STA457TUT6

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2022/2/12

```
set.seed(111)
ar1 = c()
ma1 = c()
sigma2 = c()
for (i in 1:10){
z <- arima.sim(model = list(ar = c(-0.5), ma = c(-0.9)),
    n = 500)
AR <- arima(z, order = c(1,0,1))
ar1[i] = coef(AR)[1]
ma1[i] = coef(AR)[2]
sigma2[i] = AR$sigma2

}
```

```
ar1_ = matrix(ar1)
colnames(ar1_) <- c("estimated_phi" )
true_phi <- c(-0.5)
ar_1 <- rbind(true_phi,ar1_)
rownames(ar_1) <- c("true_phi","sim1","sim2","sim3","sim4","sim5","sim6","sim7","sim8","sim9","sim10")
```

```
ar1_ = matrix(ar1)
colnames(ar1_) <- c("estimated_phi" )
true_parameter <- c(-0.5)
ar_1 <- rbind(true_parameter,ar1_)
rownames(ar_1) <- c("true_parameter","sim1","sim2","sim3","sim4","sim5","sim6","sim7","sim8","sim9","si
```

```
ma1_ = matrix(ma1)
colnames(ma1_) <- c("estimated_theta" )
true_parameter <- c(-0.9)
ma_1 <- rbind(true_parameter,ma1_)
rownames(ma_1) <- c("true_parameter","sim1","sim2","sim3","sim4","sim5","sim6","sim7","sim8","sim9","si
```

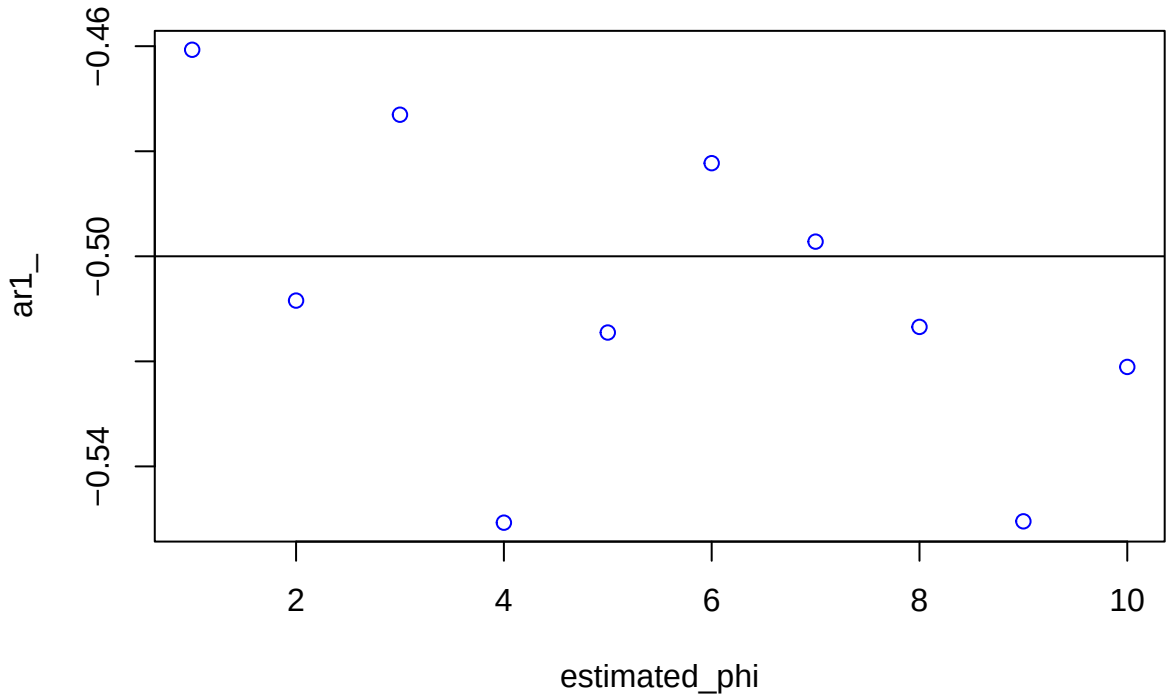
```
sigma2_ = matrix(sigma2)
colnames(sigma2_) <- c("estimated_sigma2" )
true_parameter <- c(1)
sigma_2 <- rbind(true_parameter,sigma2_)
rownames(sigma_2) <- c("true_parameter","sim1","sim2","sim3","simu4","sim5","sim6","sim7","sim8","sim9"
```

```
do.call(cbind, list(ar_1, ma_1,sigma_2))
```

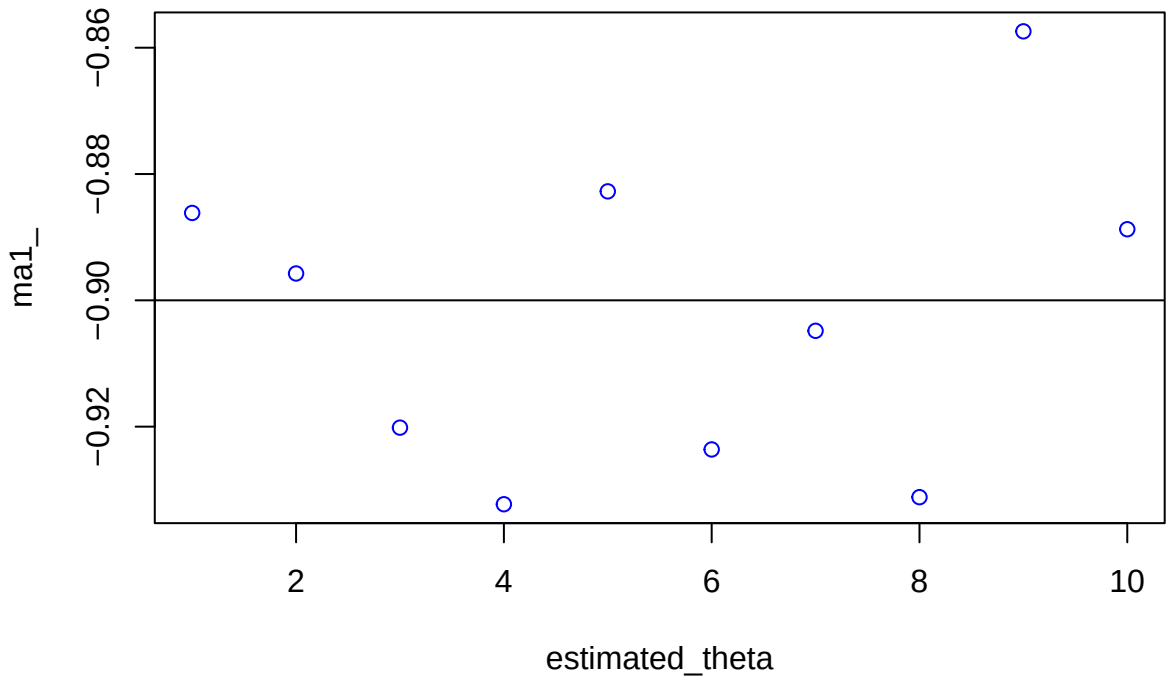
```
##                estimated_phi estimated_theta estimated_sigma2
## true_parameter    -0.5000000      -0.9000000        1.0000000
## sim1              -0.4606816      -0.8861621        1.0066656
## sim2              -0.5084295      -0.8957472        0.9545764
```

```
## sim3              -0.4730468      -0.9201530        0.9389484
## sim4              -0.5507091      -0.9322839        0.9242786
## sim5              -0.5145113      -0.8827459        0.9709722
## sim6              -0.4822710      -0.9236083        1.1460721
## sim7              -0.4972073      -0.9048256        1.0309401
## sim8              -0.5134424      -0.9311640        0.8993930
## sim9              -0.5504592      -0.8574106        0.9380856
## sim10             -0.5210618      -0.8887411        1.1221034
```

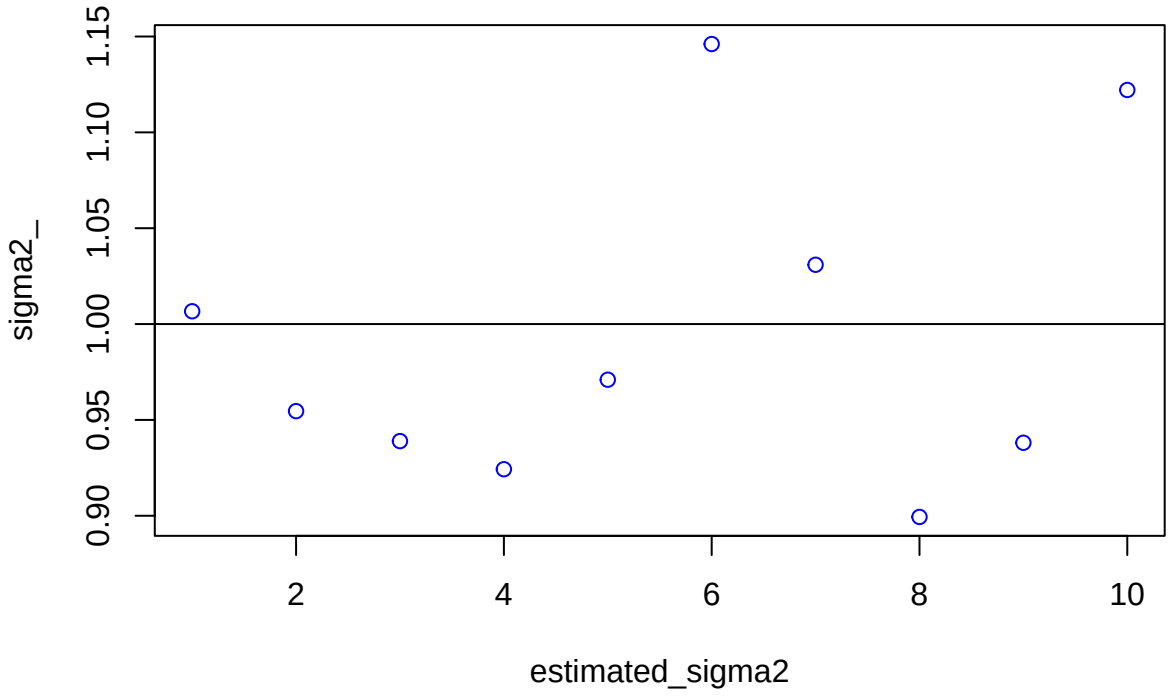
```
plot(ar1_,xlab = "estimated_phi",col = "blue")
abline(h = -0.5)
```




```
plot(ma1_,xlab = "estimated_theta",col = "blue")
abline(h = -0.9)
```




```
plot(sigma2_,xlab = "estimated_sigma2",col = "blue")
abline(h = 1)
```



The conclusion is that the estimated values are randomly distributed around the true parameters taken(phi = -0.5,theta = -0.9,sigma2 = 1).There's no pattern of relationship between the estimates, which indicates that the observations taken are identical and independent distribution.