

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:

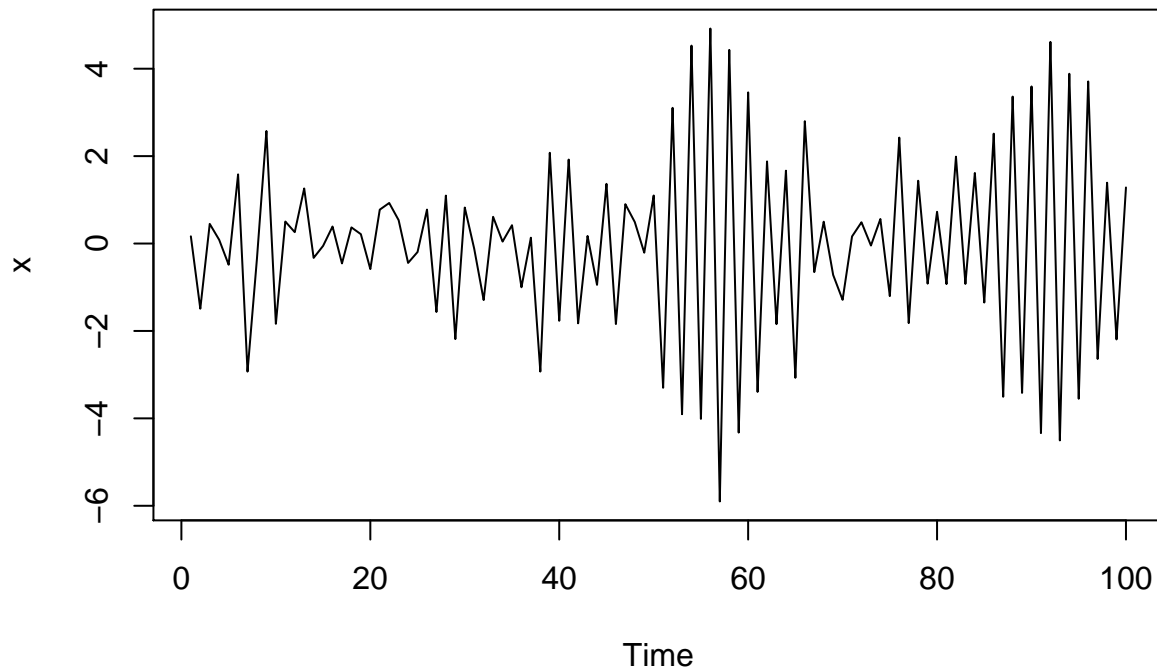
- Plot the correlogram
- Plot the theoretical autocorrelation function on top of this (how well does it fit?)

Common for all cases:

```
n <- 100
```

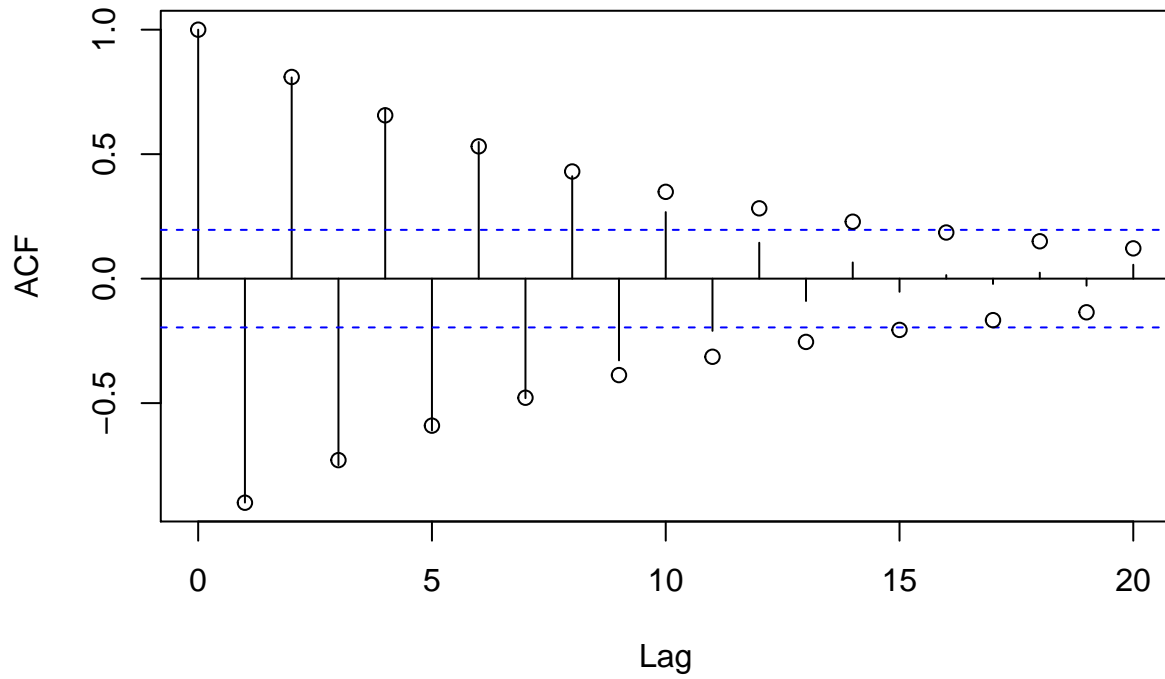
Case 1: $\alpha_1 = -0.9$

```
alpha1 <- -0.9  
x <- arima.sim(model = list(ar=alpha1), n = n)  
plot(x)
```



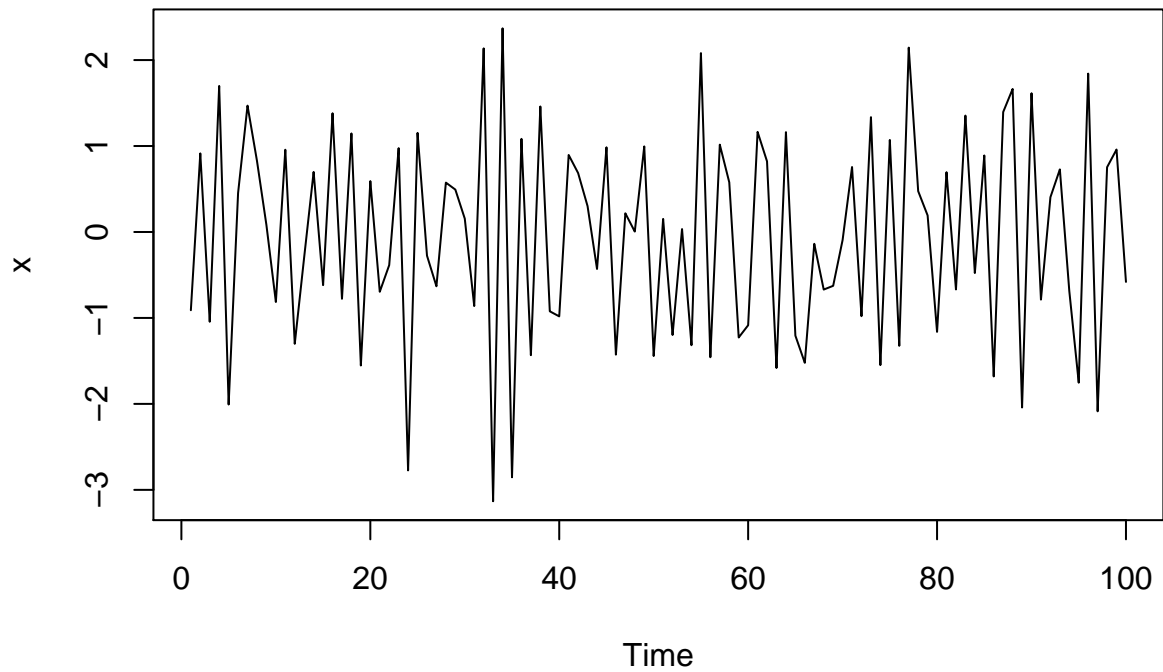
```
acf(x)  
points(0:20,alpha1^(0:20))
```

Series x



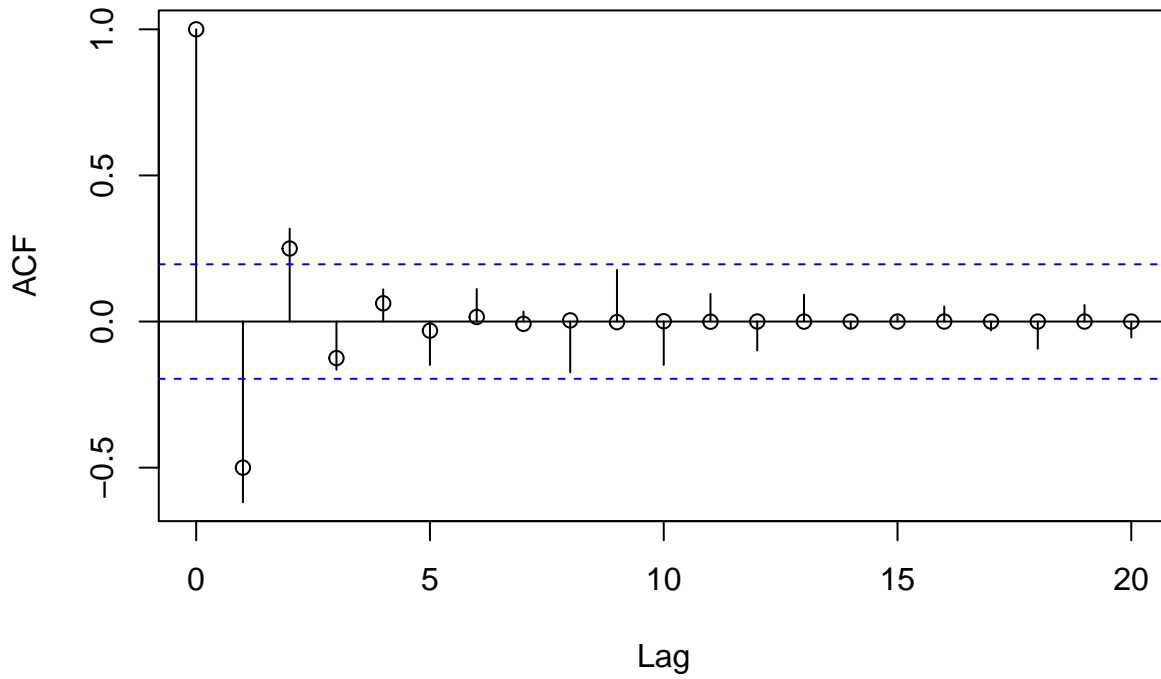
Case 2: $\alpha_2 = -0.5$

```
alpha2 <- -0.5  
x <- arima.sim(model = list(ar=alpha2), n = n)  
plot(x)
```



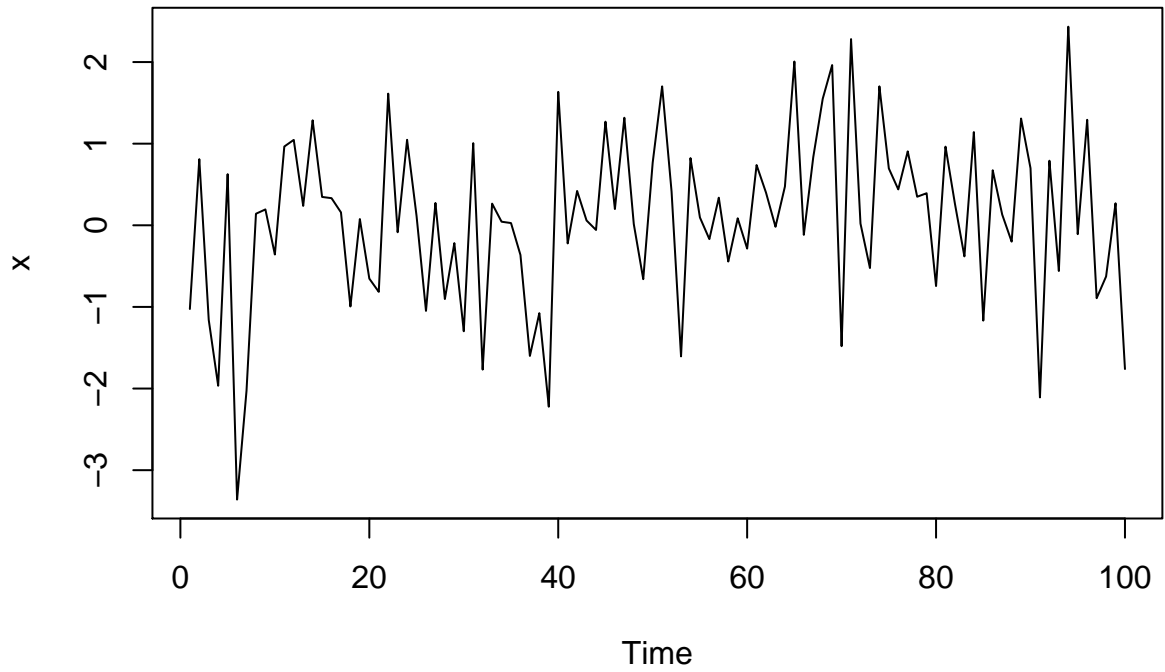
```
acf(x)
points(0:20,alpha2^(0:20))
```

Series x



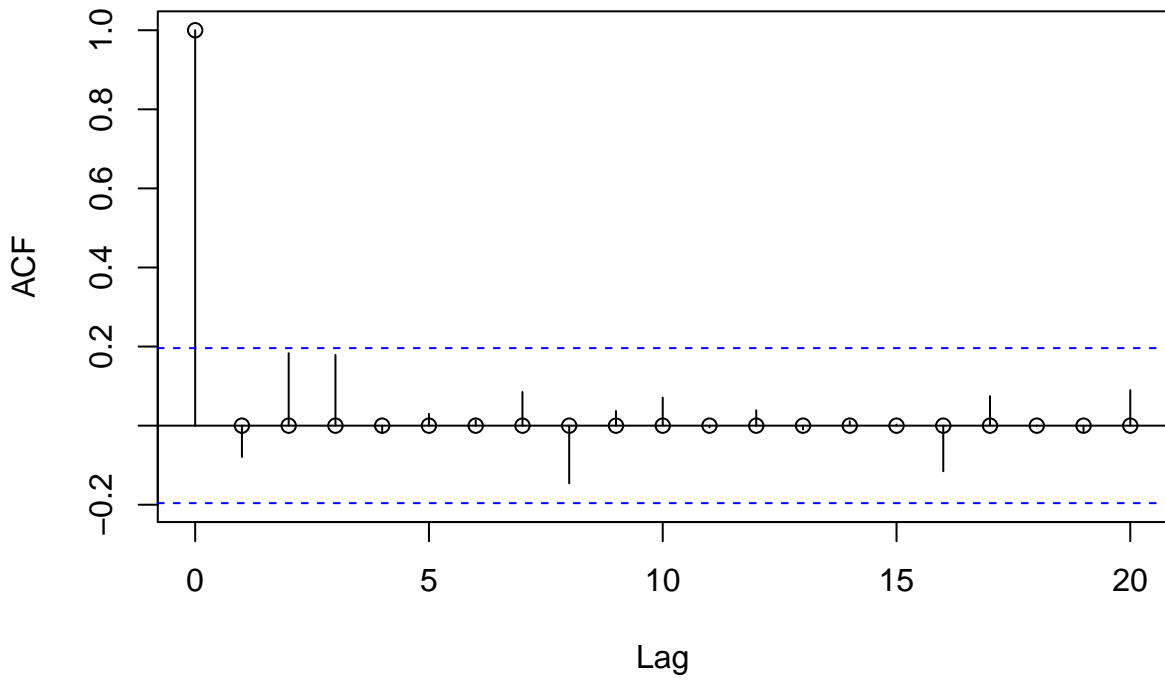
Case 3: $\alpha_3 = 0$

```
alpha3 <- 0
x <- arima.sim(model = list(), n = n)
plot(x)
```



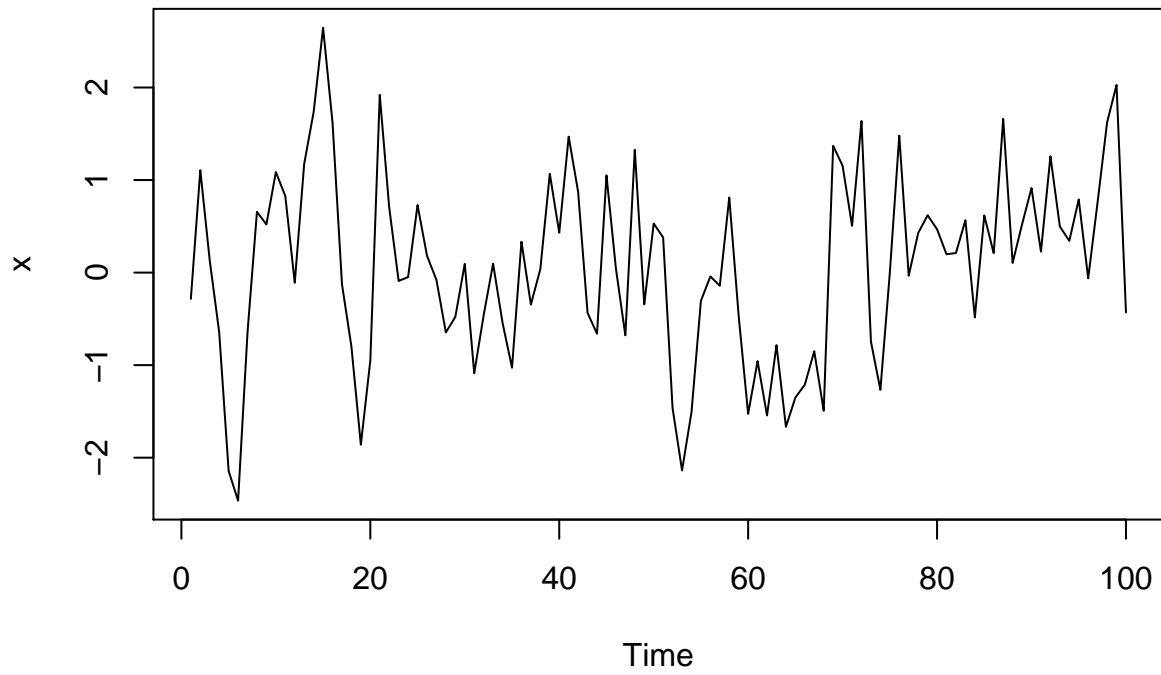
```
acf(x)  
points(0:20,alpha3^(0:20))
```

Series x



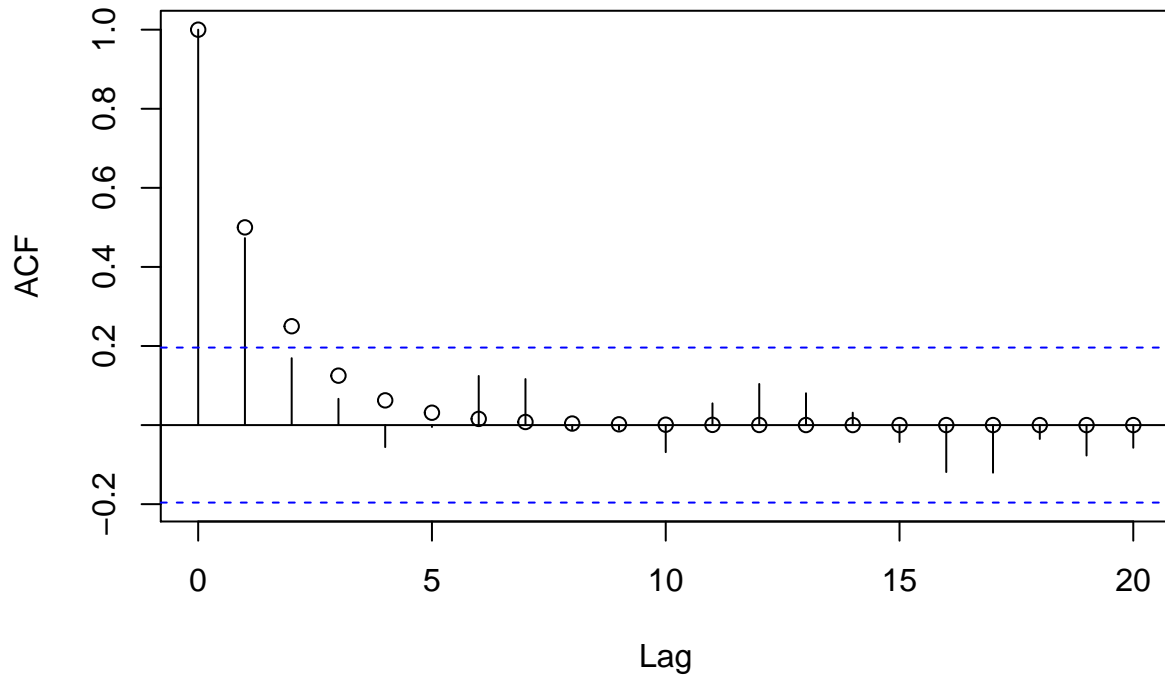
Case 4: $\alpha_4 = 0.5$

```
alpha4 <- 0.5  
x <- arima.sim(model = list(ar=alpha4), n = n)  
plot(x)
```



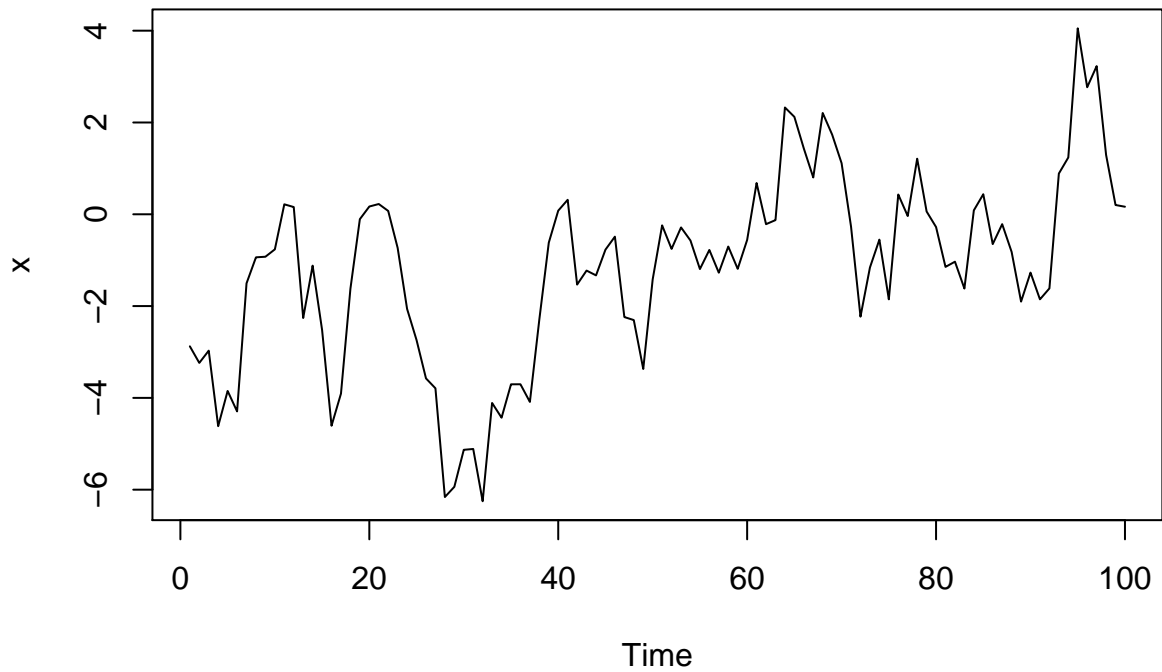
```
acf(x)  
points(0:20,alpha4^(0:20))
```

Series x



Case 5: $\alpha_5 = 0.9$

```
alpha5 <- 0.9  
x <- arima.sim(model = list(ar=alpha5), n = n)  
plot(x)
```



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

Series x

