Coursework 3

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R Markdown

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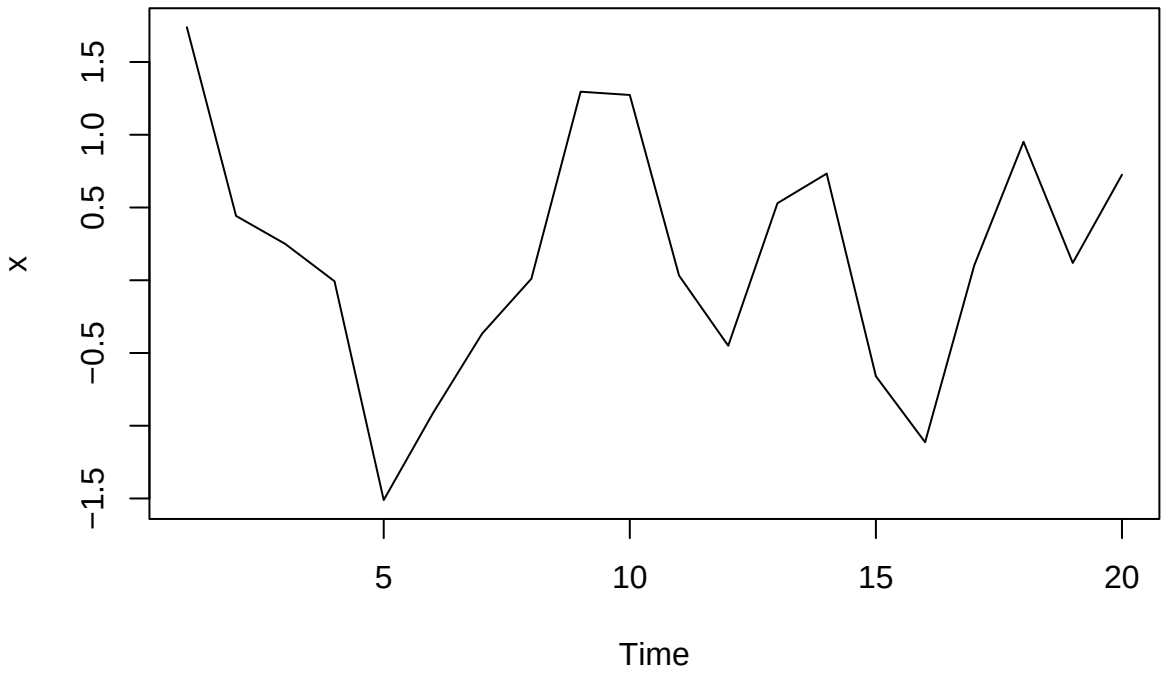
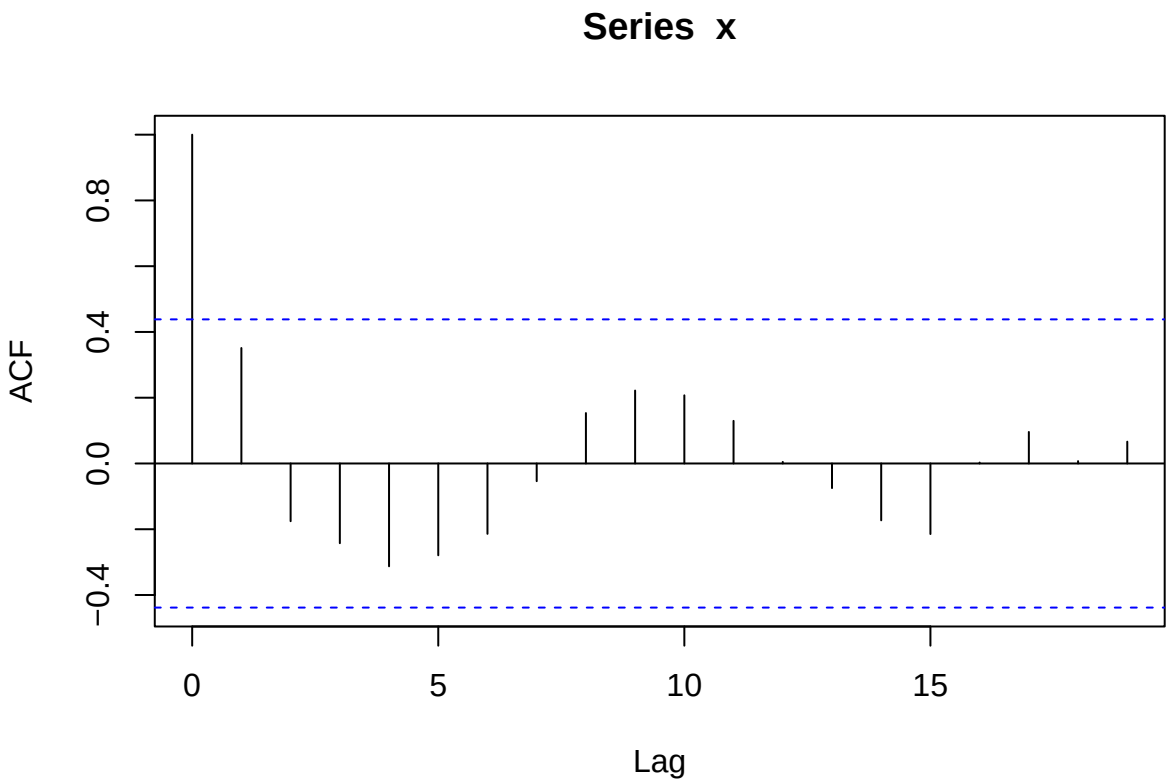
When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

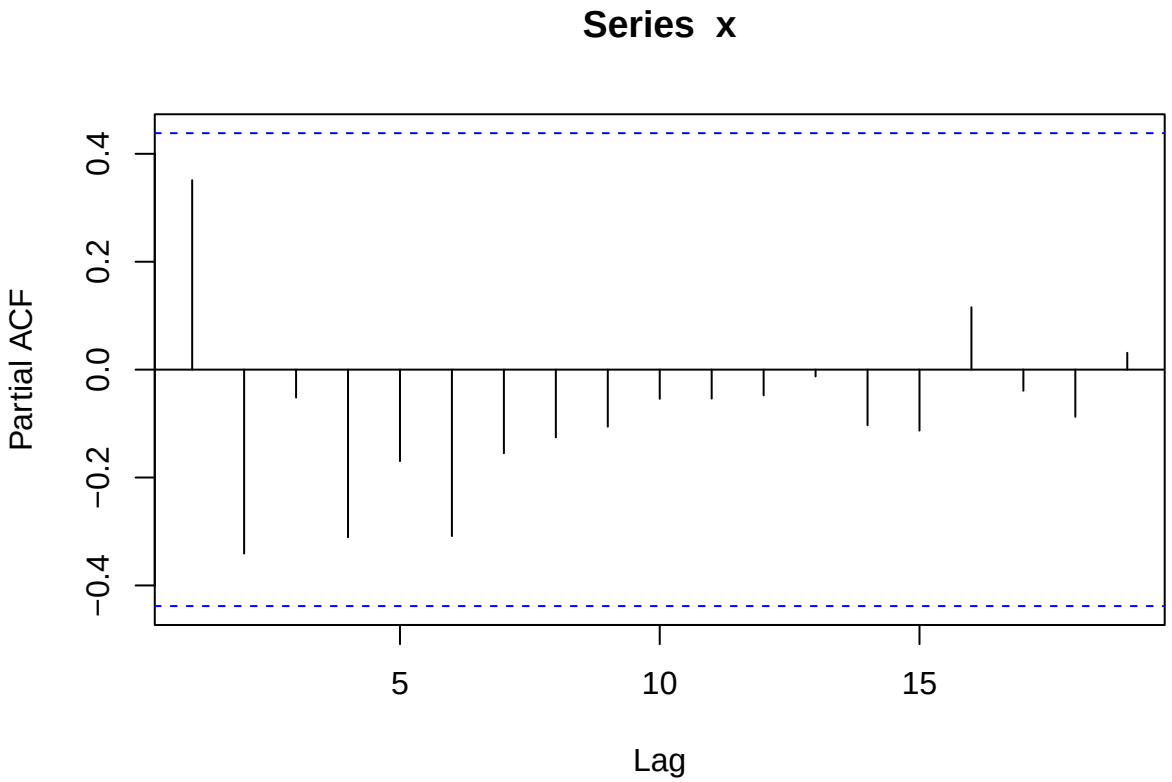
```
set.seed(1) # it is often a good idea to set the random number seed so you can get
# the same simulated values on different sessions.
x<-arima.sim(n=20,model=list(ar=c(0.8),ma=c(-0.5,-0.4)))
# simulates from the ARMA(1,2) model
ts.plot(x) # plot the time series
```




```
a1 <- acf(x,lag.max=30)$acf # plot the acf
```



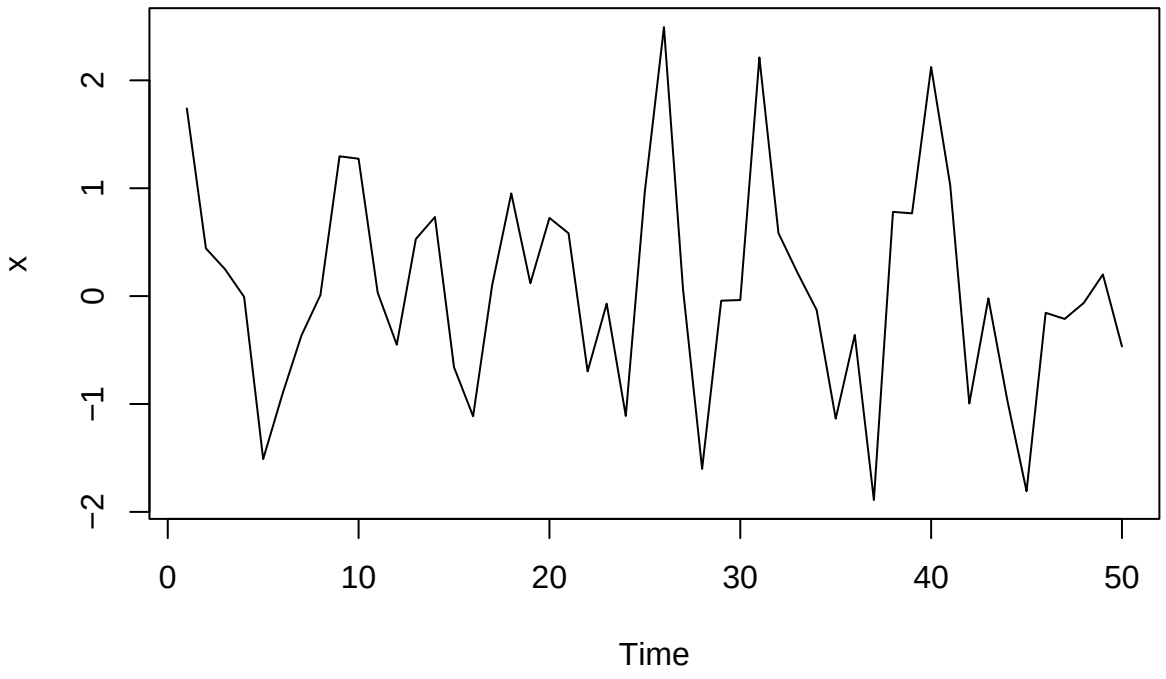

```
p1 <- pacf(x,lag.max=30)$acf #plot the pacf and
```



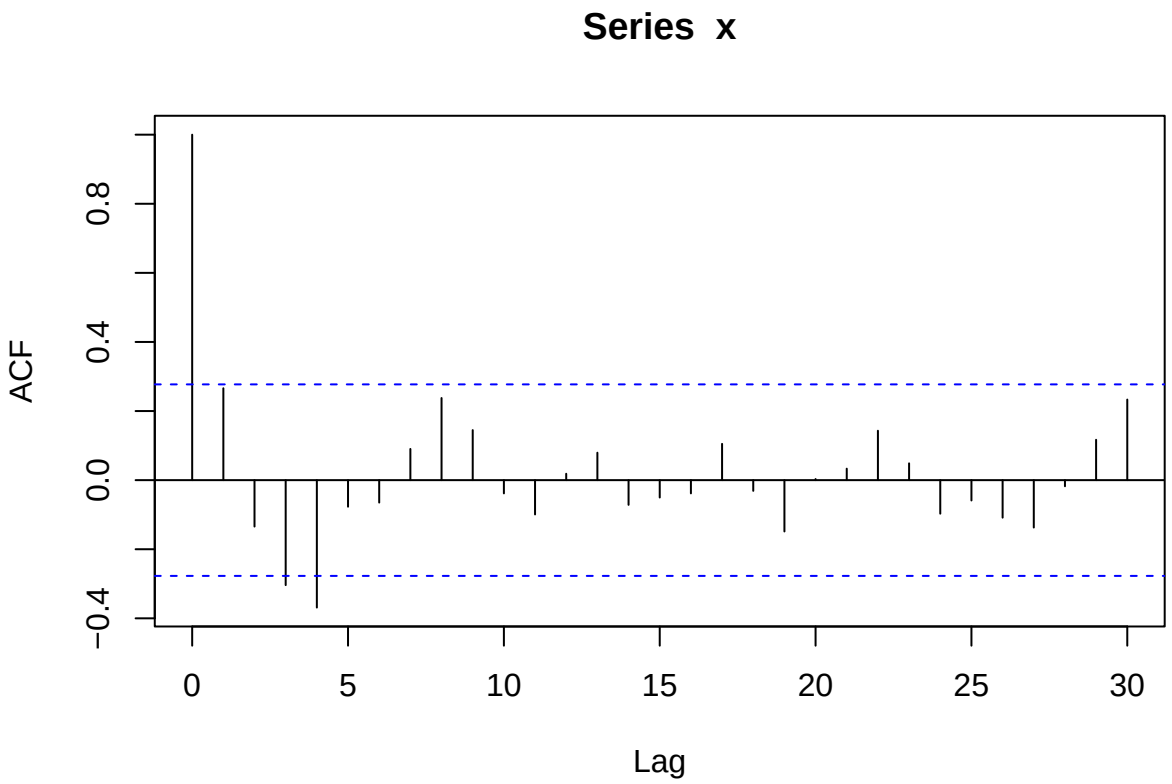

```
#store pacf values for lags up to 30
p1 # print the values
```

```
## , , 1
##
##              [,1]
##  [1,]  0.35115056
##  [2,] -0.34091837
##  [3,] -0.05177760
##  [4,] -0.31084610
##  [5,] -0.16952574
##  [6,] -0.30858655
##  [7,] -0.15493979
##  [8,] -0.12565246
##  [9,] -0.10571187
## [10,] -0.05411184
## [11,] -0.05370549
## [12,] -0.04769068
## [13,] -0.01256359
## [14,] -0.10312068
## [15,] -0.11304688
## [16,]  0.11556114
## [17,] -0.03915355
## [18,] -0.08759772
## [19,]  0.03114828
```

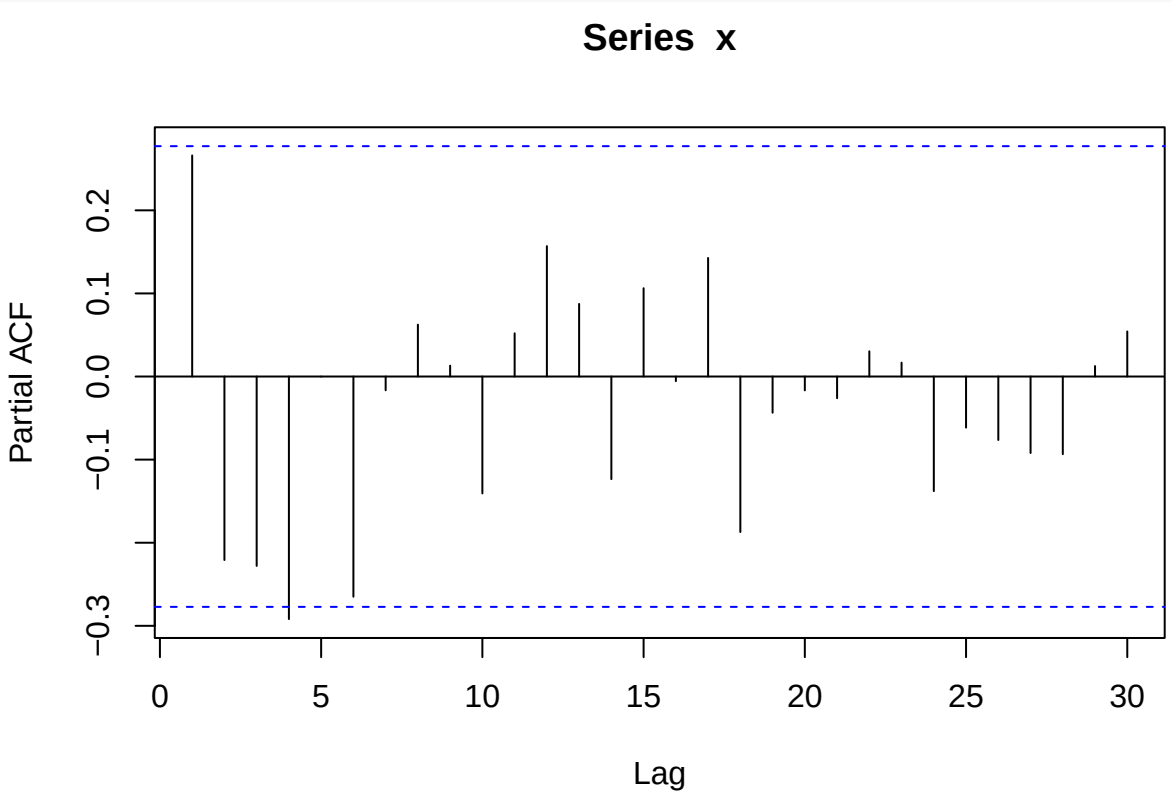
```r
set.seed(1) # it is often a good idea to set the random number seed so you can get
# the same simulated values on different sessions.
x<-arima.sim(n=50,model=list(ar=c(0.8),ma=c(-0.5,-0.4)))
# simulates from the ARIMA(2,0,1) model
ts.plot(x) # plot the time series
```




```r
a1 <- acf(x,lag.max=30)$acf # plot the acf and
```



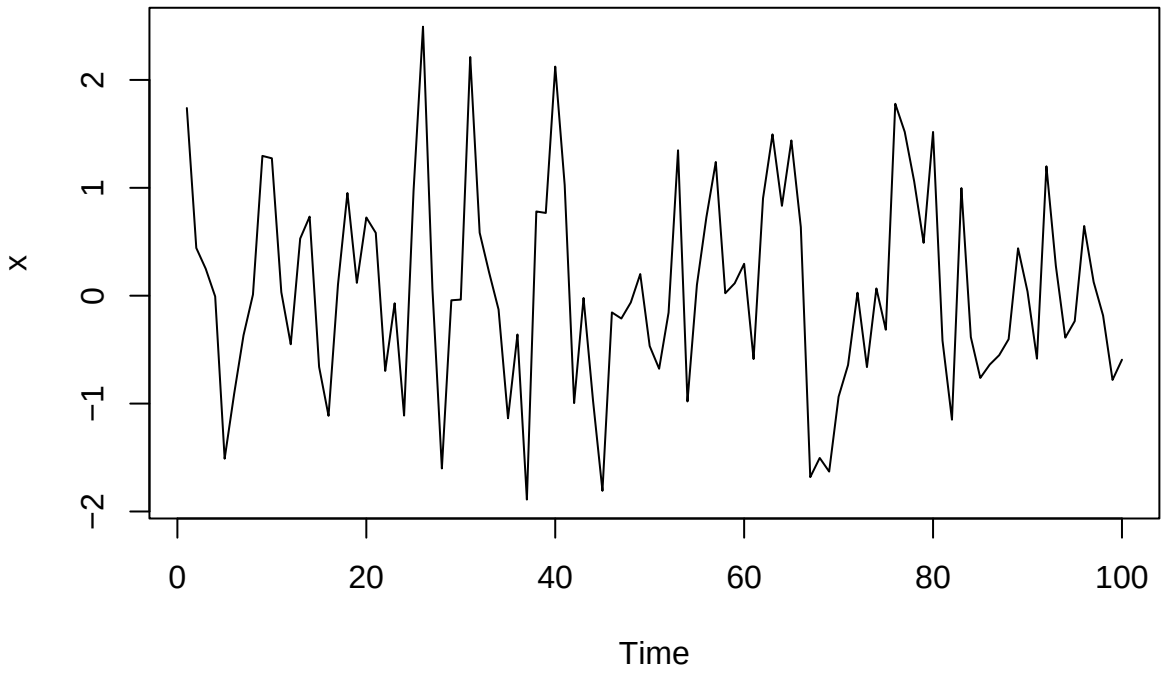

```
p1 <- pacf(x,lag.max=30)$acf #plot the pacf and
```



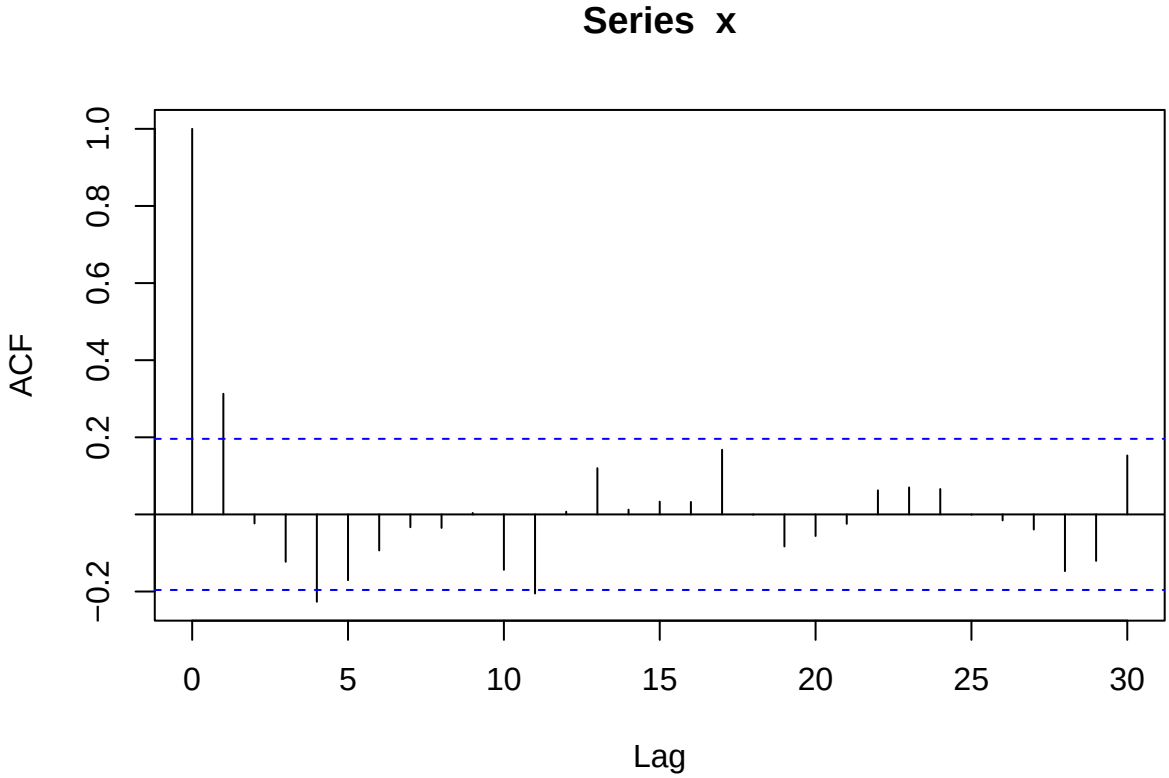

```
#store pacf values for lags up to 30
p1 # print the values
```

```
## , , 1
##
##                [,1]
##  [1,]  0.2660372477
##  [2,] -0.2208403042
##  [3,] -0.2279179865
##  [4,] -0.2918699072
##  [5,] -0.0001353961
##  [6,] -0.2649466201
##  [7,] -0.0165490307
##  [8,]  0.0624536972
##  [9,]  0.0130515028
## [10,] -0.1406837289
## [11,]  0.0520529892
## [12,]  0.1569391800
## [13,]  0.0873690037
## [14,] -0.1235125058
## [15,]  0.1062829764
## [16,] -0.0055731889
## [17,]  0.1426614865
## [18,] -0.1871385227
## [19,] -0.0435729656
## [20,] -0.0166799331
## [21,] -0.0260783413
## [22,]  0.0303858489
## [23,]  0.0167214124
## [24,] -0.1378971448
## [25,] -0.0615186345
## [26,] -0.0764108163
## [27,] -0.0920752858
## [28,] -0.0934594323
## [29,]  0.0125879168
## [30,]  0.0542548269
```

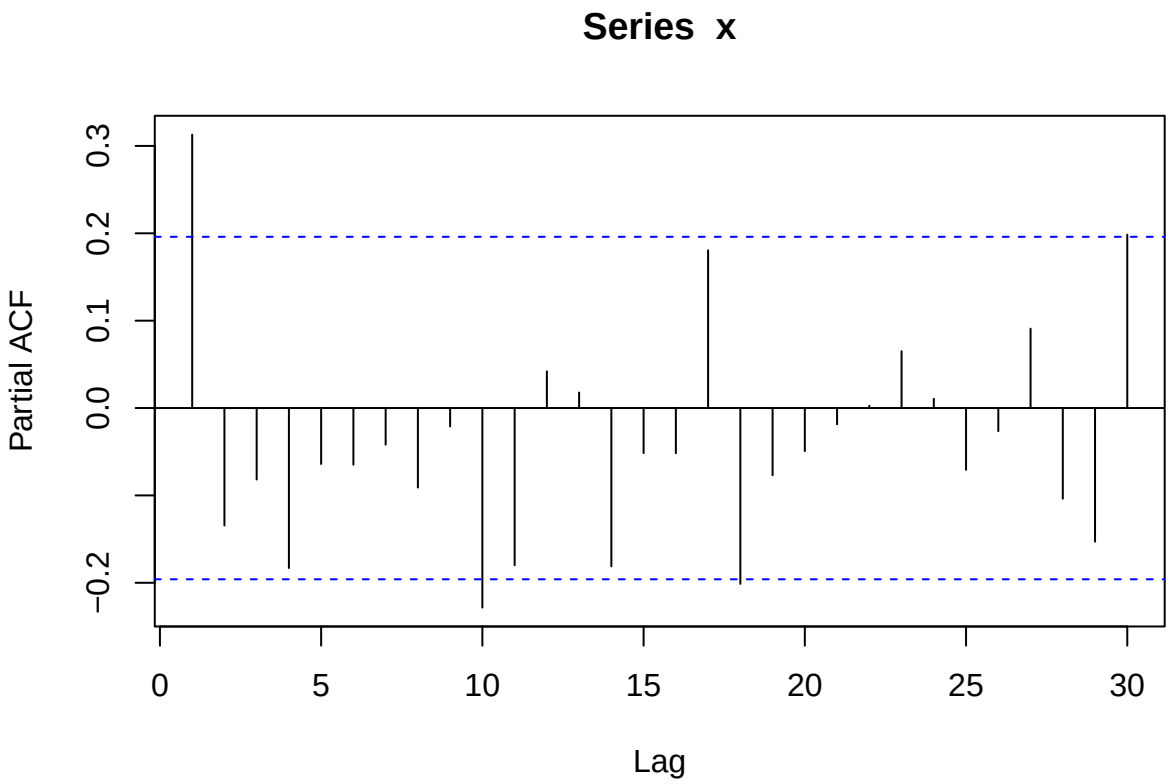
```r
set.seed(1) # it is often a good idea to set the random number seed so you can get
# the same simulated values on different sessions.
x<-arima.sim(n=100,model=list(ar=c(0.8),ma=c(-0.5,-0.4)))
# simulates from the ARIMA(2,0,1) model
ts.plot(x) # plot the time series
```




```
a1 <- acf(x,lag.max=30)$acf # plot the acf and
```




```
p1 <- pacf(x,lag.max=30)$acf #plot the pacf and
```

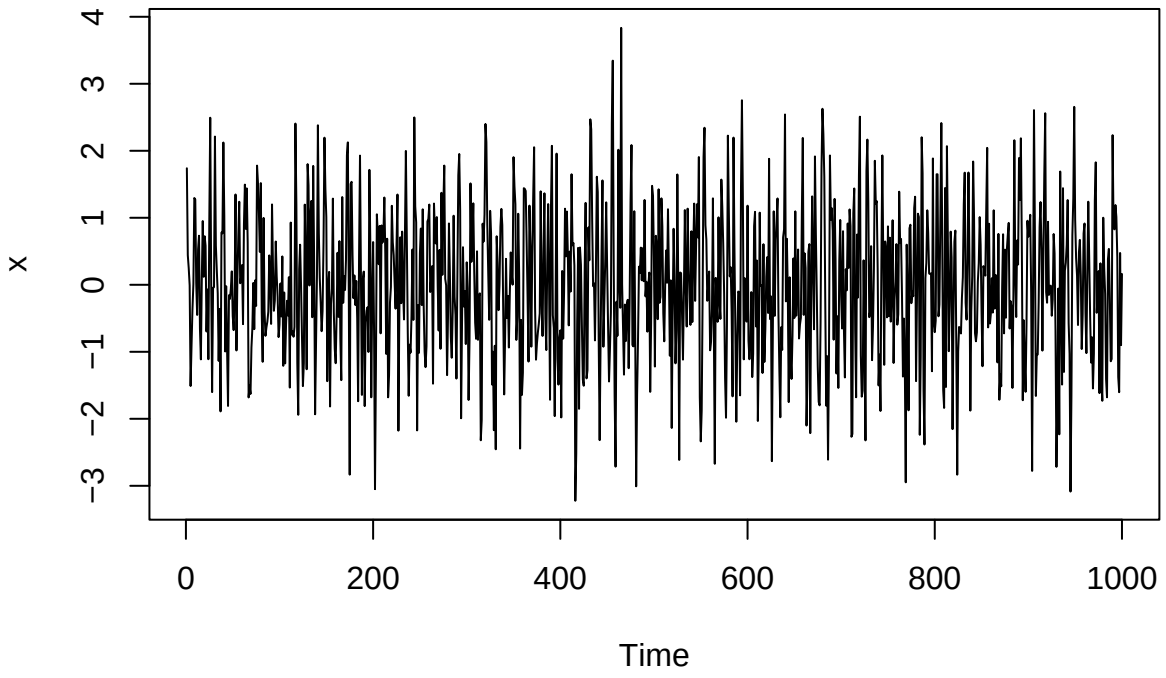



```
#store pacf values for lags up to 30
p1 # print the values
```

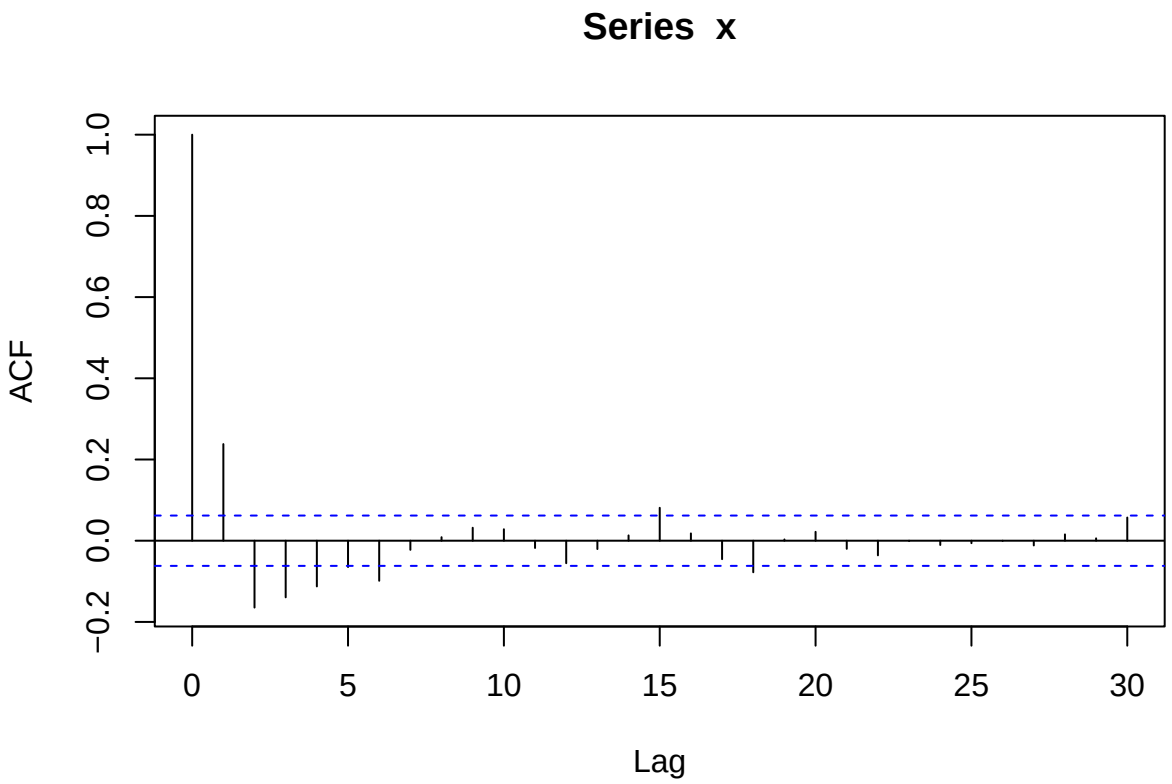
```
## , , 1
##
##               [,1]
##  [1,]  0.312876043
##  [2,] -0.134459892
##  [3,] -0.081833605
##  [4,] -0.183112871
##  [5,] -0.064100817
##  [6,] -0.064813638
##  [7,] -0.041853386
##  [8,] -0.091039425
##  [9,] -0.021091055
## [10,] -0.228375647
## [11,] -0.179942111
## [12,]  0.042083370
## [13,]  0.017737864
## [14,] -0.181215987
## [15,] -0.051565534
## [16,] -0.051694820
## [17,]  0.180618588
## [18,] -0.201296442
## [19,] -0.076935787
## [20,] -0.049328736
## [21,] -0.018632312
## [22,]  0.002690216
## [23,]  0.065053657
```

```
## [24,]  0.010509780
## [25,] -0.070722070
## [26,] -0.026491640
## [27,]  0.090856618
## [28,] -0.103805416
## [29,] -0.152934926
## [30,]  0.198467881
```

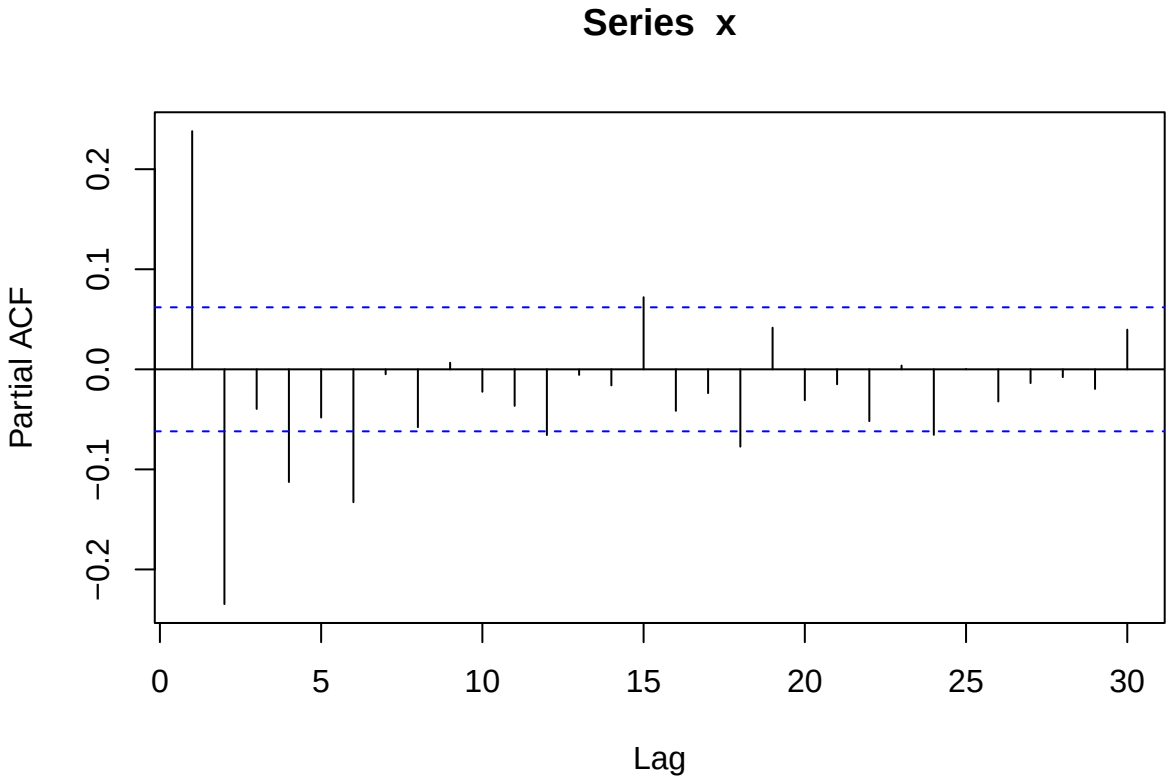
```
set.seed(1) # it is often a good idea to set the random number seed so you can get
# the same simulated values on different sessions.
x<-arima.sim(n=1000,model=list(ar=c(0.8),ma=c(-0.5,-0.4)))
# simulates from the ARIMA(2,0,1) model
ts.plot(x) # plot the time series
```




```
a1 <- acf(x,lag.max=30)$acf # plot the acf and
```



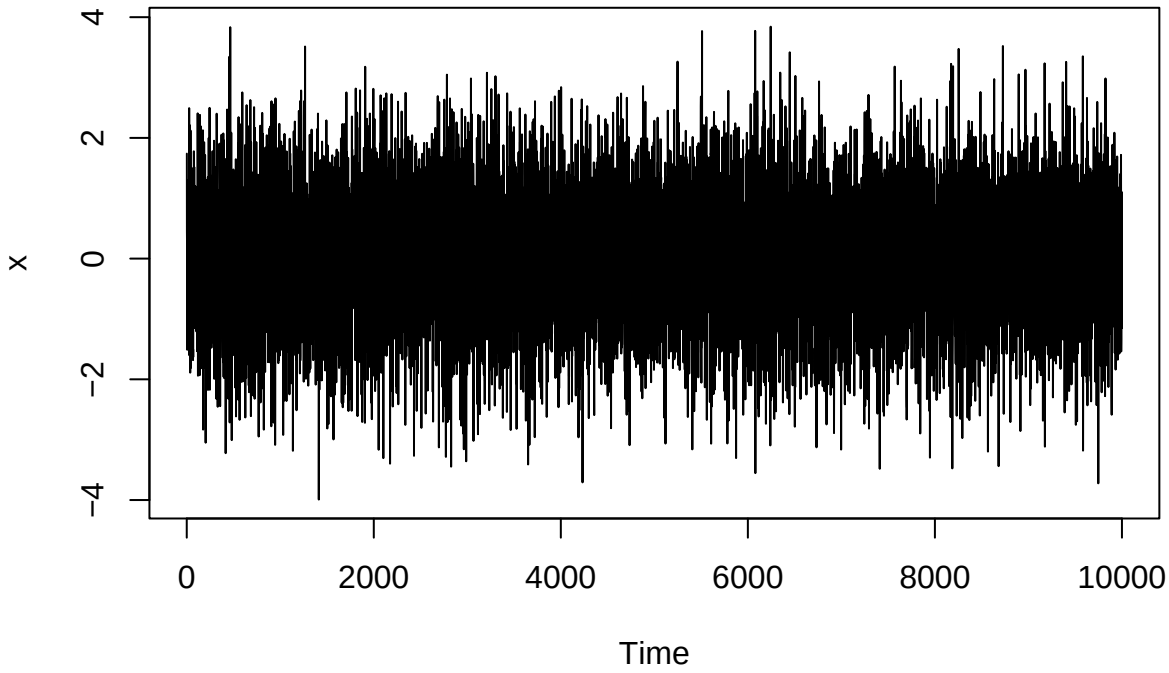

```
p1 <- pacf(x,lag.max=30)$acf #plot the pacf and
```



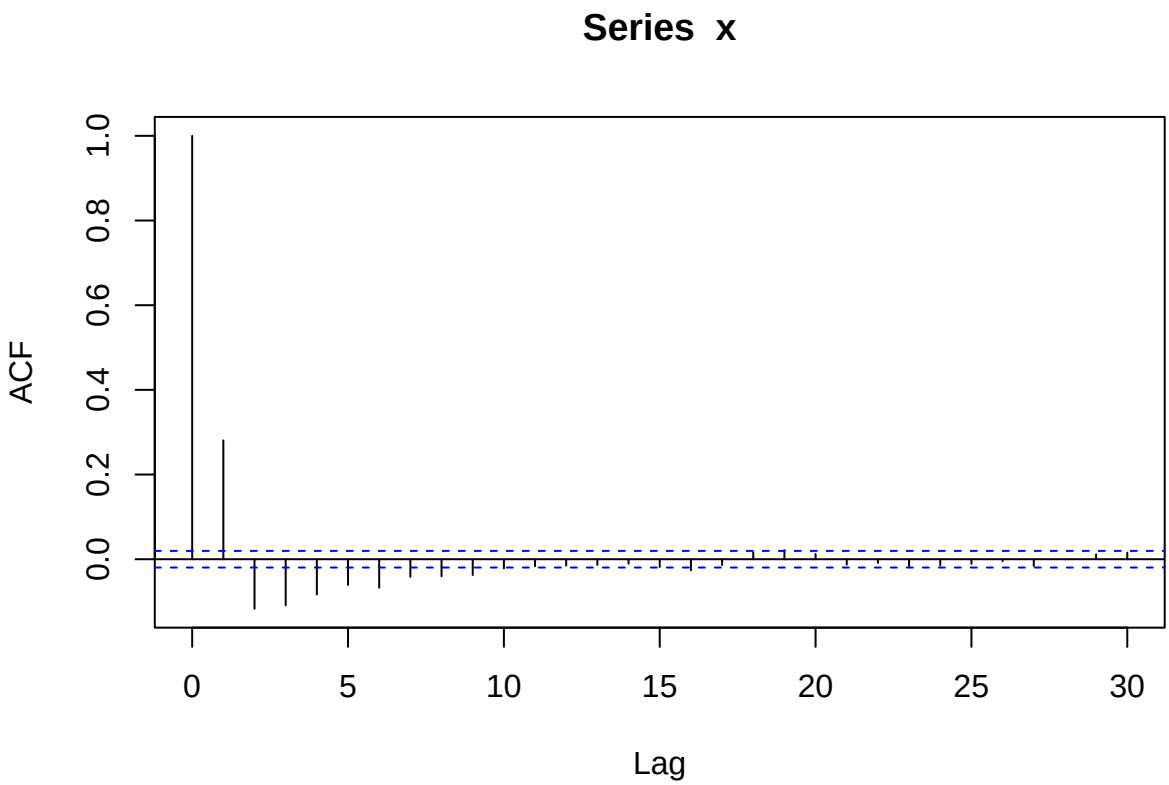

```
#store pacf values for lags up to 30
p1 # print the values
```

```
## , , 1
##
##                [,1]
##  [1,]  0.2379888766
##  [2,] -0.2345976186
##  [3,] -0.0395543427
##  [4,] -0.1126006217
##  [5,] -0.0481972148
##  [6,] -0.1328048133
##  [7,] -0.0048945549
##  [8,] -0.0578228742
##  [9,]  0.0065352326
## [10,] -0.0224290669
## [11,] -0.0365178586
## [12,] -0.0656849670
## [13,] -0.0055806075
## [14,] -0.0160502636
## [15,]  0.0720616708
## [16,] -0.0414912201
## [17,] -0.0237764107
## [18,] -0.0772784917
## [19,]  0.0415525282
## [20,] -0.0308726063
## [21,] -0.0149651782
## [22,] -0.0517626188
## [23,]  0.0037357569
## [24,] -0.0654784156
## [25,]  0.0004107028
## [26,] -0.0321190607
## [27,] -0.0137403413
## [28,] -0.0078055382
## [29,] -0.0195940715
## [30,]  0.0396561298
```

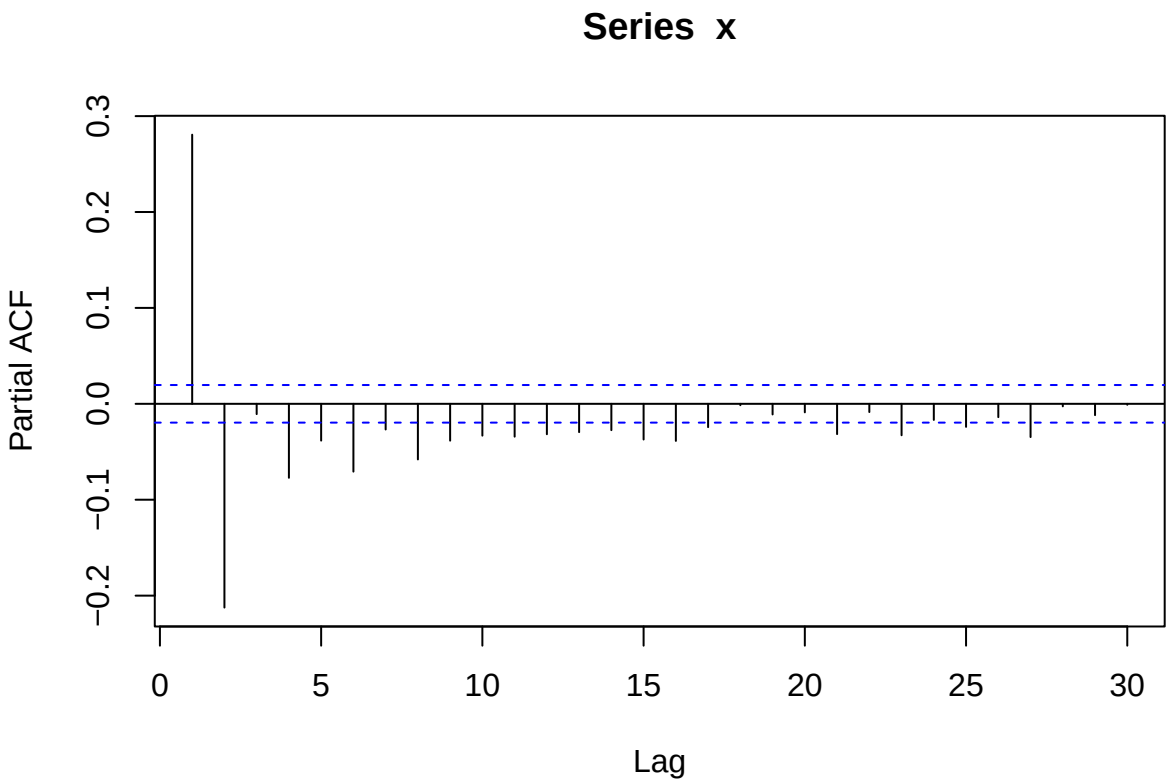
```r
set.seed(1) # it is often a good idea to set the random number seed so you can get
# the same simulated values on different sessions.
x<-arima.sim(n=10000,model=list(ar=c(0.8),ma=c(-0.5,-0.4)))
# simulates from the ARMA(1,2) model
ts.plot(x) # plot the time series
```




```
a1 <- acf(x,lag.max=30)$acf # plot the acf
```




```
p1 <- pacf(x,lag.max=30)$acf #plot the pacf and
```

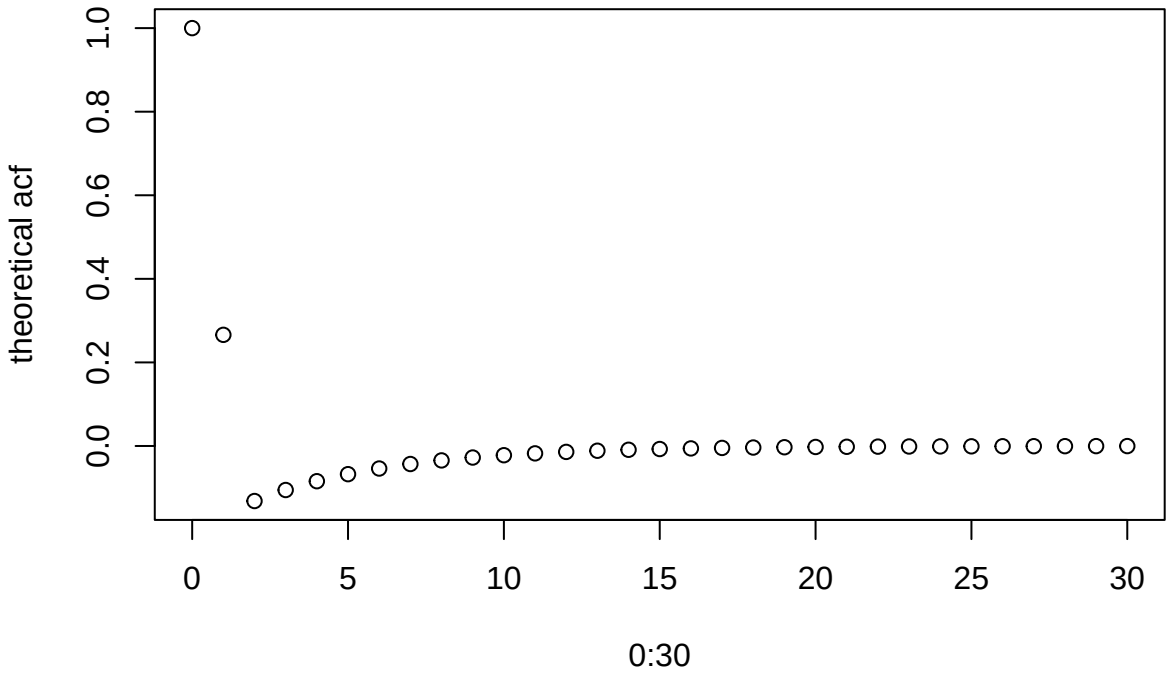



```
#store pacf values for lags up to 30
p1 # print the values
```

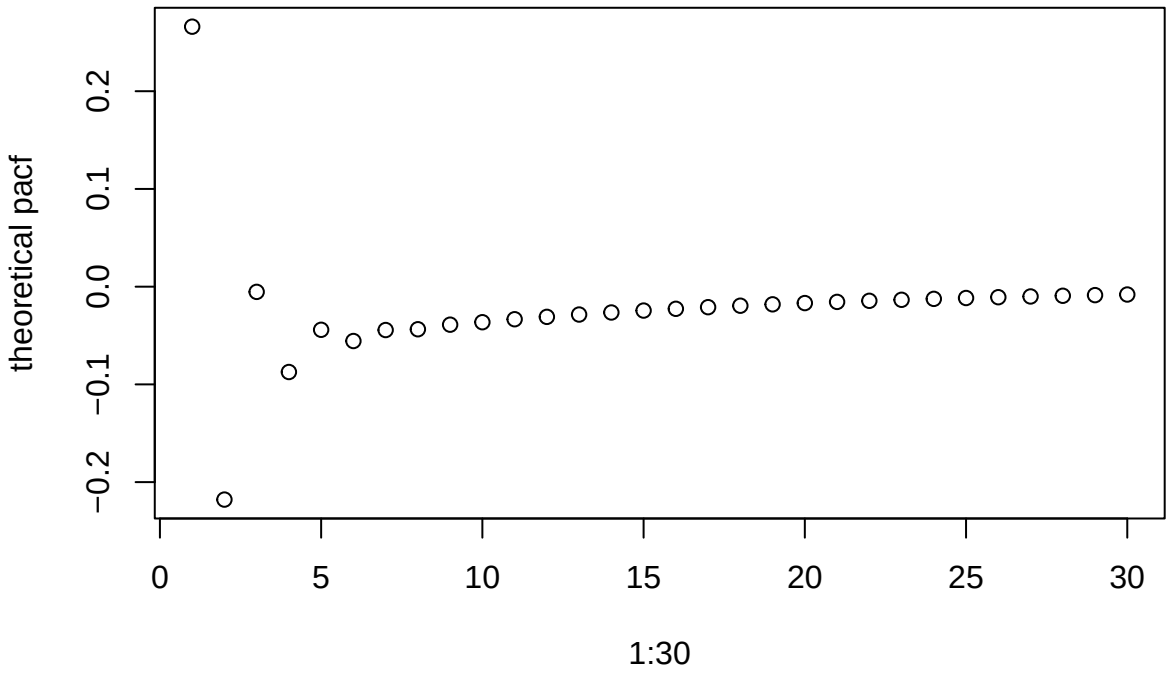
```
## , , 1
##
##               [,1]
##  [1,]  0.280630991
##  [2,] -0.212461202
##  [3,] -0.010750522
##  [4,] -0.077175023
##  [5,] -0.038382438
##  [6,] -0.070708961
##  [7,] -0.026785852
##  [8,] -0.058006079
##  [9,] -0.038435311
## [10,] -0.033200981
## [11,] -0.034266910
## [12,] -0.031730085
## [13,] -0.029547938
## [14,] -0.027485502
## [15,] -0.037232439
## [16,] -0.038683828
## [17,] -0.024347793
## [18,] -0.001471652
## [19,] -0.011089365
## [20,] -0.008910694
## [21,] -0.031602370
## [22,] -0.008585303
## [23,] -0.032788245
```

```
## [24,] -0.016804924
## [25,] -0.024062216
## [26,] -0.013906292
## [27,] -0.034690838
## [28,] -0.002652068
## [29,] -0.011823569
## [30,] -0.001025845
```

```
ta1 <- ARMAacf(ar=c(0.8), ma=c(-0.5,-0.4),lag.max=30)
# theoretical acf
plot(0:30,ta1,ylab="theoretical acf")
```




```
tp1 <- ARMAacf(ar=c(0.8),ma=c(-0.5,-0.4),lag.max=30,pacf=TRUE)
# theoretical pacf
plot(1:30,tp1,ylab="theoretical pacf")
```



Comparing the sample acf to theoretical acf at different values: we see that the plot only begins to look like the theoretical acf, with a line(excluding the 0 lag) above the blue line, for n=100,1000,and 10000.

For the pacf, there is basically supposed to be one positive spike and one negative spike and then a convergence to 0. This only starts to look like this once n=1000.