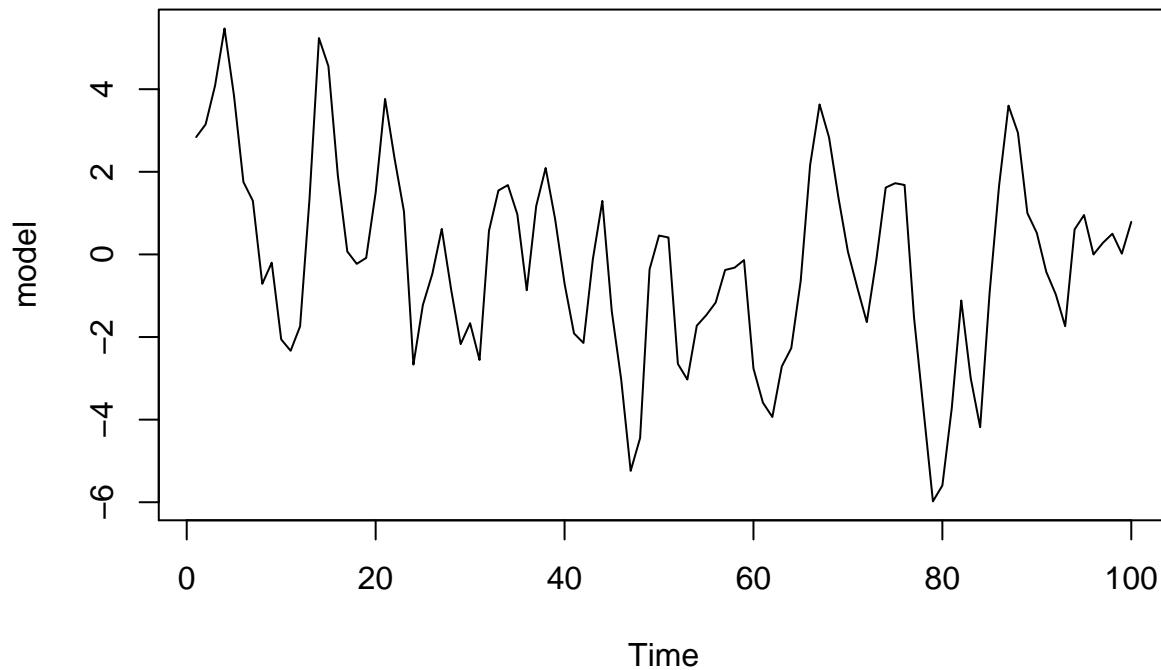# Those are back-up materials I used for calculation

Preparation

To initailize the ARMA process by following code:

```
model = arima.sim(n = 100, list(ar = c(0.8, -0.1), ma = c(0.9,0,0,-0.8, -0.1)),
          sd = 1)
var(model)
```

```
## [1] 5.528024
```
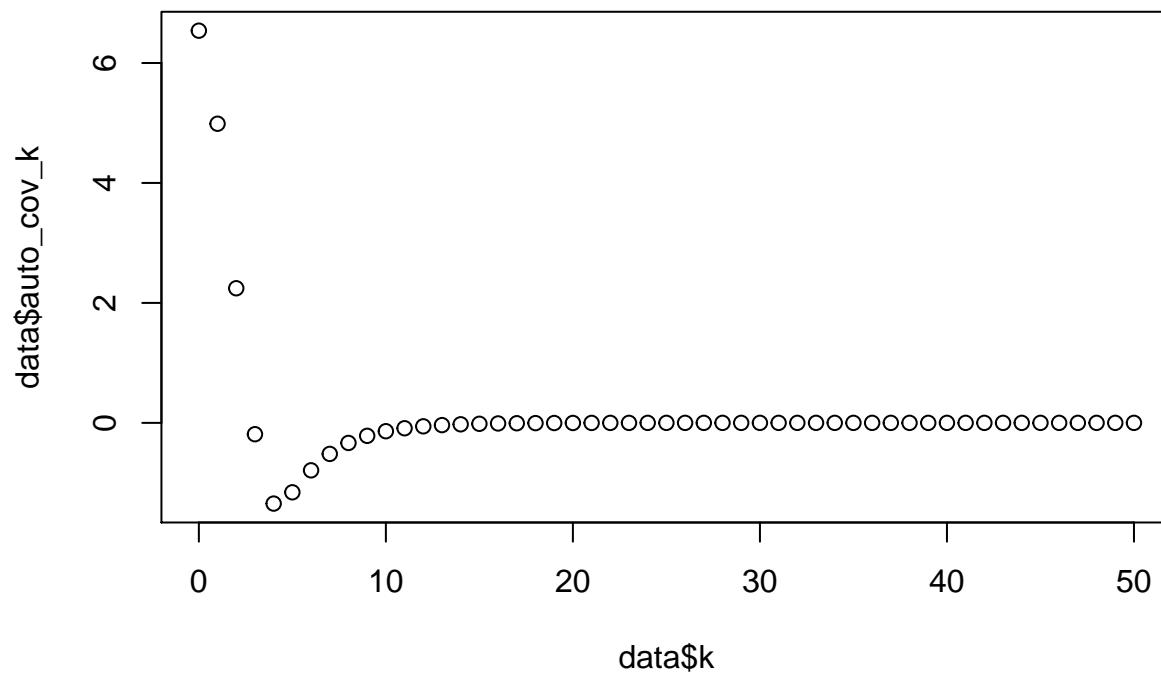
```
plot(model)
```



```
data = read.csv("/Users/kevin/Desktop/HW 1.csv")
```

this arima simlator shows given ARMA process.

2.3 Auto-Cov

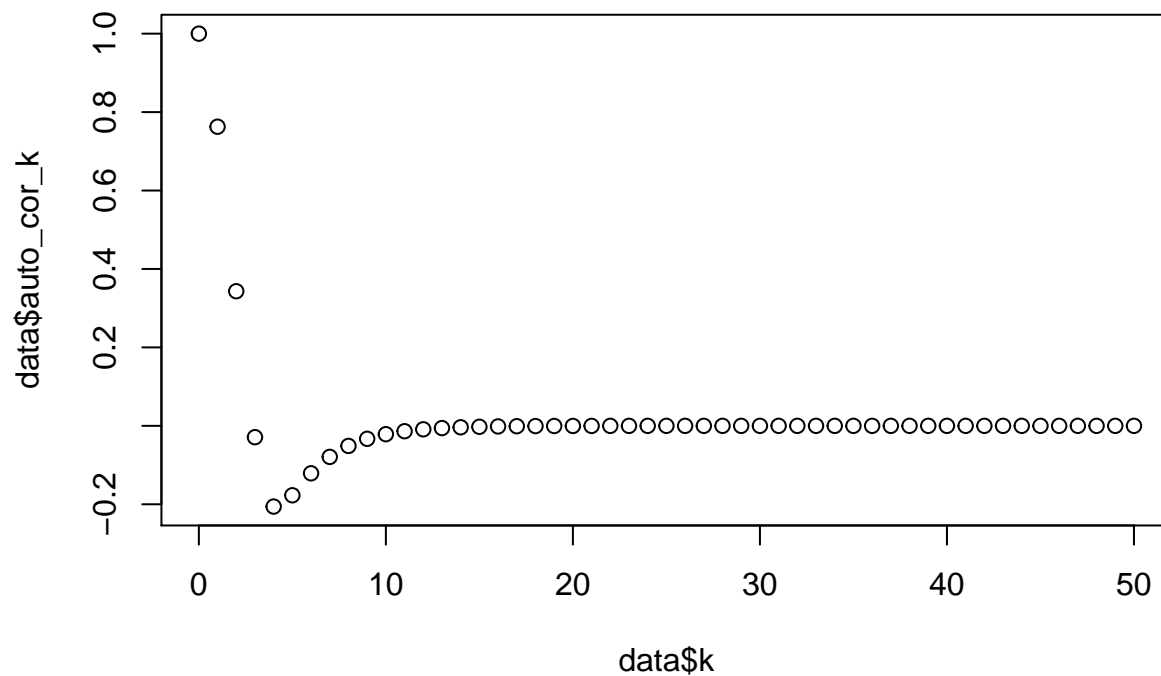Here are first auto_covariance of this process.

```
plot(data$k, data$auto_cov_k)
```

1

2.4 Auto-Cor

Here are first auto_correlation of this process.

```
plot(data$k, data$auto_cor_k)
```



```
data
```

```
##     k auto_cov_k auto_cor_k
## 1   0    6.53890    1.00000
## 2   1    4.98750    0.76274
```

```
## 3    2     2.24430     0.34322
## 4    3    -0.18930    -0.02895
## 5    4    -1.34590    -0.20583
## 6    5    -1.15780    -0.17706
## 7    6    -0.79165    -0.12107
## 8    7    -0.51754    -0.07915
## 9    8    -0.33487    -0.05121
## 10   9    -0.21614    -0.03305
## 11  10    -0.13942    -0.02132
## 12  11    -0.08993    -0.01375
## 13  12    -0.05800    -0.00887
## 14  13    -0.03741    -0.00572
## 15  14    -0.02413    -0.00369
## 16  15    -0.01556    -0.00238
## 17  16    -0.01004    -0.00153
## 18  17    -0.00647    -0.00099
## 19  18    -0.00417    -0.00064
## 20  19    -0.00269    -0.00041
## 21  20    -0.00174    -0.00027
## 22  21    -0.00112    -0.00017
## 23  22    -0.00072    -0.00011
## 24  23    -0.00047    -0.00007
## 25  24    -0.00030    -0.00005
## 26  25    -0.00019    -0.00003
## 27  26    -0.00012    -0.00002
## 28  27    -0.00008    -0.00001
## 29  28    -0.00005    -0.00001
## 30  29    -0.00003    -0.00001
## 31  30    -0.00002     0.00000
## 32  31    -0.00001     0.00000
## 33  32    -0.00001     0.00000
## 34  33    -0.00001     0.00000
## 35  34     0.00000     0.00000
## 36  35     0.00000     0.00000
## 37  36     0.00000     0.00000
## 38  37     0.00000     0.00000
## 39  38     0.00000     0.00000
## 40  39     0.00000     0.00000
## 41  40     0.00000     0.00000
## 42  41     0.00000     0.00000
## 43  42     0.00000     0.00000
## 44  43     0.00000     0.00000
## 45  44     0.00000     0.00000
## 46  45     0.00000     0.00000
## 47  46     0.00000     0.00000
## 48  47     0.00000     0.00000
## 49  48     0.00000     0.00000
## 50  49     0.00000     0.00000
## 51  50     0.00000     0.00000
```

2.5 Min MSE

I use this code to calculate alpha(4,1)

```
A = array(c(6.5389,4.9875,2.2443,-0.1893,4.9875, 6.5389, 4.9875, 2.2443,2.2443, 4.9875, 6.5389, 4.9875,
B=solve(A)
C=array(c(4.9875,2.2443,-0.1893,-1.34590),dim=c(4,1))
D=B%*%C
D
```

```
##              [,1]
## [1,]   1.1896254
## [2,]  -0.4896856
## [3,]  -0.1463828
## [4,]   0.1083334
```