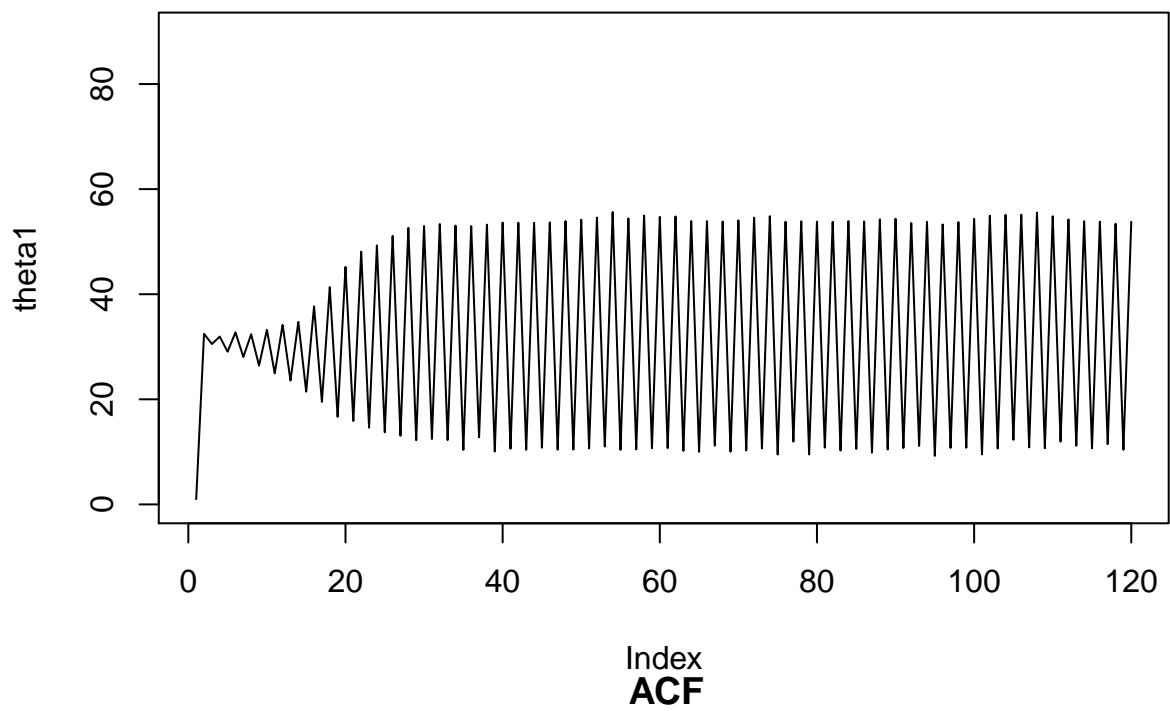
Final iteration
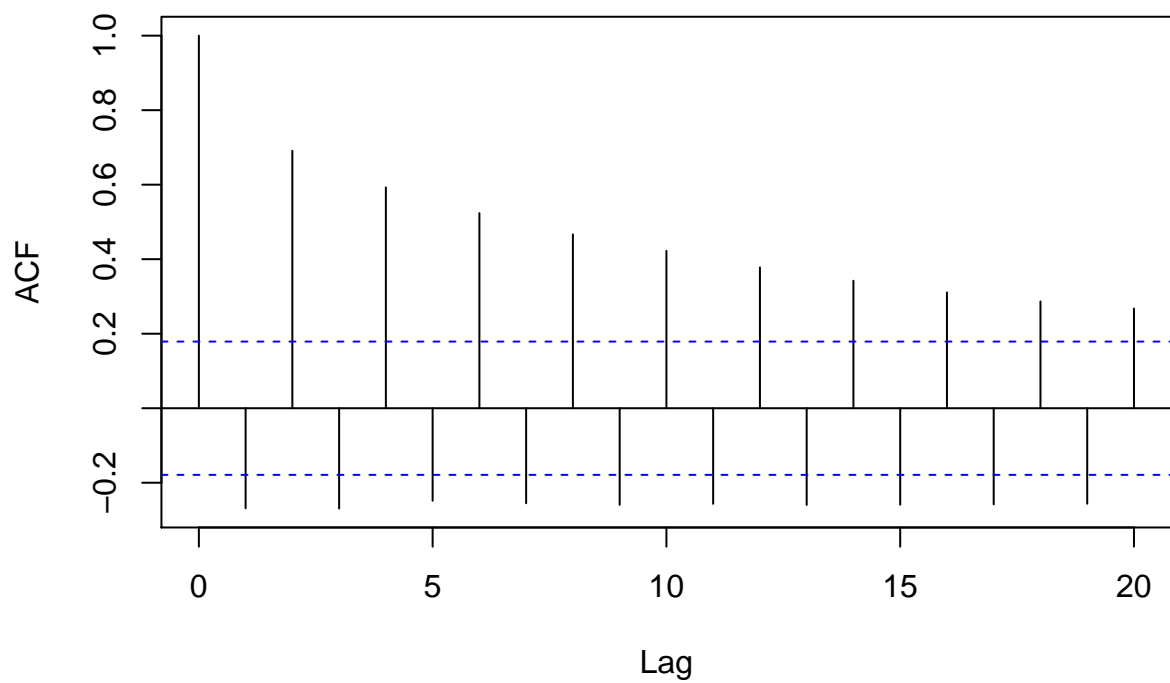
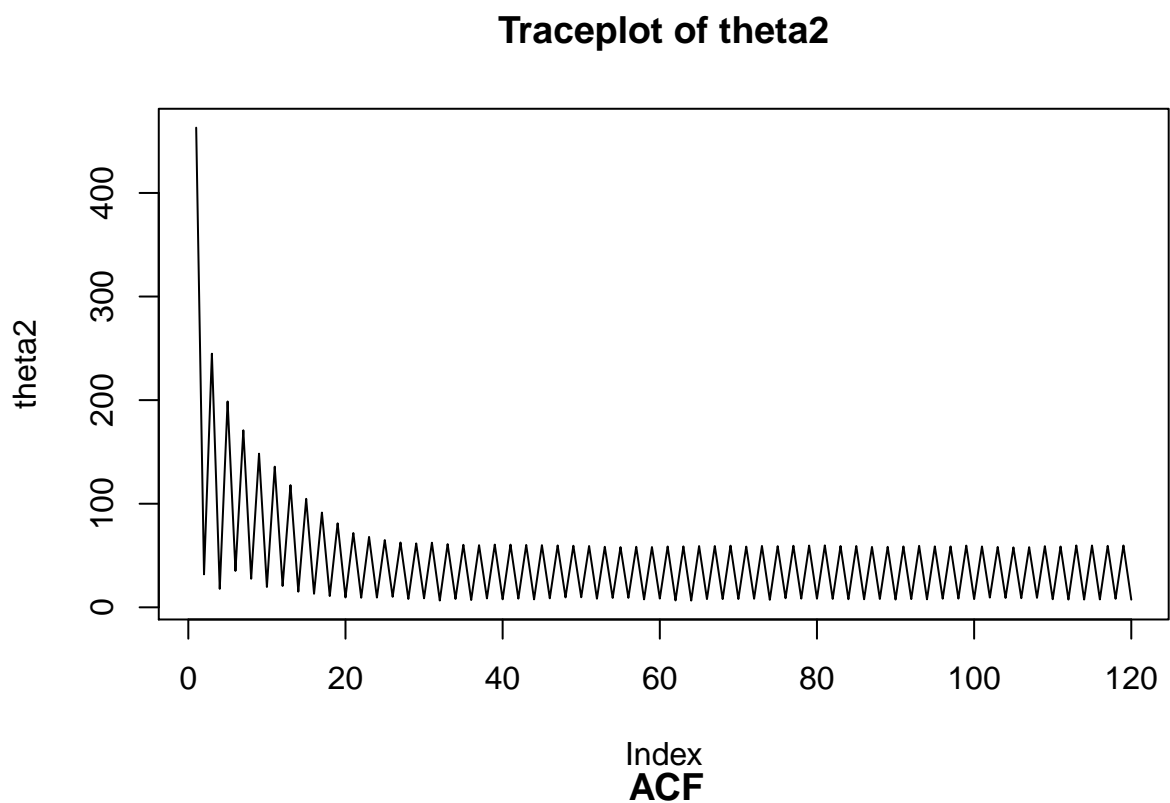Let check the convergence of all the parameters.

Traceplot, ACF and inefficiency factor of μ_1:

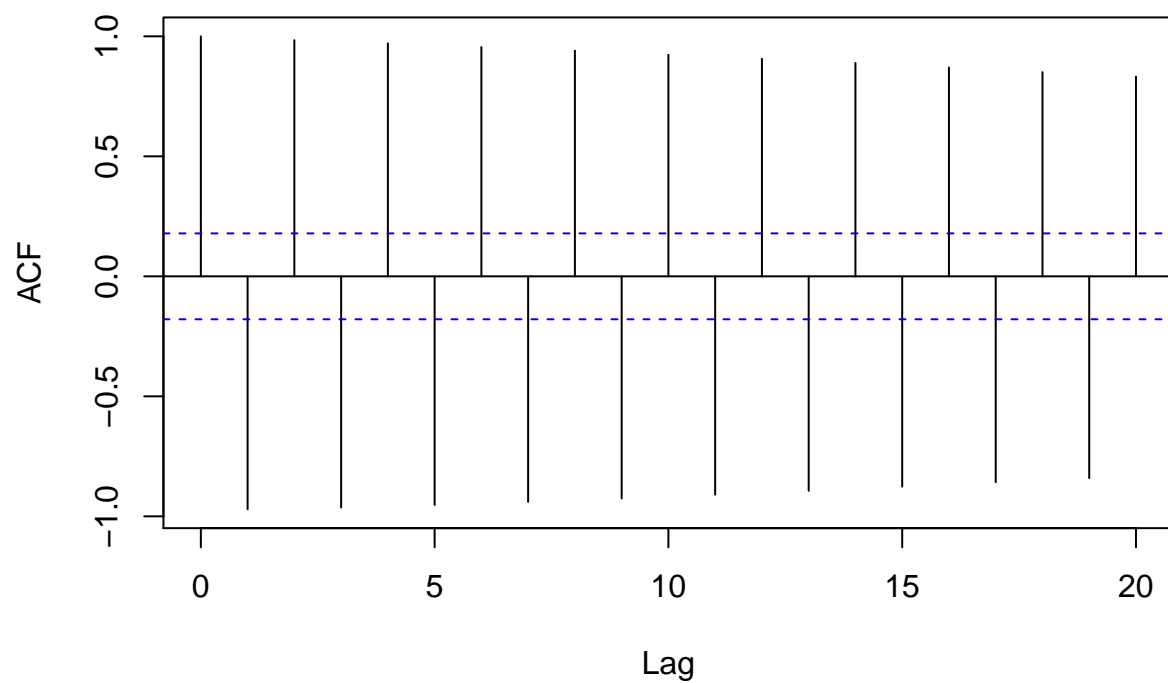## Traceplot of theta1

ACF


```
## [1] 0.8093222
```

Traceplot, ACF and inefficiency factor of μ_2:

Traceplot of theta2

ACF


```
## [1] 3.847187
```

Traceplot, ACF and inefficiency factor of σ_1^2:

Traceplot of sigma1

ACF
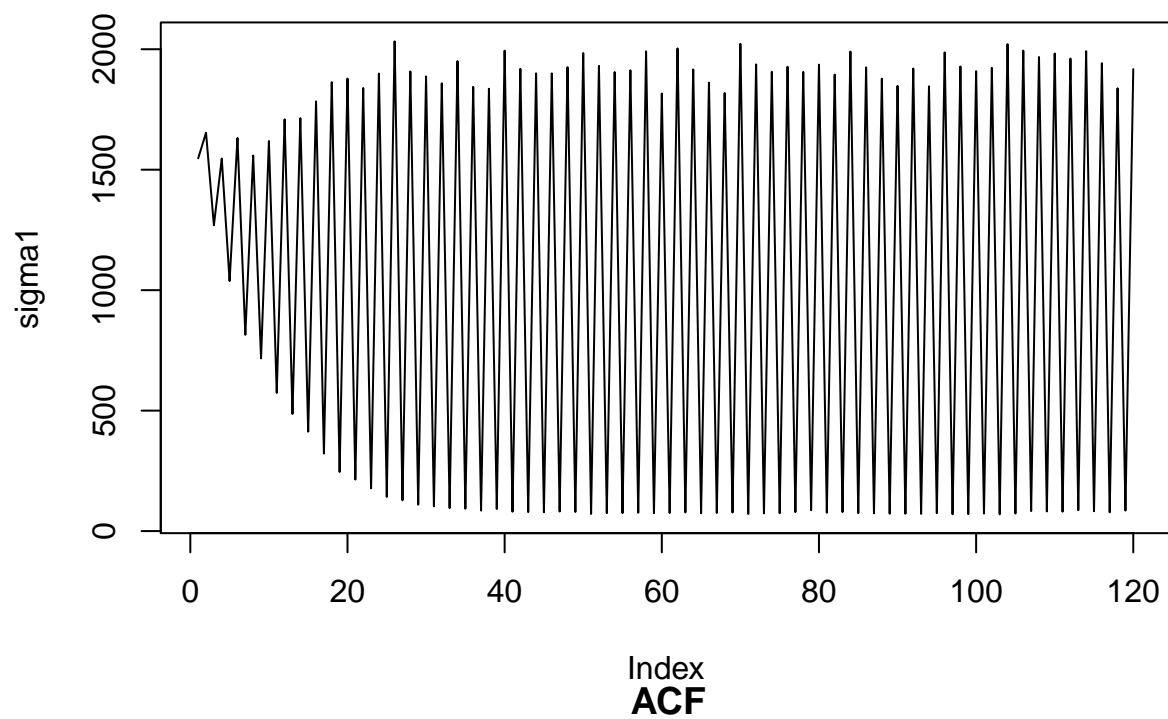

```
## [1] -0.6780999
```

Traceplot, ACF and inefficiency factor of σ_2^2:

Traceplot of sigma2

ACF
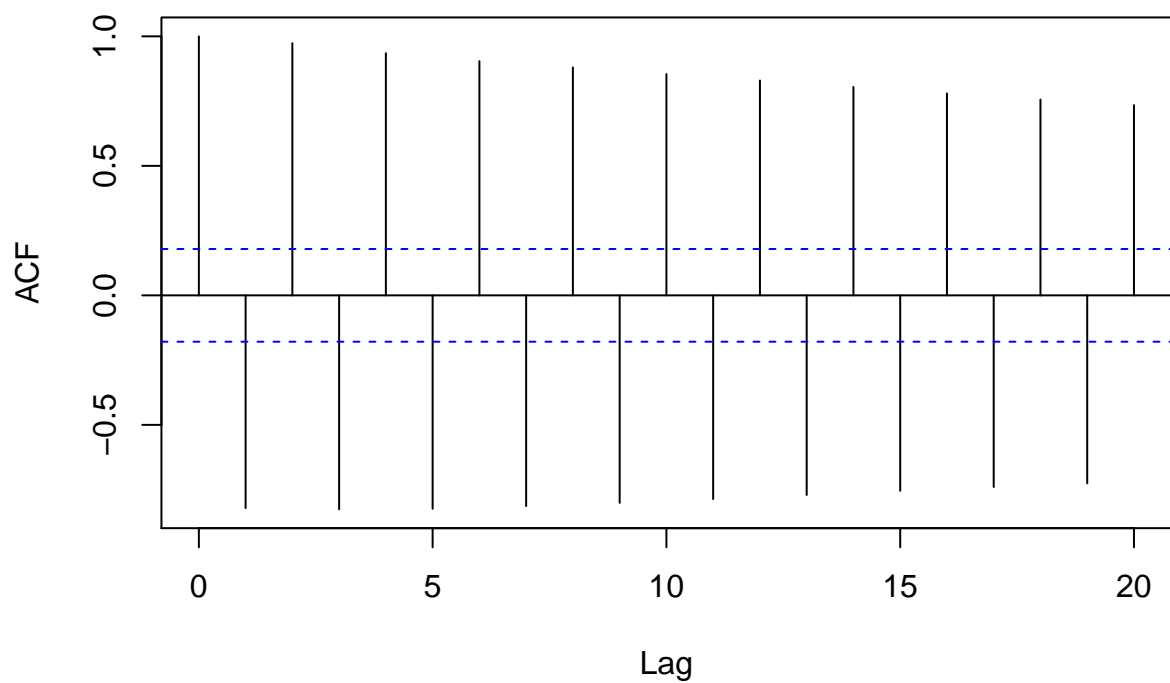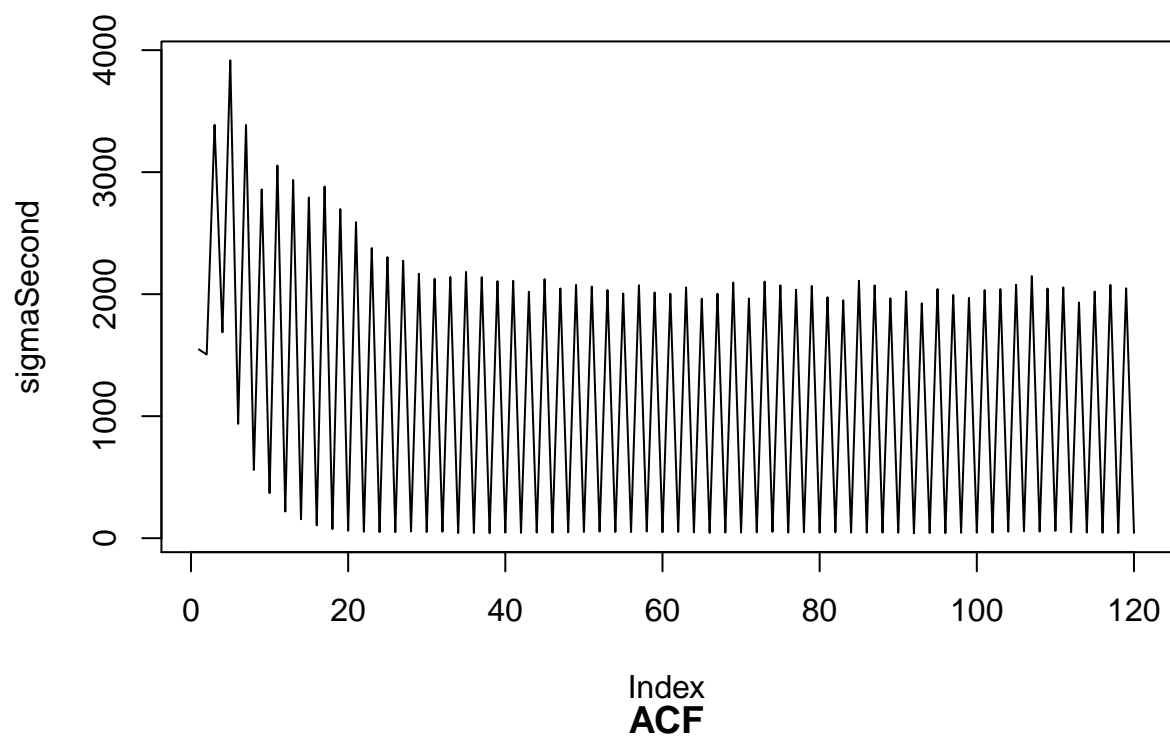

```
## [1] 0.7074198
```

Traceplot, ACF and inefficiency factor of π_1:

Traceplot of pi1

ACF
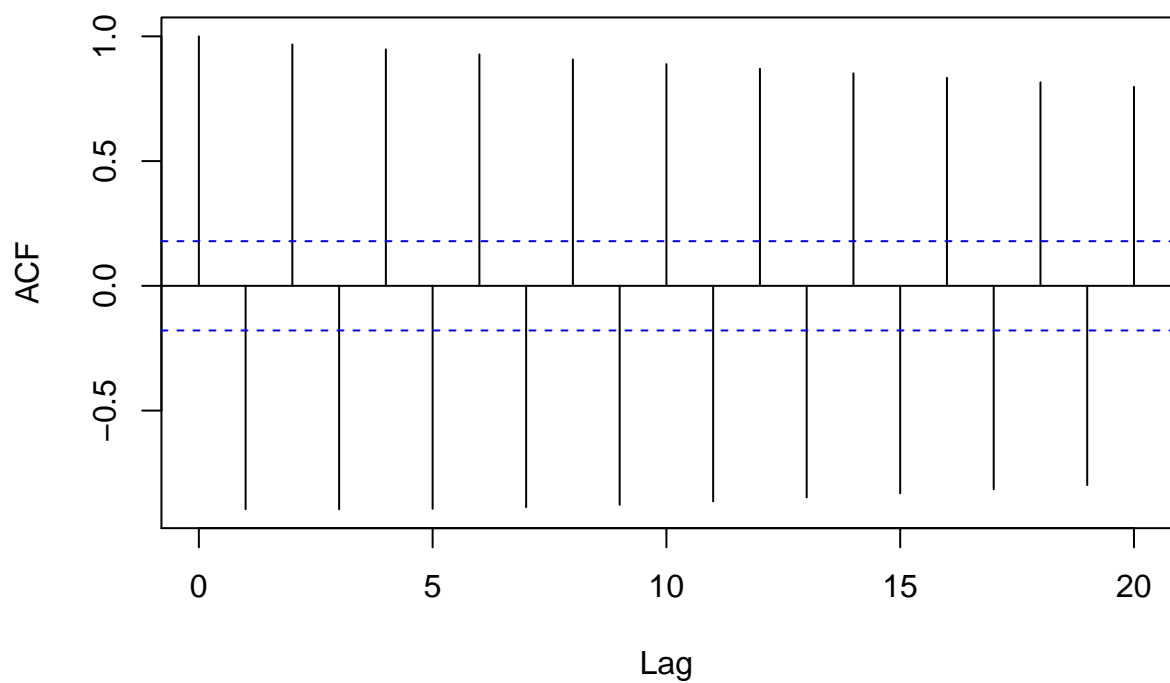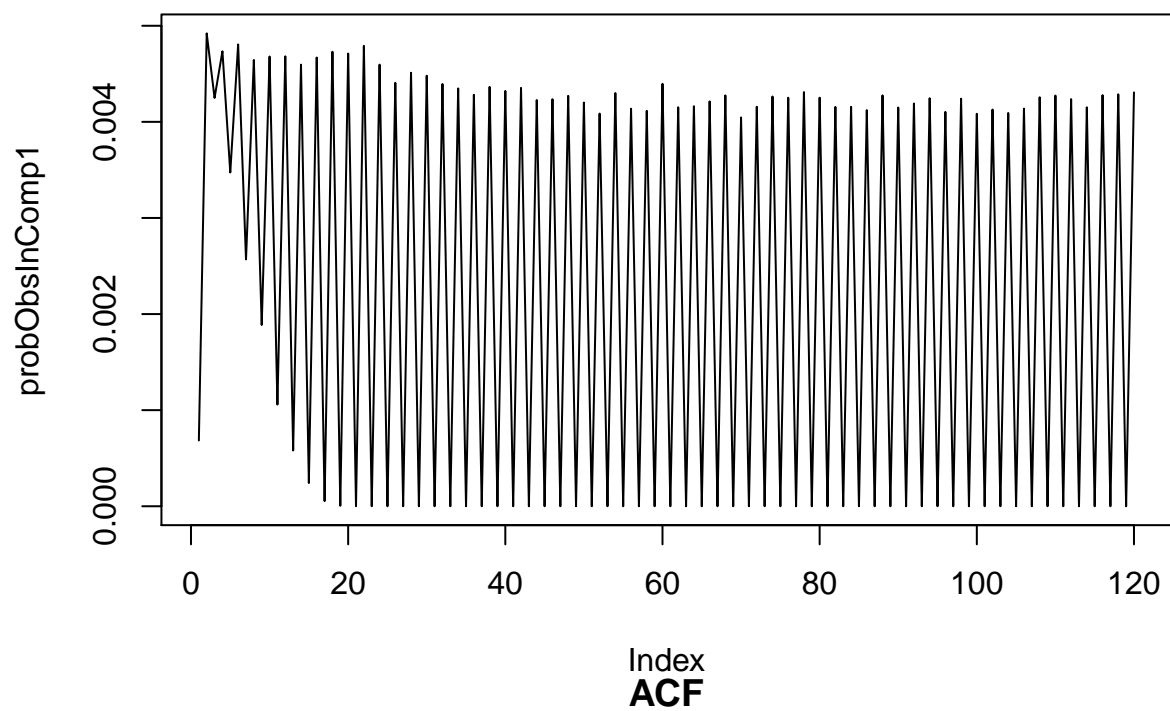

```
## [1] -0.1939632
```

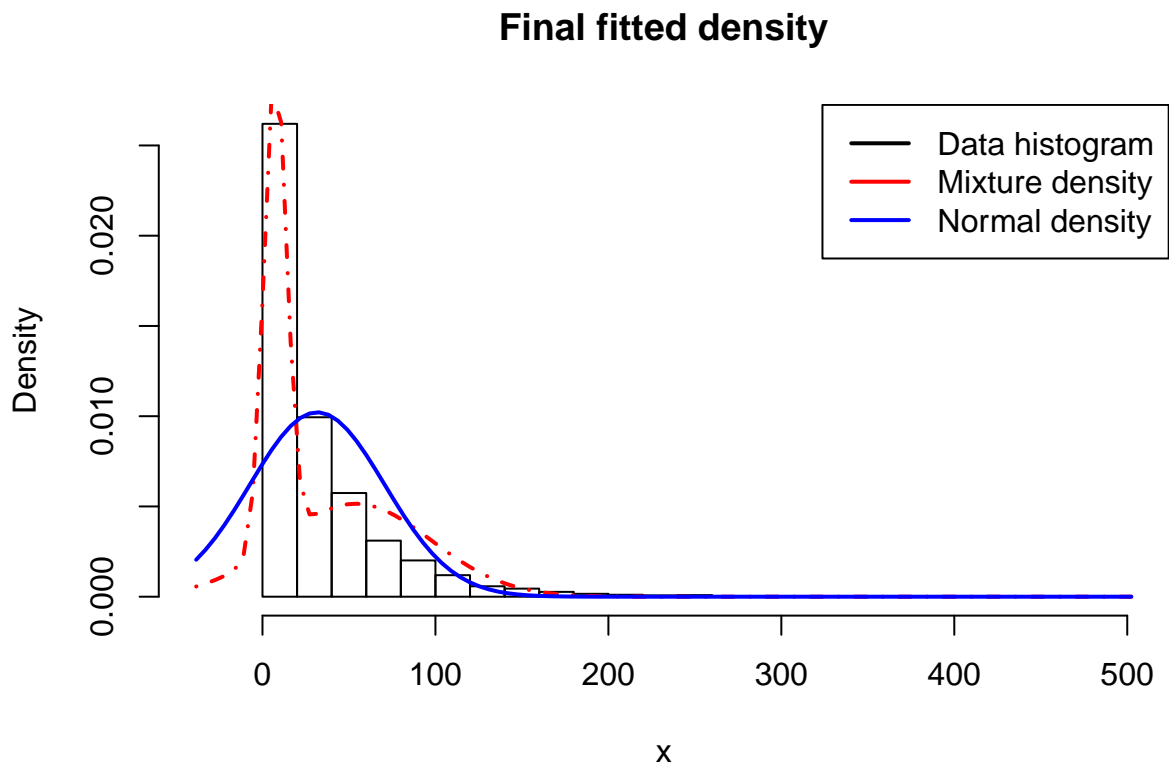Traceplot, ACF and inefficiency factor of π_2:
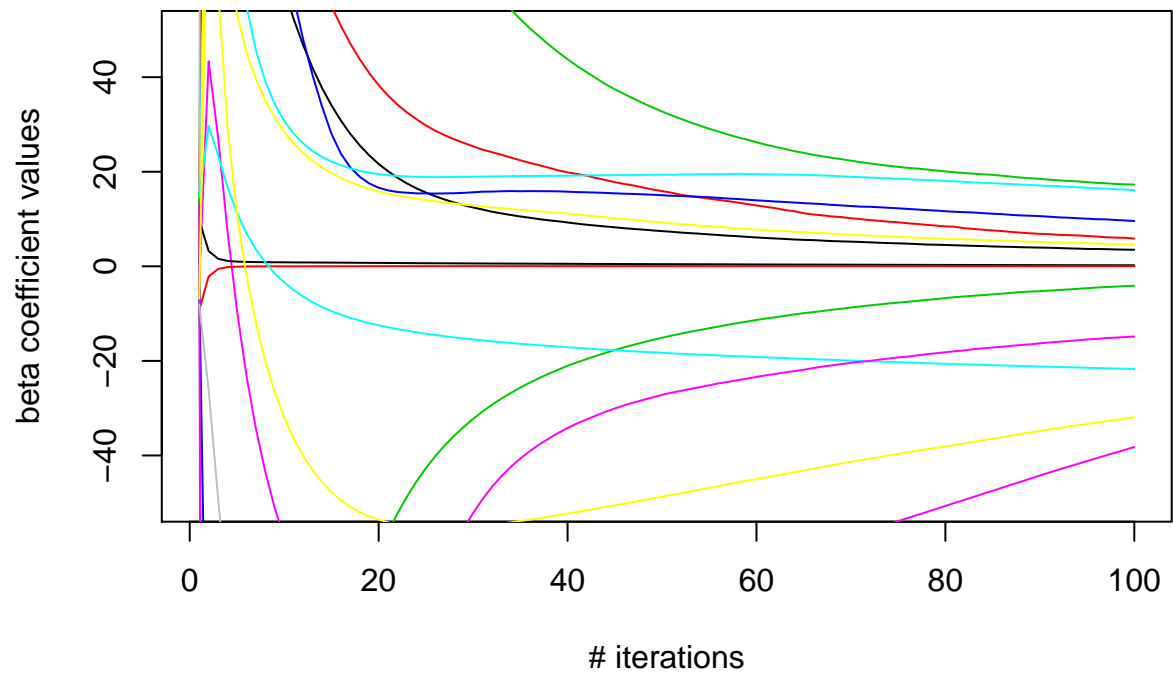
Traceplot of pi2

ACF
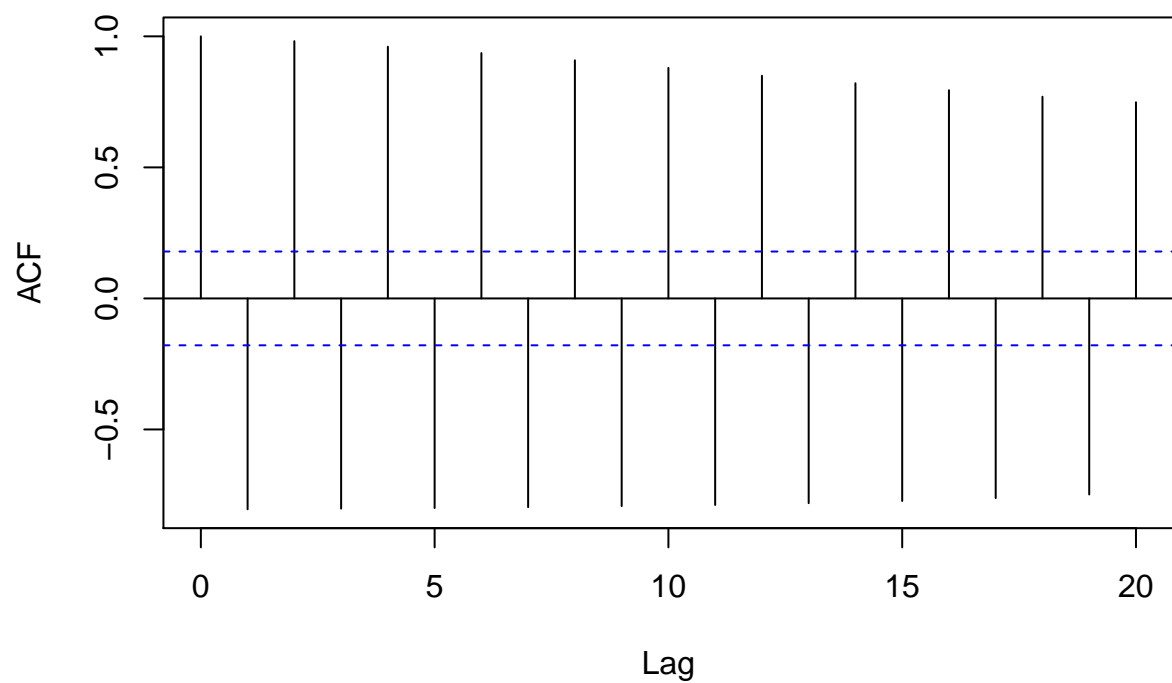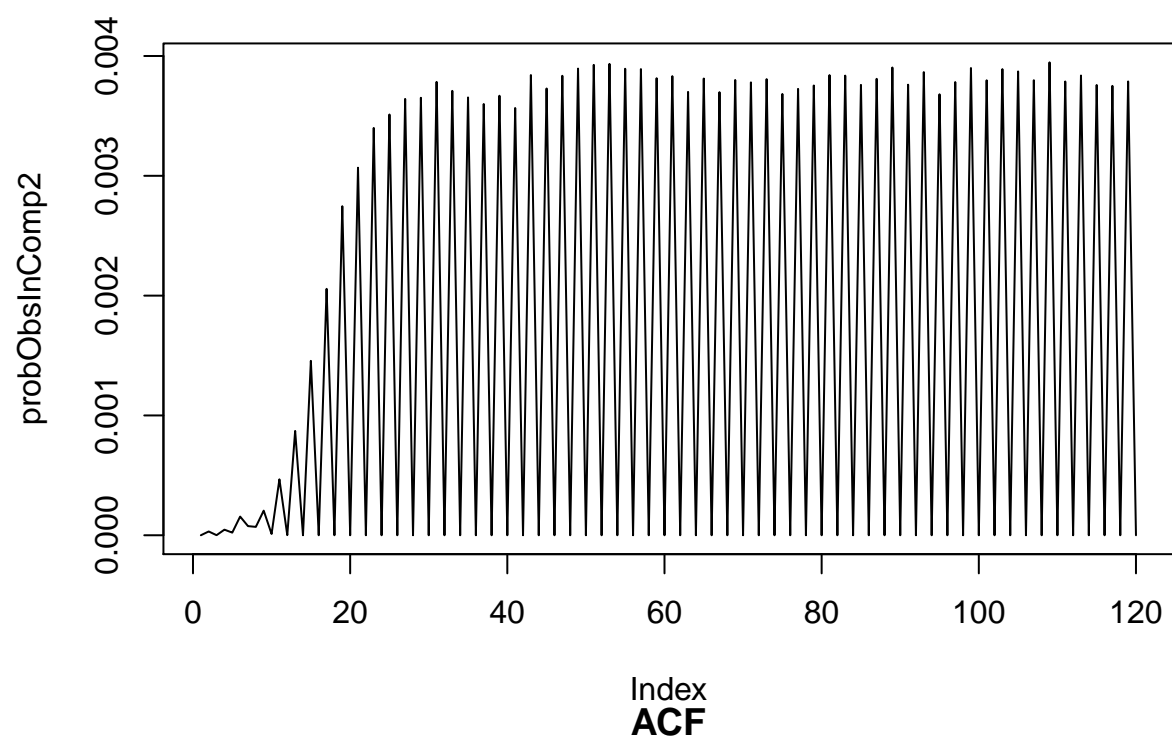

```
## [1] 1.107236
```

1.c

Histogram of the data with the model in 1.a and 1.b using the posterior mean values for all the parameters:

Final fitted density

The mixture of normal models seems to be the best in terms of fitting.

beta coefficents vs # iterations

[1] "Classification rate for posterior mode coefficients: 90.6 %"

[1] "Classification rate for gibbs sampler coefficients: 88.7 %"