Applied Econometric Time Series - W.Enders - Ch2 - Ex9

Thalles Quinaglia Liduares

The second column in file SIM_2.xls contains the 100 values of the simulated ARMA(1, 1) process used in Section 7. This series is entitled Y2. Use this series to perform the following tasks (Note: Due to differences in data handling and rounding, your answers need only approximate those presented here.)

a. Plot the sequence against time. Does the series appear to be stationary? Plot the ACF. Load packages

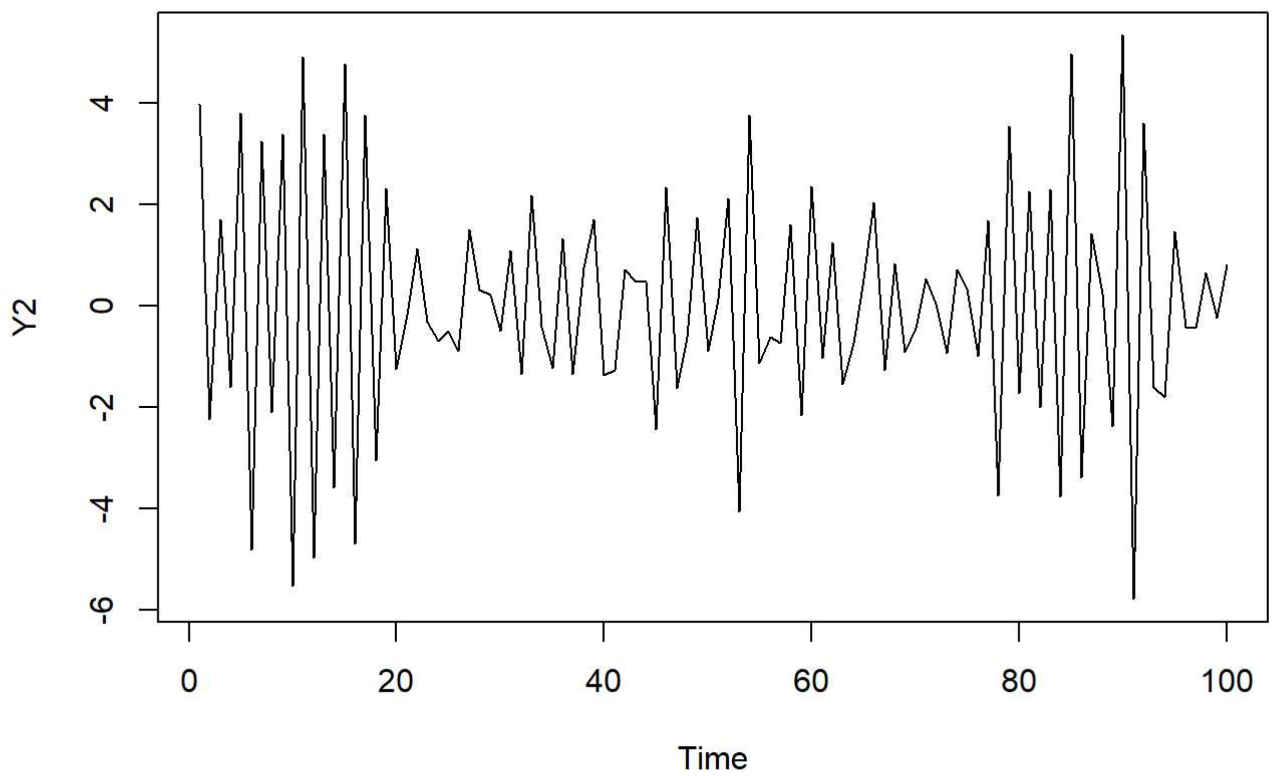
```
library(readxl)
```

Load data

```
data<-readxl::read_xlsx("C:\\Users\\thalles.l\\Desktop\\Data\\Sim.xlsx")
```

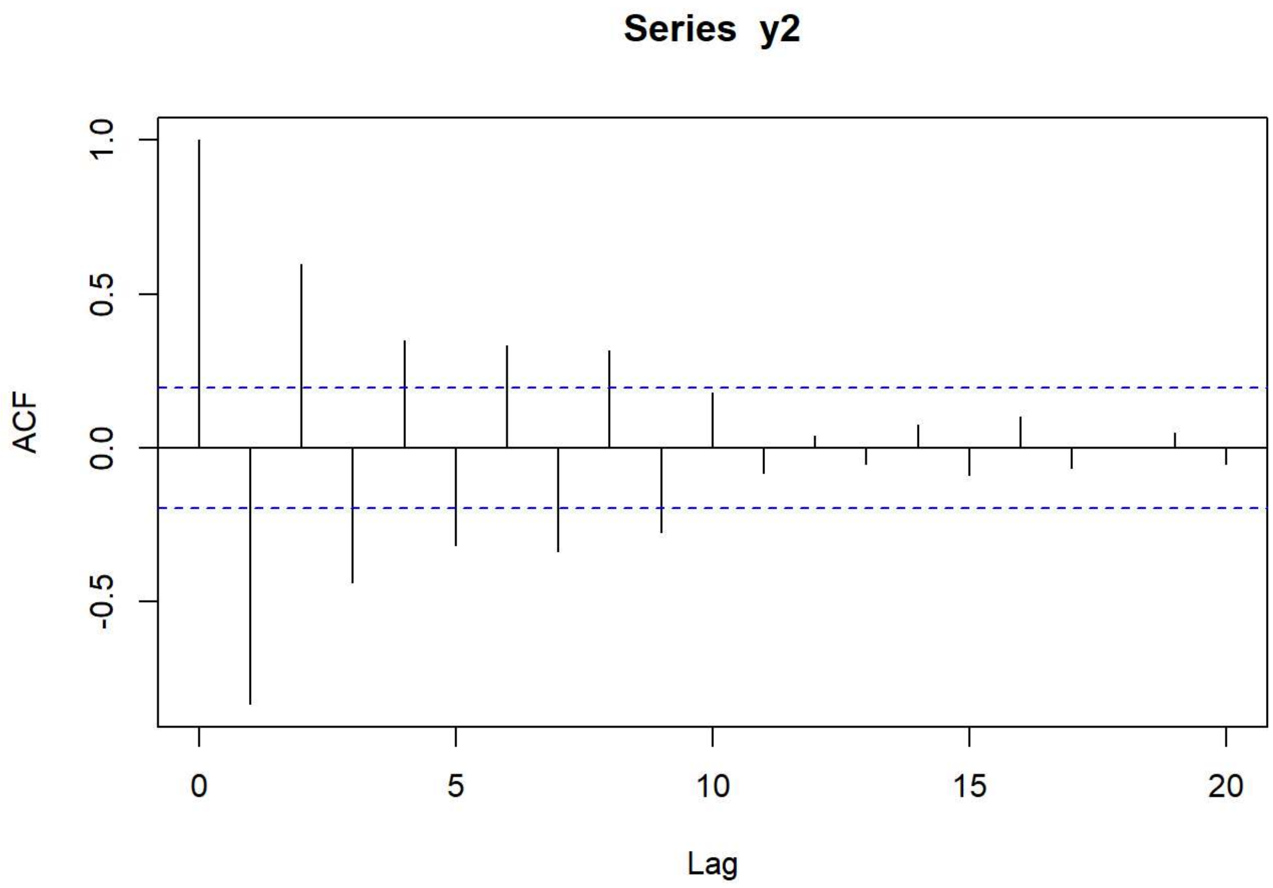
Define variable

```
y2 <- data$Y2
plot(y2, type = "l", xlab = "Time", ylab = "Y2")
```



ACF

```
acf(y2, lag.max = 20)
```



The ACF shows a strong correlation at the first lag, which is expected for an ARMA(1,1) process. The correlation decreases quickly for higher lags, indicating that the process may be well-approximated by an AR(1) model.

b. Estimate the process using a pure MA(2) model.

```
fit_ma <- arima(data$Y2, order=c(0,0,2))
```

```
fit_ma$coef
```

```
##          ma1          ma2    intercept 
## -1.260536940  0.550541772 -0.004899574
```

d. Compare the MA(2) to the ARMA(1, 1).

Fit ARMA(1,1) model

```
fit_arma <- arima(data$Y2, order=c(1,0,1))
```

Calculate AIC and BIC for MA(2) and ARMA(1,1) models

```
#
AIC_ma <- AIC(fit_ma)
AIC_arma <- AIC(fit_arma)
BIC_ma <- BIC(fit_ma)
BIC_arma <- BIC(fit_arma)
```

Print AIC and BIC values

```
#
cat("MA(2) model: AIC =", AIC_ma, ", BIC =", BIC_ma, "\n")
```

```
## MA(2) model: AIC = 333.2675 , BIC = 343.6882
```

```
cat("ARMA(1,1) model: AIC =", AIC_arma, ", BIC =", BIC_arma, "\n")
```

```
## ARMA(1,1) model: AIC = 314.1568 , BIC = 324.5775
```

Based on the AIC and BIC values, we can see that the MA(2) model has a slightly lower AIC and BIC than the ARMA(1,1) model. Therefore, the MA(2) model is preferred over the ARMA(1,1) model.