HW7

Qi Qi

10/26/2018

$$f(x|\delta, \mu_1, \mu_2, \sigma_1^2, \sigma_2^2) = \delta \frac{1}{\sqrt{2\pi}\sigma_1} e^{-\frac{(x-\mu_1)^2}{2\sigma_1^2}} + (1-\delta) \frac{1}{\sqrt{2\pi}\sigma_2} e^{-\frac{(x-\mu_2)^2}{2\sigma_2^2}}$$
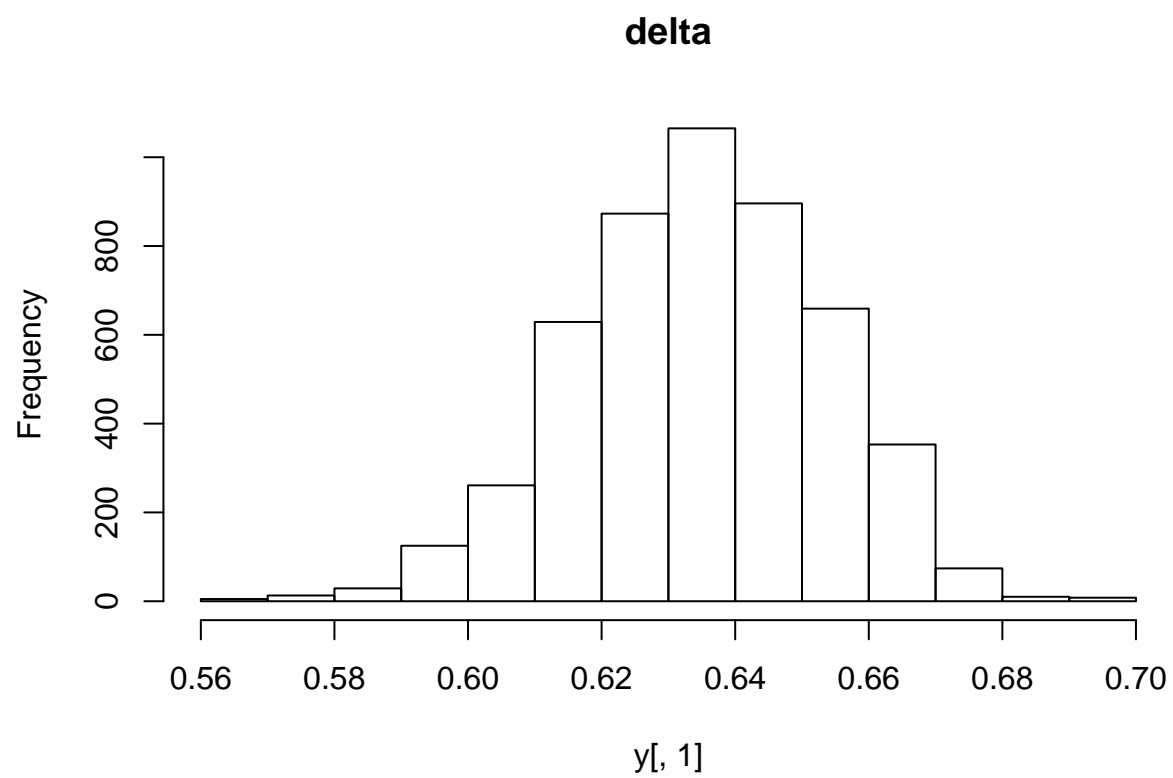
$\mu_1 \sim N(0, 10^2)$, $\mu_2 \sim N(0, 10^2)$, $1/\sigma_1^2 \sim Gamma(.5, 10)$, $1/\sigma_2^2 \sim Gamma(.5, 10)$.

$$f(\delta, \mu_1, \mu_2, \sigma_1^2, \sigma_2^2, x) = [\delta \frac{1}{\sqrt{2\pi}\sigma_1} e^{-\frac{(x-\mu_1)^2}{2\sigma_1^2}} + (1-\delta) \frac{1}{\sqrt{2\pi}\sigma_2} e^{-\frac{(x-\mu_2)^2}{2\sigma_2^2}}]$$
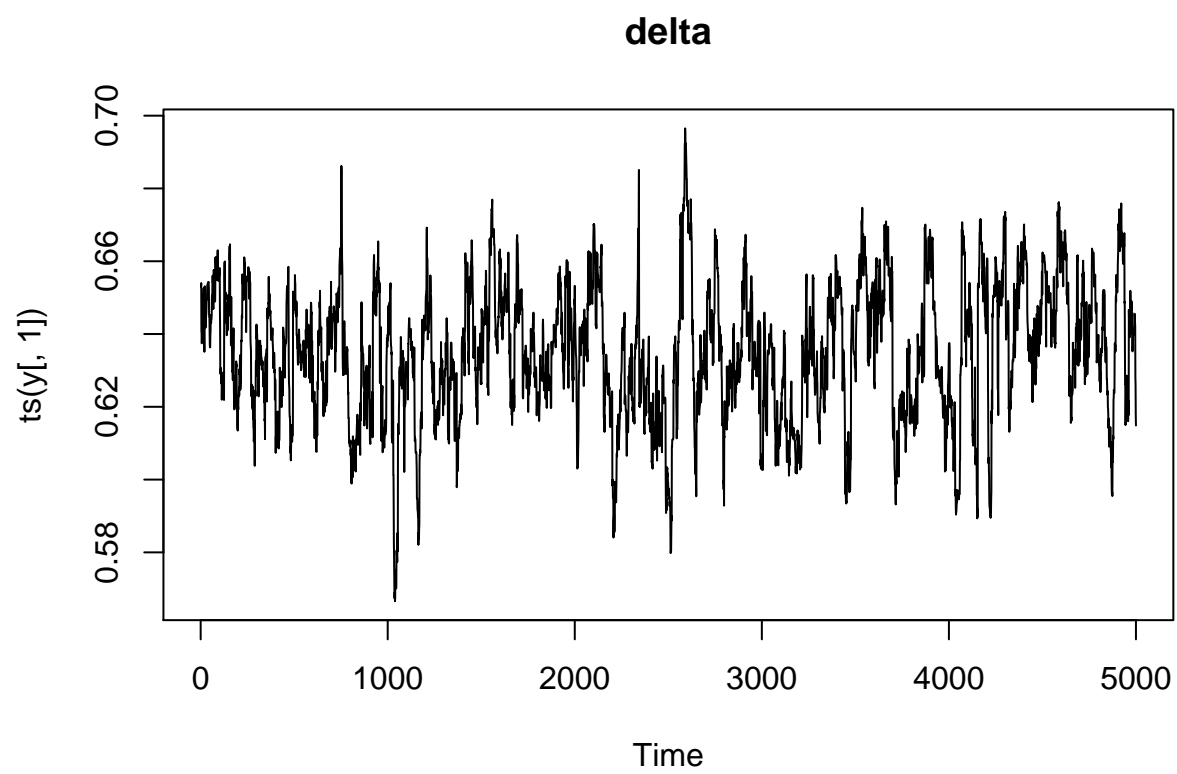
$$\frac{1}{2\pi} e^{-\frac{\mu_1^2+\mu_2^2}{200}} \frac{1}{\Gamma(.5)^2 10} (1/\sigma_1^2)^{1.5} (1/\sigma_2^2)^{1.5} e^{-\frac{1}{10\sigma_1^2}} e^{-\frac{1}{10\sigma_2^2}}$$

$$f(\delta, \mu_1, \mu_2, \sigma_1^2, \sigma_2^2|x) \propto \exp[\log(\frac{\delta}{\sigma_1} e^{-\frac{(x-\mu_1)^2}{2\sigma_1^2}} + \frac{1-\delta}{\sigma_2} e^{-\frac{(x-\mu_2)^2}{2\sigma_2^2}}) - \mu_1^2/200 - \mu_2^2/200 - 3\log\sigma_1 - 3\log\sigma_2 - \frac{1}{10\sigma_1^2} - \frac{1}{10\sigma_2^2}]$$
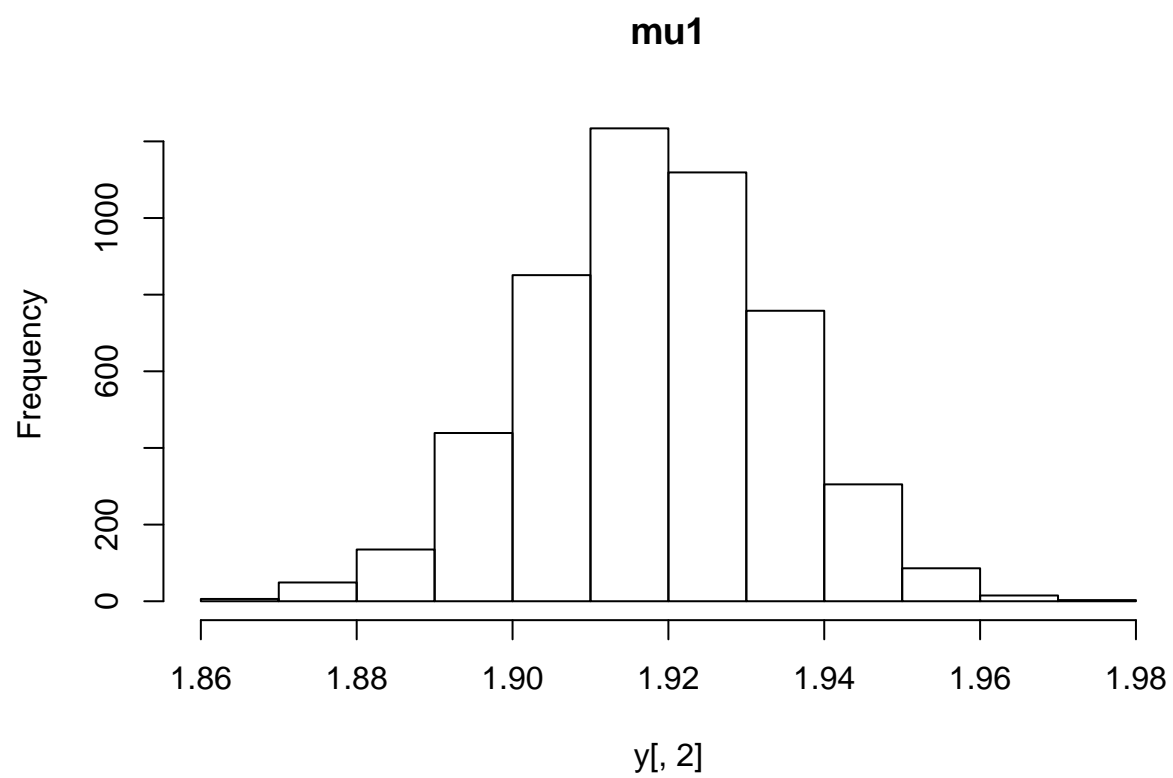
```r
# true value
delta <- 0.7
mu1 <- 2
mu2 <- 4
sigma1 <- .5
sigma2 <- .8
# sample
n <- 1000
u <- rbinom(n, prob = delta, size = 1)
dat <- rnorm(n, ifelse(u == 1, mu1, mu2), ifelse(u == 1, sigma1, sigma2))
mylike <- function(delta, mu1, mu2, sigma1, sigma2, x){
  sum(log(delta / sigma1 * exp(-(x - mu1) ^ 2 / (2 * sigma1 ^ 2)) + (1 - delta) / sigma2 * exp(-(x - mu
}
init <- c(.6, 3, 5, 3, 4)
y <- arms(init, function(x) mylike(x[1], x[2], x[3], x[4], x[5], x = dat), function(x) (x[1] > 1e-5) *
hist(y[, 1], main = "delta")
```
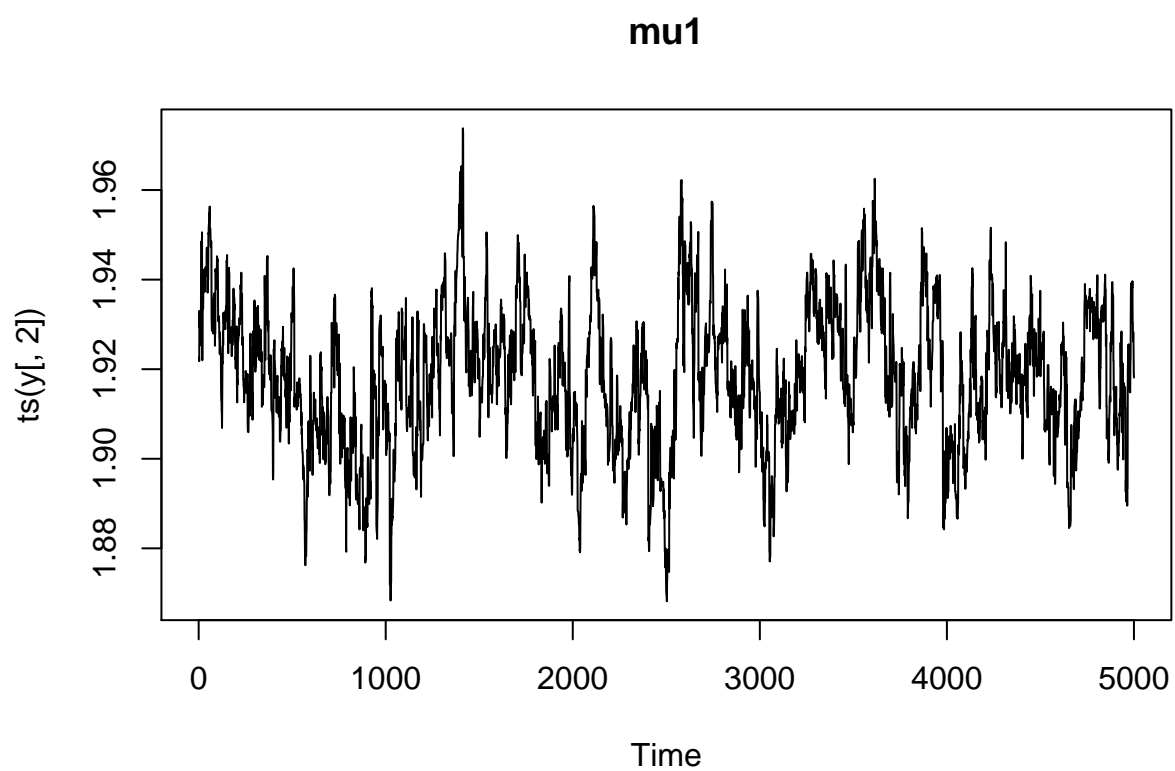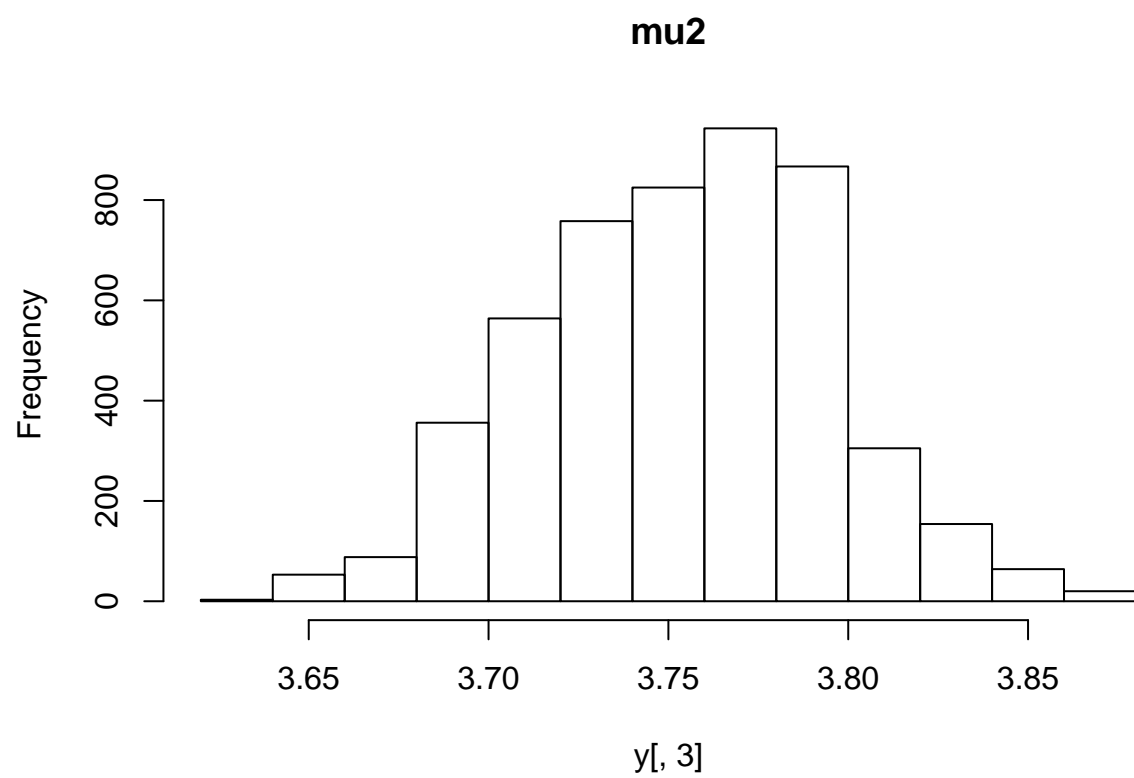
delta


```r
plot(ts(y[, 1]), main = "delta")
```
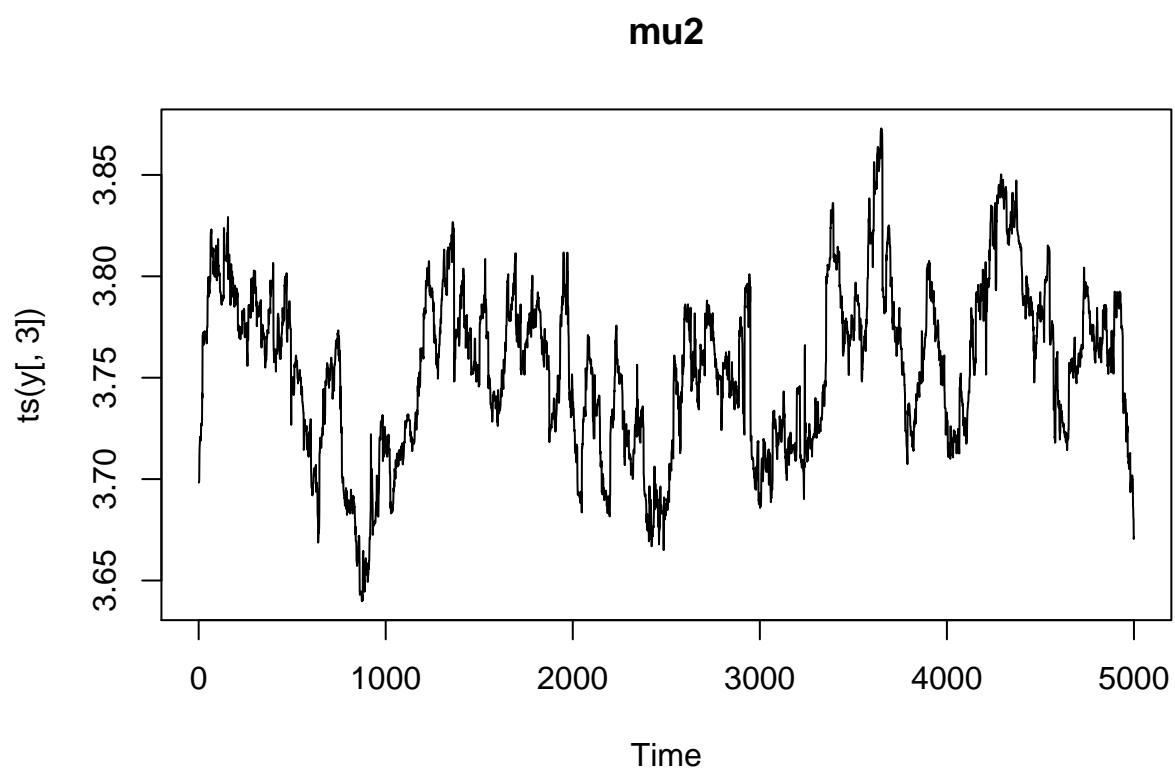
delta


```r
hist(y[, 2], main = "mu1")
```

3

mu1


```r
plot(ts(y[, 2]), main = "mu1")
```

mu1


```r
hist(y[, 3], main = "mu2")
```

mu2


```r
plot(ts(y[, 3]), main = "mu2")
```

mu2


```r
hist(y[, 4], main = "sigma1")
```

sigma1

y[, 4]
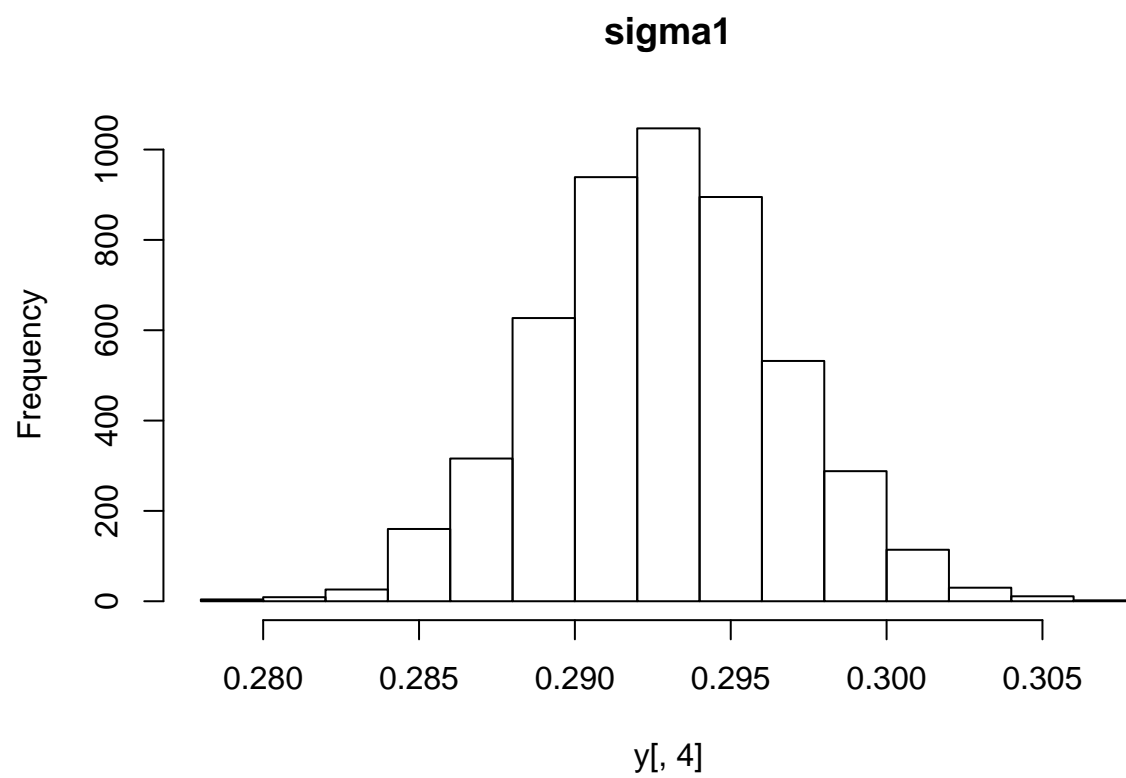
```r
plot(ts(y[, 4]), main = "sigma1")
```

sigma1


```r
hist(y[, 5], main = "sigma2")
```

sigma2


```r
plot(ts(y[, 5]), main = "sigma2")
```

sigma2