Time Series Analysis: Third laboratory

12 de febrero de 2020

Third Laboratory contents.

Consider the following processes:

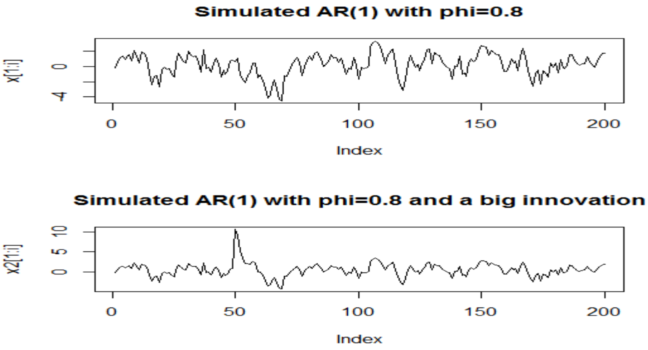
1. $X_t = 1{,}2X_{t-1} + a_t$
2. $X_t = 0{,}8X_{t-1} + a_t$
3. $X_t = 1{,}2X_{t-1} - 0{,}8X_{t-2} + a_t$
4. $X_t = a_t - 1{,}2a_{t-1}$
5. $X_t = a_t - 0{,}8a_{t-1}$
6. $X_t = a_t - 1{,}2a_{t-1} + 0{,}8a_{t-2}$
7. $X_t = 0{,}8X_{t-1} - 0{,}8a_{t-1} + a_t$
8. $X_t = 1{,}2X_{t-1} - 0{,}8X_{t-2} + a_t - 1{,}2a_{t-1} + 0{,}8a_{t-2}$

Third Laboratory contents.

1. Plot the original simulated series and the original simulated series affected by a big innovation at $t = 50$.
2. Check the stationarity and invertibility conditions of the proposed models.
3. For the AR(2) model discuss whether it represents a cycle and obtain the period.
4. For the stationary and invertible processes, plot the theoretical ACF and compare it with the ACF of the simulated process. Discuss differences.
5. For the stationary and invertible processes, plot the theoretical PACF and compare it with the PACF of the simulated process. Discuss differences.
6. Give a tentative ARMA(p,q) order identification for the real data in tswseries2.xls.

Third Laboratory contents.

1 Plot the original series and the original series affected by a big innovation at $t = 50$.



Third Laboratory contents.

2. Check the stationarity and invertibility conditions of the proposed models.

```
abs(polyroot(c(1,-1.2,0.8)))
```

Third Laboratory contents.

3. For the AR(2) model discuss whether it represents a cycle and obtain the period. Results in a period $p = 7{,}52$

```
phi1=1.2
phi2=-0.8
m=sqrt(abs(phi2))
w=acos(phi1/(2*m))
p=(2*3.141516)/w
```

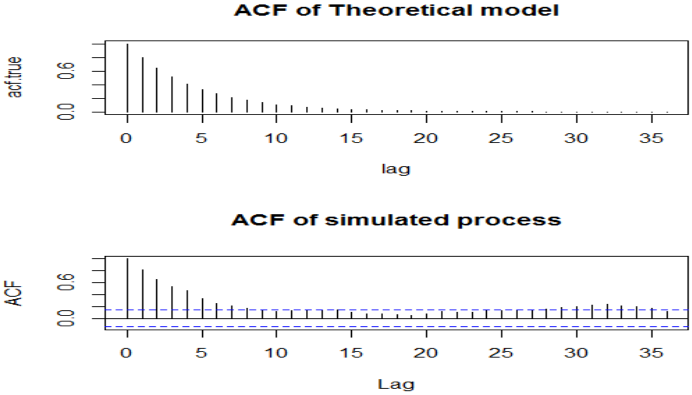
Third Laboratory contents.

For the stationary and invertible processes, plot the theoretical ACF and compare it with the ACF of the simulated process. Discuss differences.

```
#simulated ARMA
x1<-arima.sim(list(ar=0.8),200)
par(mfrow=c(2,1))
#plot of the theoretical ACF
acf.true<-ARMAacf(ar=0.8,lag.m=36)
plot(0:36,acf.true,type="h",xlab="lag", main="ACF of Theoretical model")
#plot of the ACF of simulated process
acf(x1,lag=36, main="ACF of simulated process")
```

Third Laboratory contents.

For the stationary and invertible processes, plot the theoretical ACF and compare it with the ACF of the simulated process. Discuss differences.



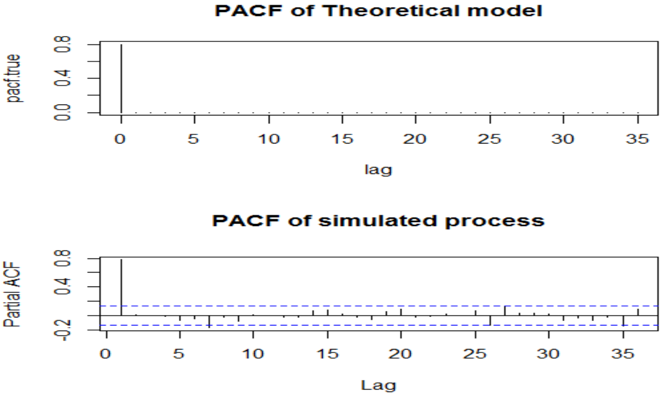
Third Laboratory contents.

For the stationary and invertible processes, plot the theoretical PACF and compare it with the PACF of the simulated process. Discuss differences.

```
#simulated ARMA
x1<-arima.sim(list(ar=0.8),200)
par(mfrow=c(2,1))
#plot of the theoretical PACF
pacf.true<-ARMAacf(ar=0.8,lag.m=36,pacf=T)
plot(0:35,pacf.true,type="h",xlab="lag", main="PACF of Theoretical model")
#plot of the PACF of simulated process
pacf(x1,lag=36, main="PACF of simulated process")
```

Third Laboratory contents.

For the stationary and invertible processes, plot the theoretical PACF and compare it with the PACF of the simulated process. Discuss differences.



Assignment.

Discuss the effect of big innovations on the ACF and PACF of AR(1) and MA(1) processes. Use different ϕ and θ coefficients, different magnitudes of the innovation and different locations.