Auto-regressive model of order 2

Simulation of AR(2)

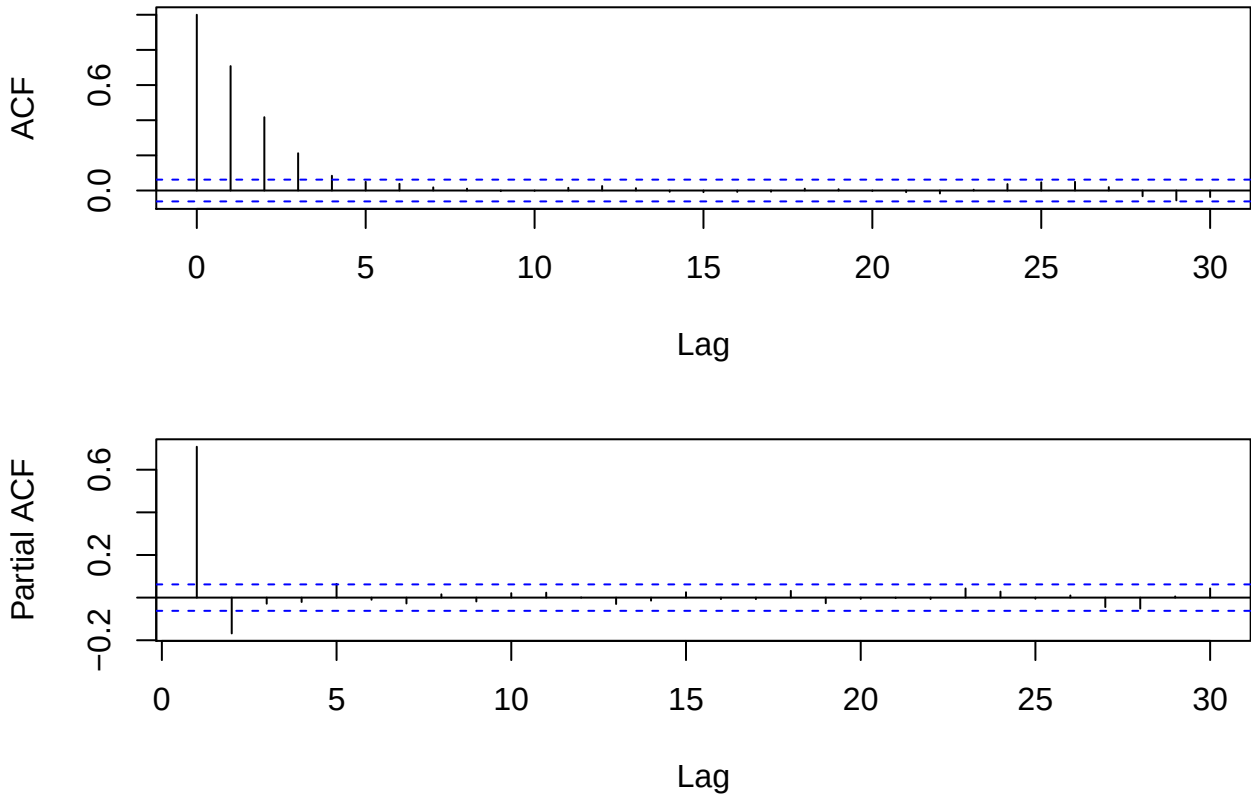
- Simulate time series of length 1000 from the following AR(2) model:

$$x_t = \frac{5}{6}x_{t-1} - \frac{1}{6}x_{t-2} + w_t$$

```
x <- arima.sim(model = list(ar=c(5/6, -1/6)), n = 1000)
```

- Plot the correlogram and partial correlogram for the simulated data and comment.

```
par(mfrow = c(2,1), mar = c(5,4,1,0))
acf(x)
pacf(x)
```



- Fit an AR model to the data giving the parameter estimates and order of the fitted AR process.

```
model <- ar(x, order.max = 2, aic = FALSE)
model
```

```
##
## Call:
## ar(x = x, aic = FALSE, order.max = 2)
```

```
##
## Coefficients:
##       1        2
##  0.8267  -0.1680
##
## Order selected 2  sigma^2 estimated as  0.897
```

- Construct 95% confidence intervals for the parameter estimates of the fitted model. Do the model parameters used for simulation fall within the confidence intervals? Explain your results.

```
se <- sqrt(diag(model$asy.var.coef))
lower <- model$ar - 2*se
upper <- model$ar + 2*se
cbind(lower, upper)
```

```
##           lower      upper
## [1,]  0.7642268  0.8891077
## [2,] -0.2304326 -0.1055517
```

- Plot the correlogram of the residuals of the fitted model, and comment.

```
res <- na.omit(model$resid)
acf(res)
```