Auto-regressive model of order 1

Simulation of AR(1)

Simulate time series of length 100 from five different AR(1) models with α_1 equal to a) -0.9, b) -0.5, c) 0, d) 0.5, e) 0.9 respectively. For each model:

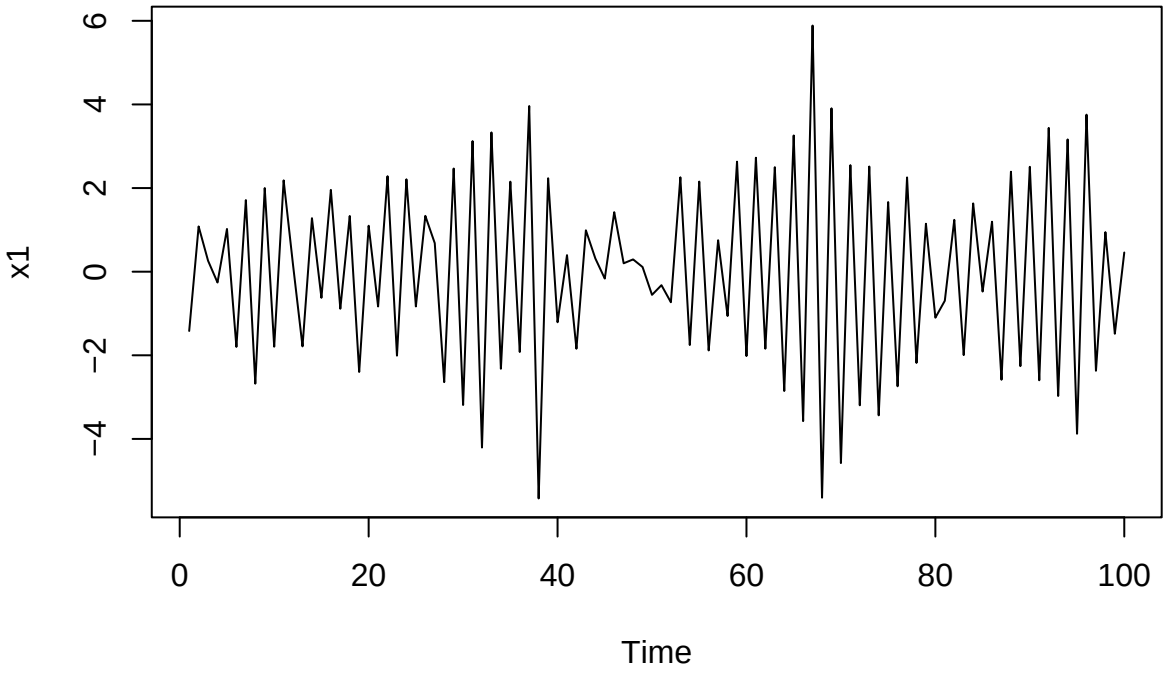
- Plot the correlogram
- Plot the theoretical autocorrelation function on top of this (how well does it fit?)

Common for all cases:

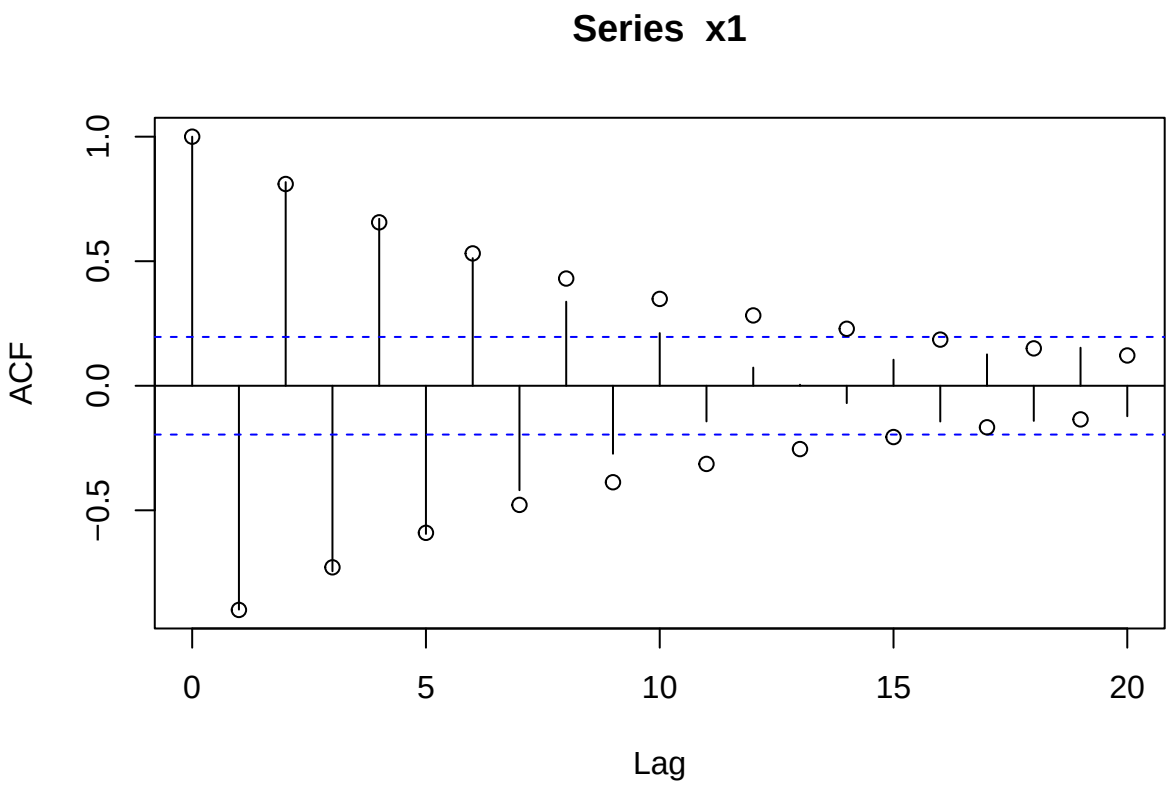
```
n <- 100
```

Case 1: $\alpha_2 = -0.9$

```
alpha1 <- -0.9
w = ts(rnorm(n))
x1 = filter(w,alpha1,method="recursive")
plot(x1)
```

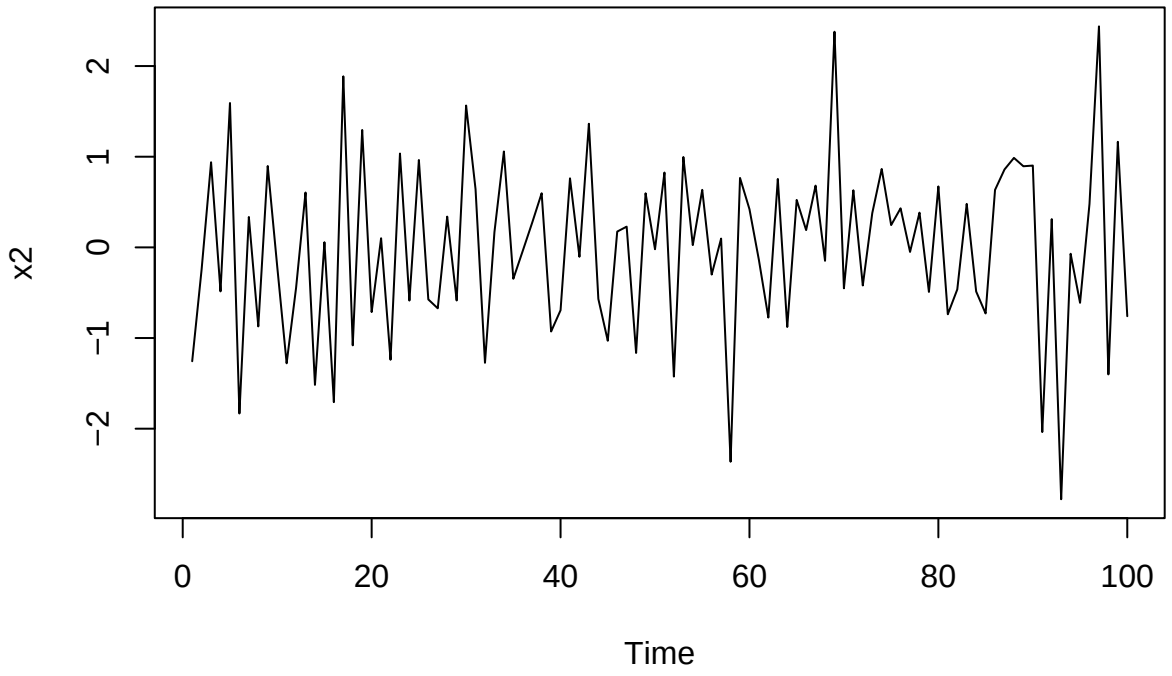



```
acf(x1)
points(0:20,alpha1^(0:20))
```

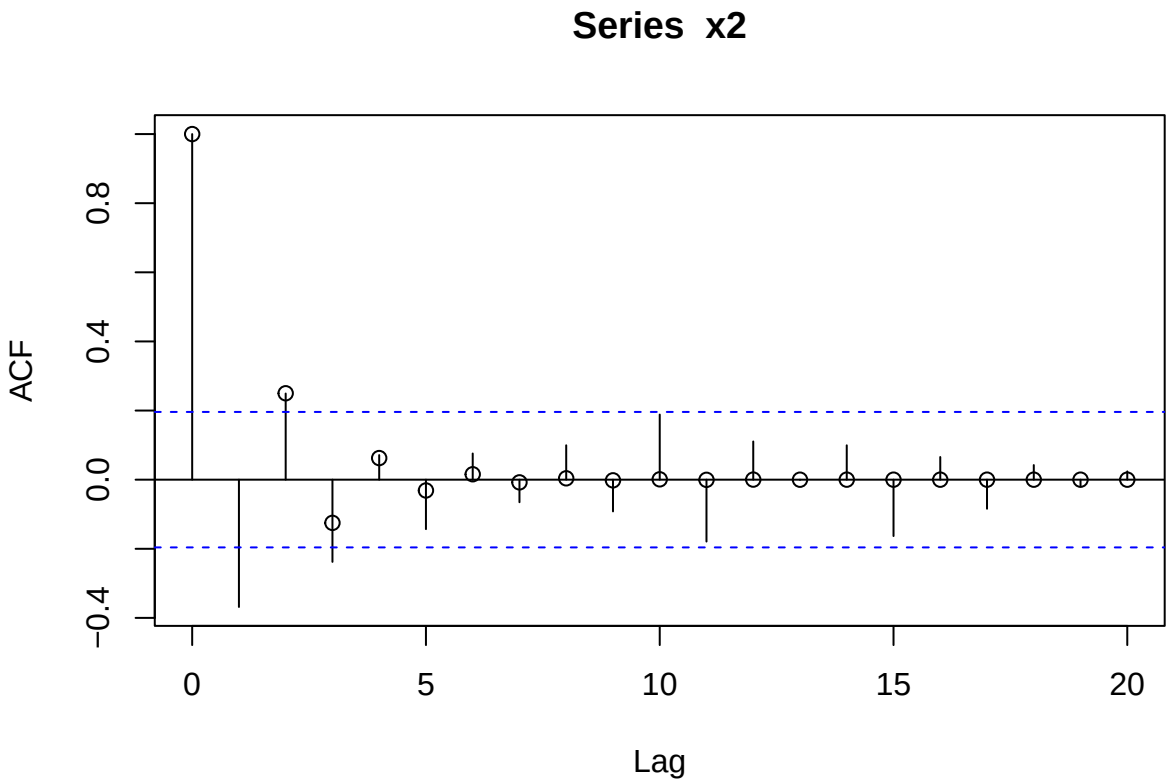


Case 2: $\alpha_2 = -0.5$

```
alpha2 <- -0.5
w = ts(rnorm(n))
x2 = filter(w,alpha2,method="recursive")
plot(x2)
```

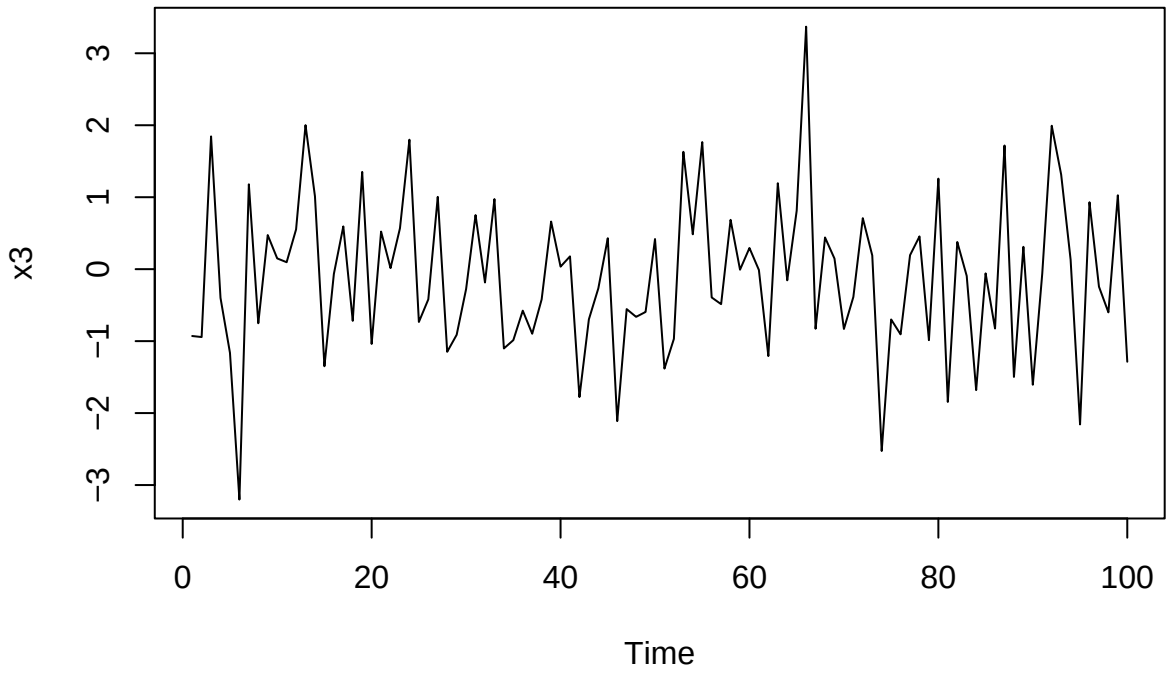


```
acf(x2)
points(0:20,alpha2^(0:20))
```

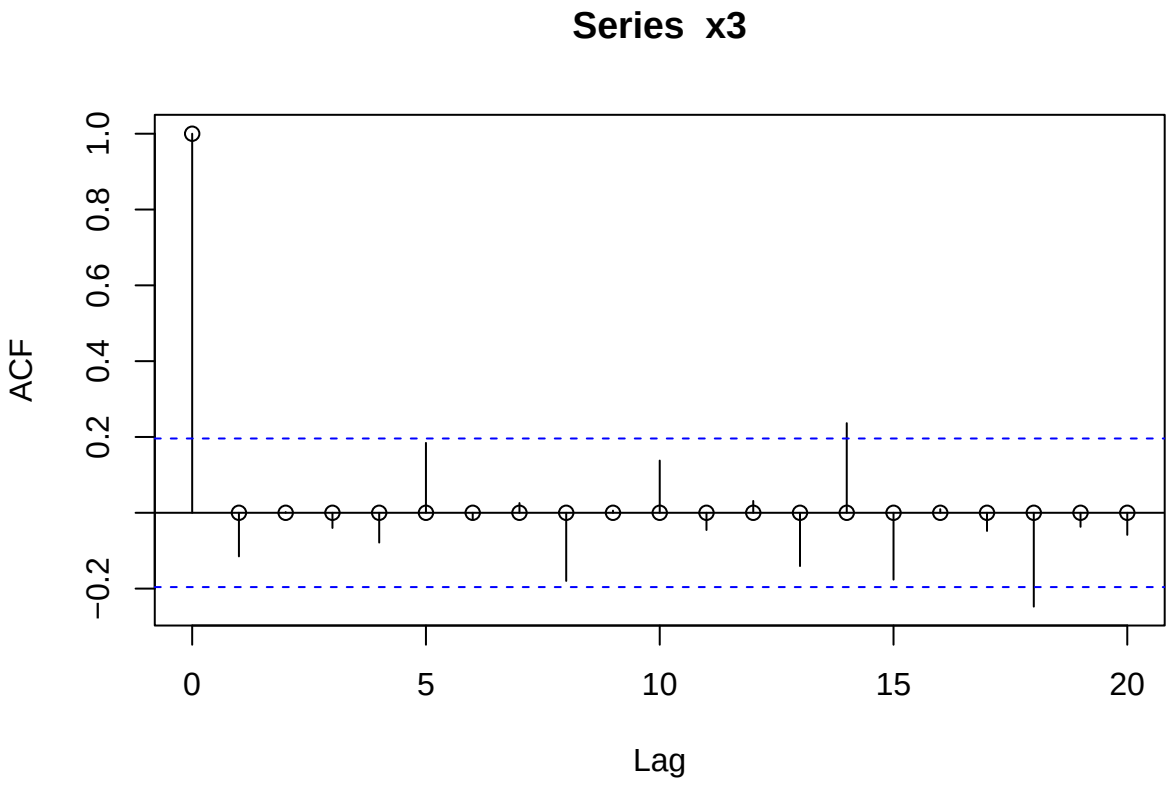


Case 3: $\alpha_3 = 0$

```
alpha3 <- 0
w = ts(rnorm(n))
x3 = filter(w,alpha3,method="recursive")
plot(x3)
```



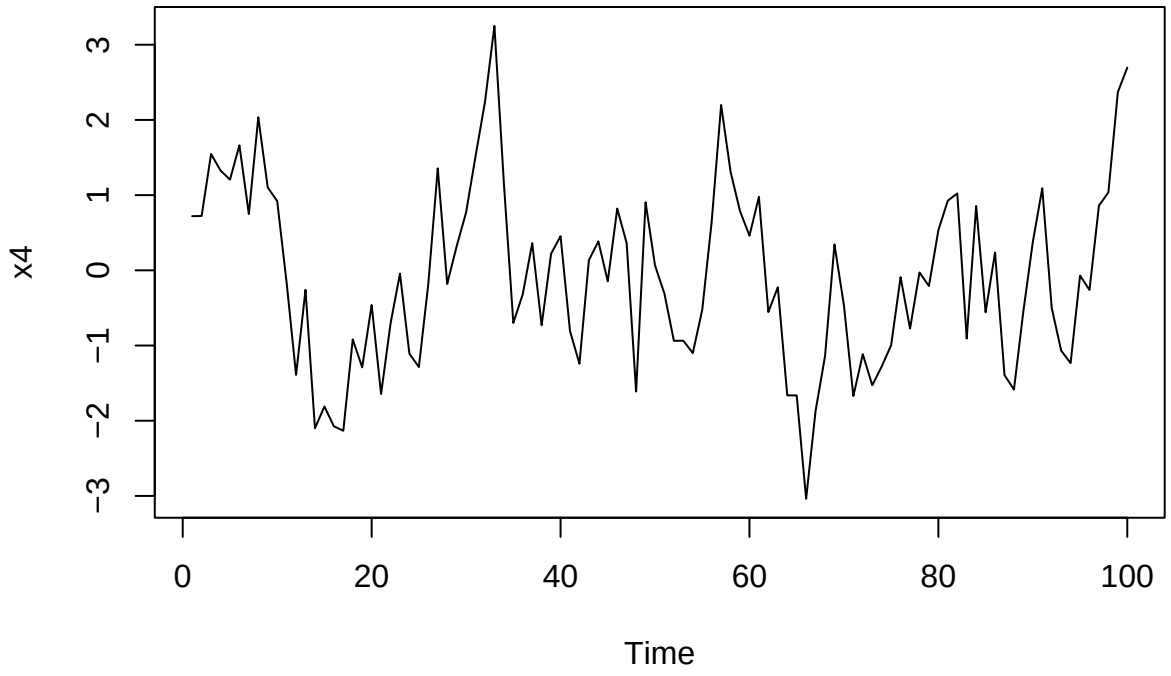

```
acf(x3)
points(0:20,alpha3^(0:20))
```



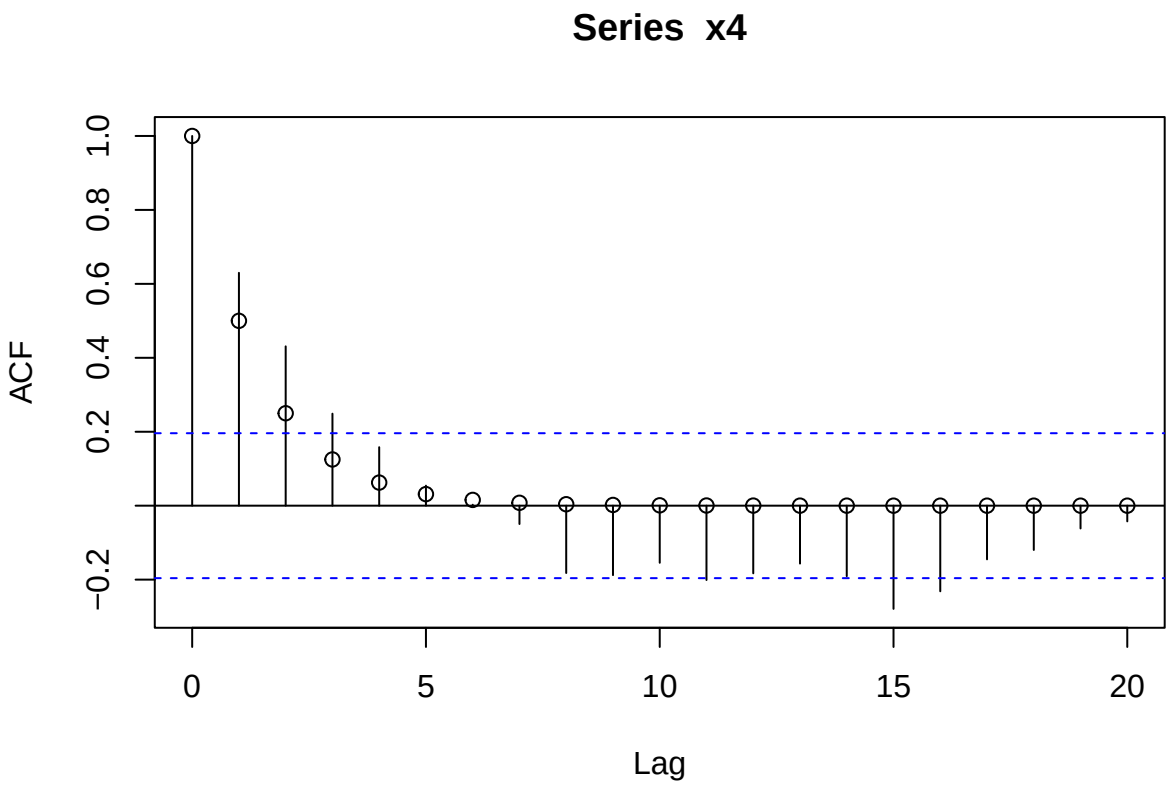
Case 4: $\alpha_4 = 0.5$

```
alpha4 <- 0.5
w = ts(rnorm(n))
```

```
x4 = filter(w,alpha4,method="recursive")
plot(x4)
```

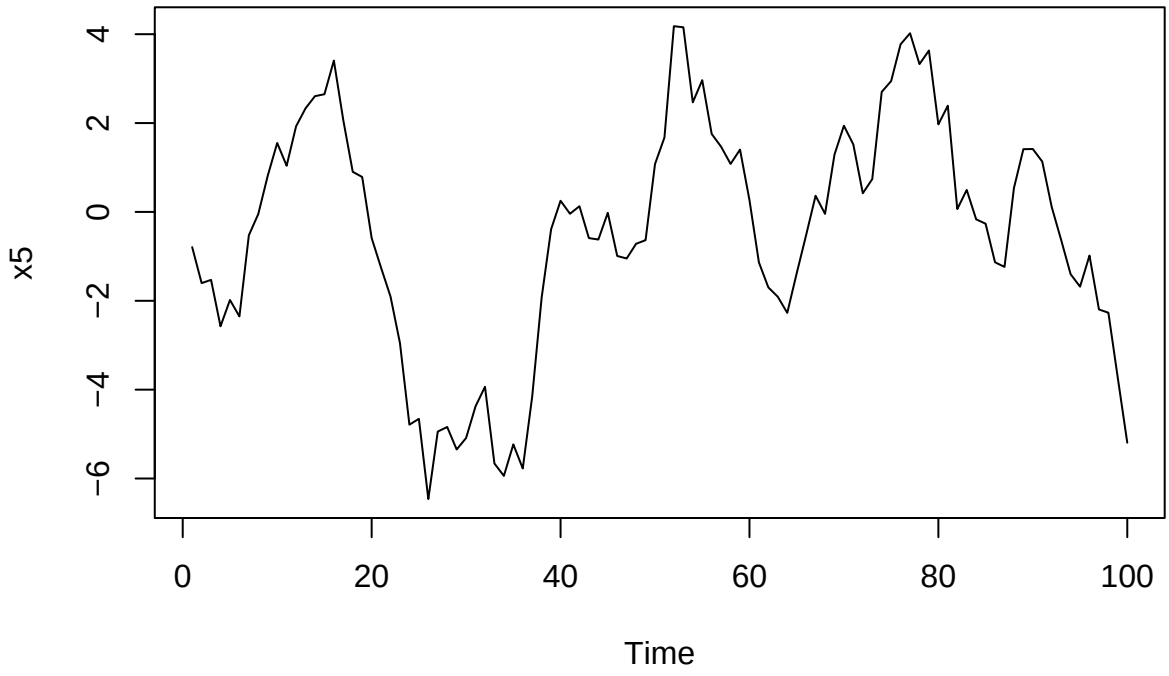



```
acf(x4)
points(0:20,alpha4^(0:20))
```

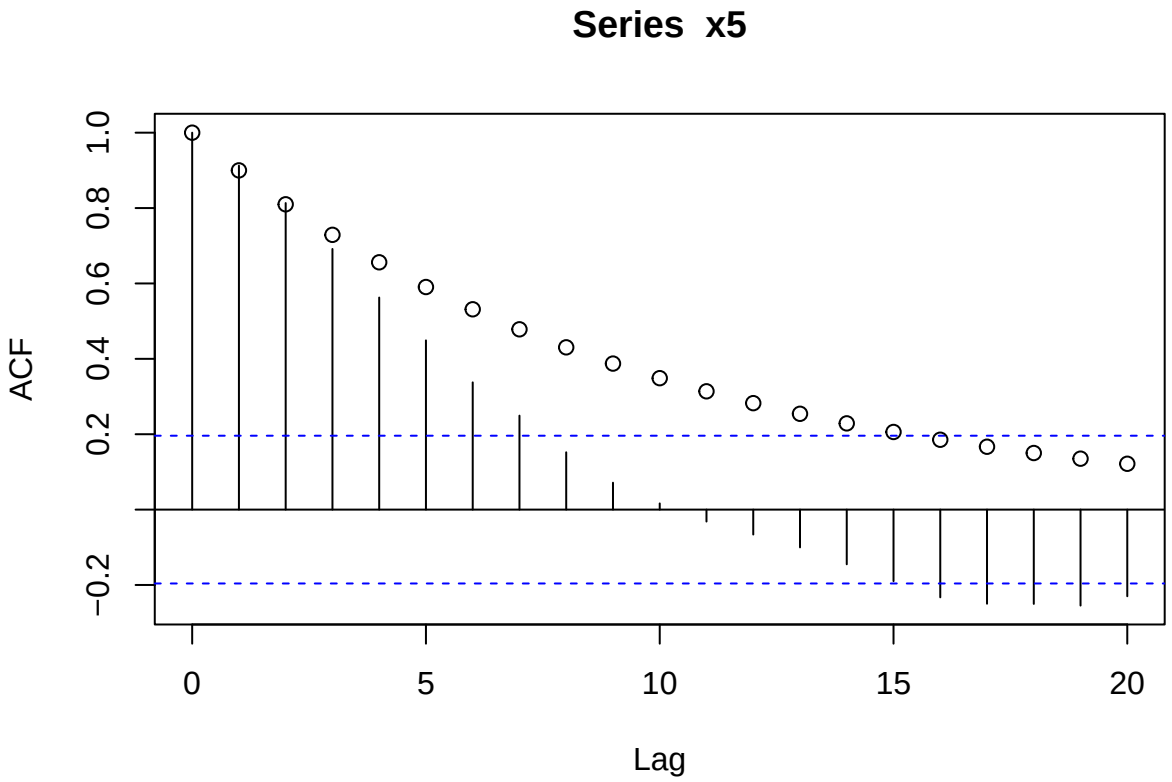


Case 5: $\alpha_5 = 0.9$

```
alpha5 <- 0.9
w = ts(rnorm(n))
x5 = filter(w,alpha5,method="recursive")
plot(x5)
```




```
acf(x5)
points(0:20,alpha5^(0:20))
```


Series x5
ACF
1.0
0.8
0.6
0.4
0.2
−0.2
0
5
10
15
20
Lag