Home Work 2

Friday, September 25, 2020 12:21 PM

1

a) for a Stationary AR(1)

$x(t) = a_0 + a_1 x(t-1) + \varepsilon_t$

for $L >= 2$

$ACF(1) = \text{Correlation}(x(t), x(t-1))$

$= a_1$

$ACF(2) = \text{Correlation}(x(t), x(t-2))$

$= a_1^2$

$x(t) = a_0 + a_1 x(t-1) + a_2 x(t-2)$

$x(t-1) = a_0 + a_1 x(t-2)$

$x(t) = a_0 + a_1 (a_0 + a_1 x(t-2)) + a_2 x(t-2)$

$x(t) = a_0 + a_1 a_0 + a_1^2 x(t-2) + a_2 x(t-2)$

$ACF(2) = \text{correlation}(x(t), x(t-2))$

$= a_1^2$

$ACF(3) = a_1^3$

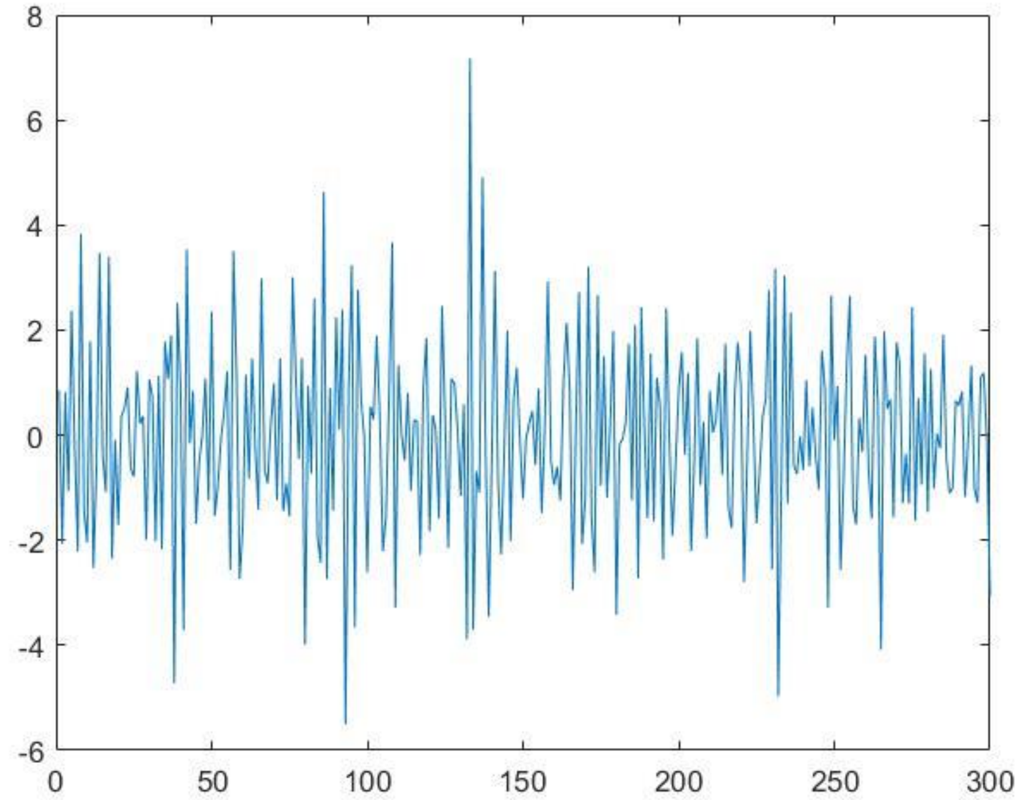
$ACF(24) = a_1^4$

∴ False, it is correlated

(b) MA(q) is greater than 0 till q, after q Everything becomes zero

∴ False, there will be no cliff for MA(1) after $L > 1$, $MA(1) = 1$ for $L = 1$

Q2



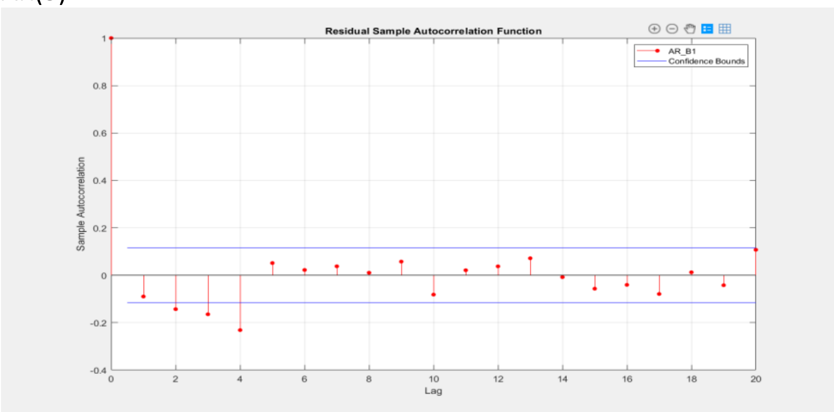
MATLAB Commands Used:

Time series for Q2 is imported to MATLAB. Timeseries is imported as a table, which needs to be converted into an array.

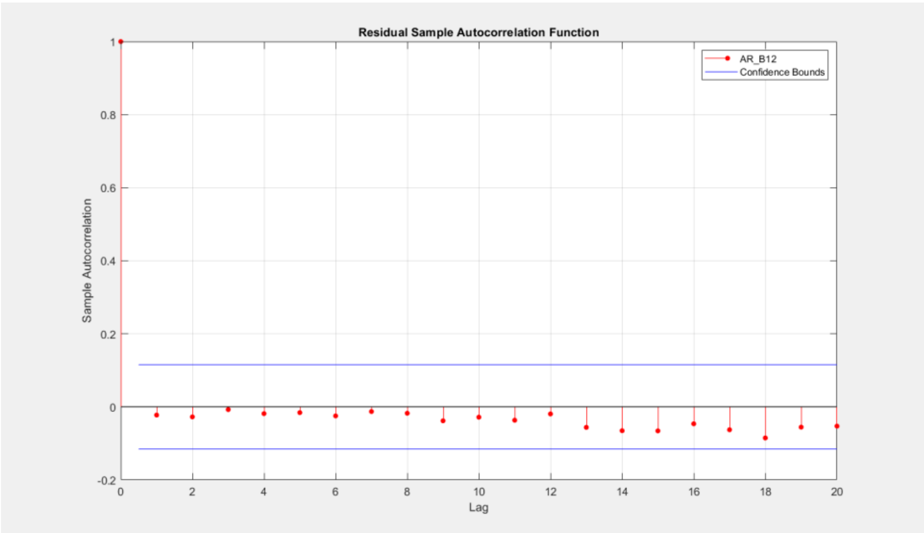
B = table2array(EE627AHW2Q2);
plot(B)

B is imported to Econometric toolbox to plot PACF and ACF.
Following which a model is created.
The models I created are given below with residual auto correlation:

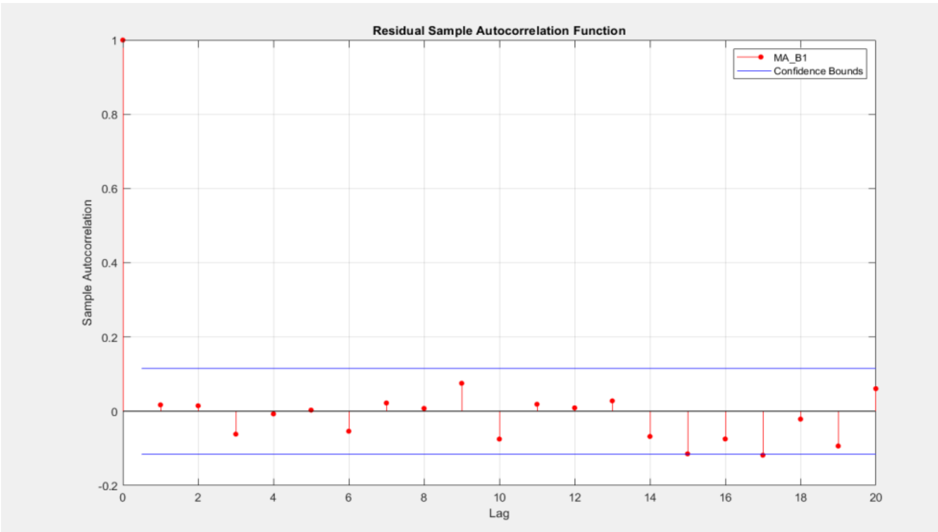
i) AR(3)



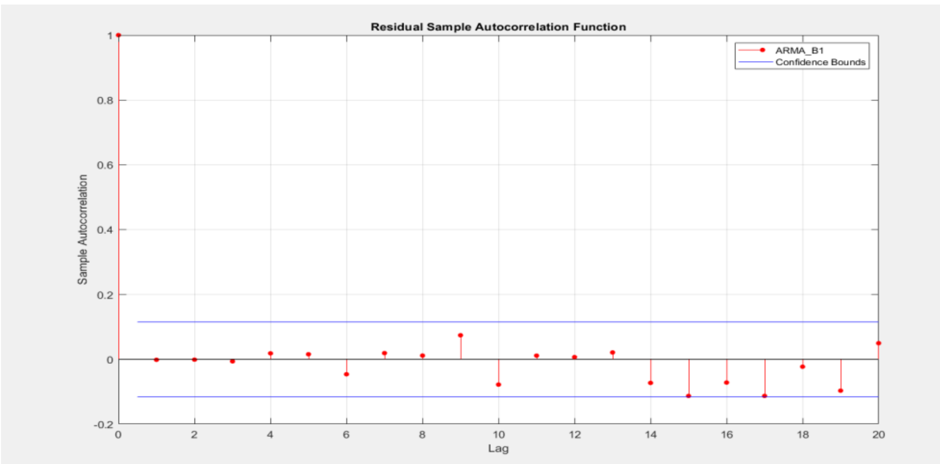
ii) AR(20)



iii) MA(3)

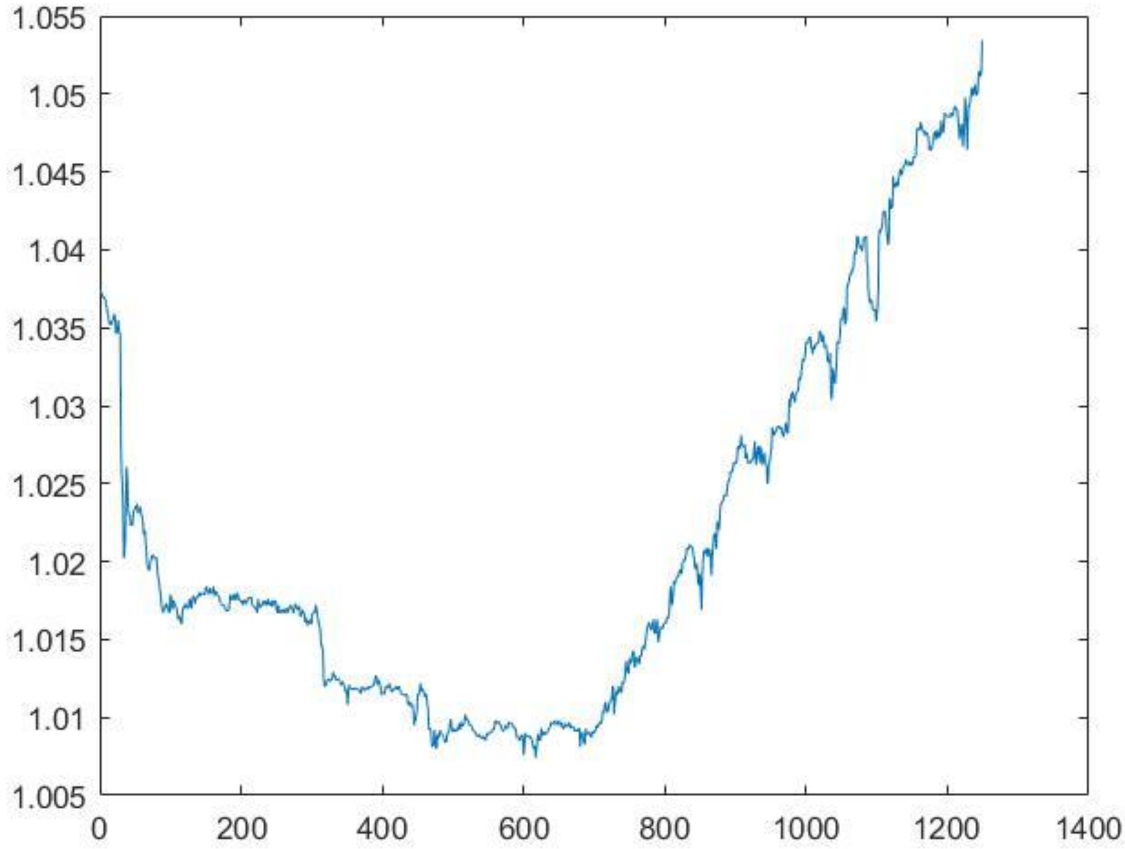


iv) ARMA(3,3)

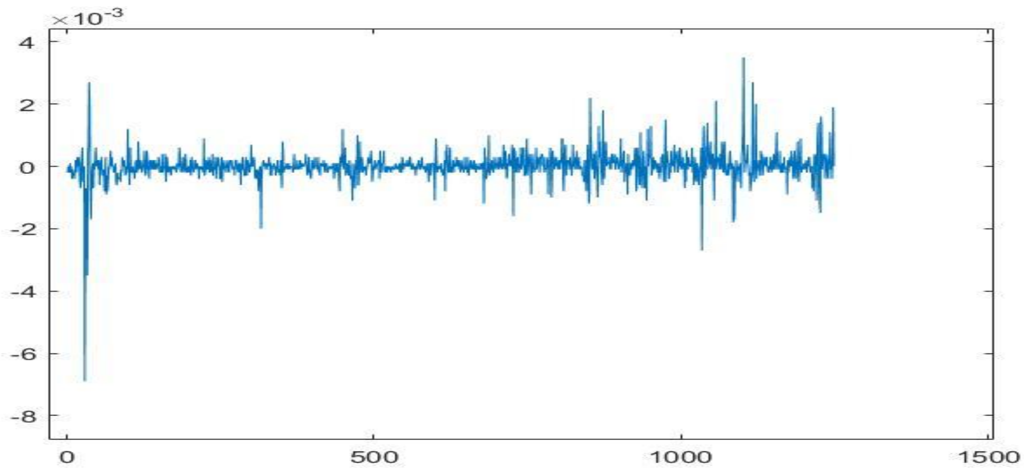


According to observation AR(20), MA(3) and ARMA(3) are best fit models. But since the one with least error terms are considered MA(3) would be a preferred model.

Q3

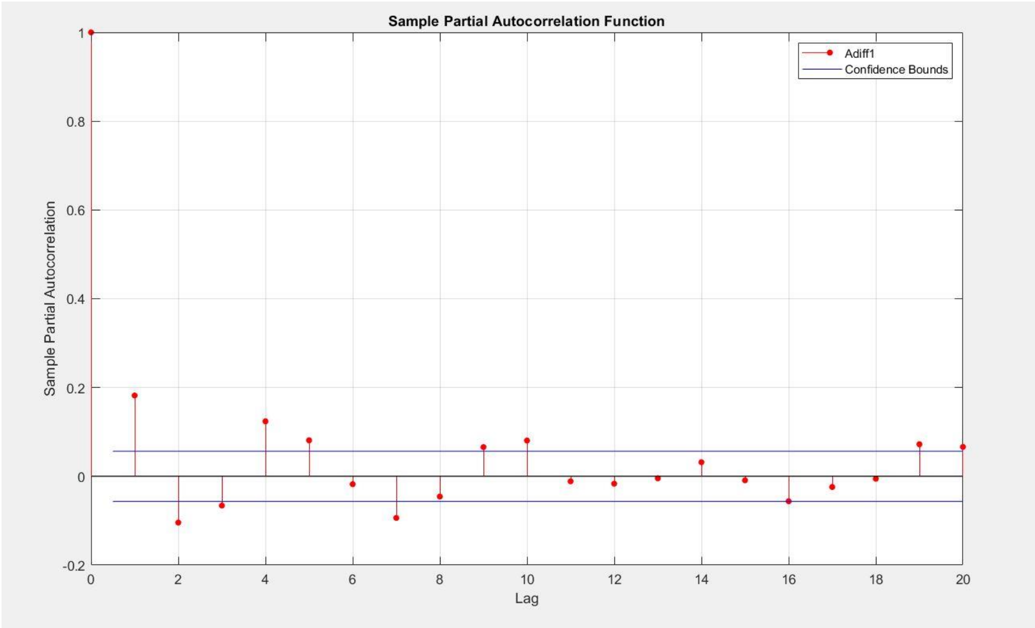


The time series is non – stationary thus, convert into stationary by taking difference. Using **diff(xt)** in MATLAB.



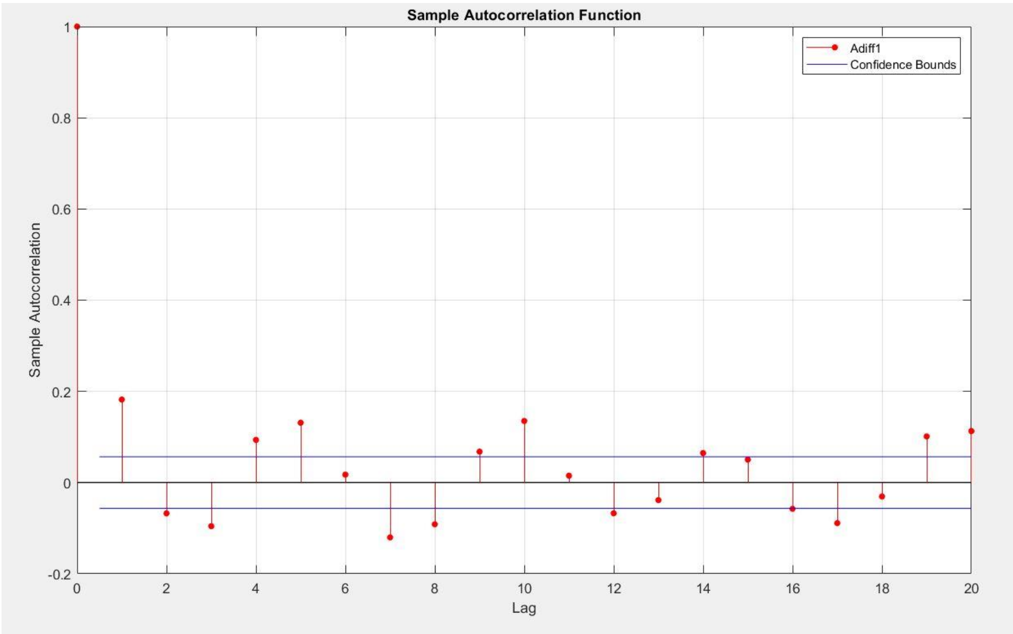
The Un-stationary signal is converted to Stationary Signal.

i) PACF



Sample Partial Autocorrelation Function
Adiff1
Confidence Bounds
Sample Partial Autocorrelation
Lag
1
0.8
0.6
0.4
0.2
0
-0.2
0
2
4
6
8
10
12
14
16
18
20

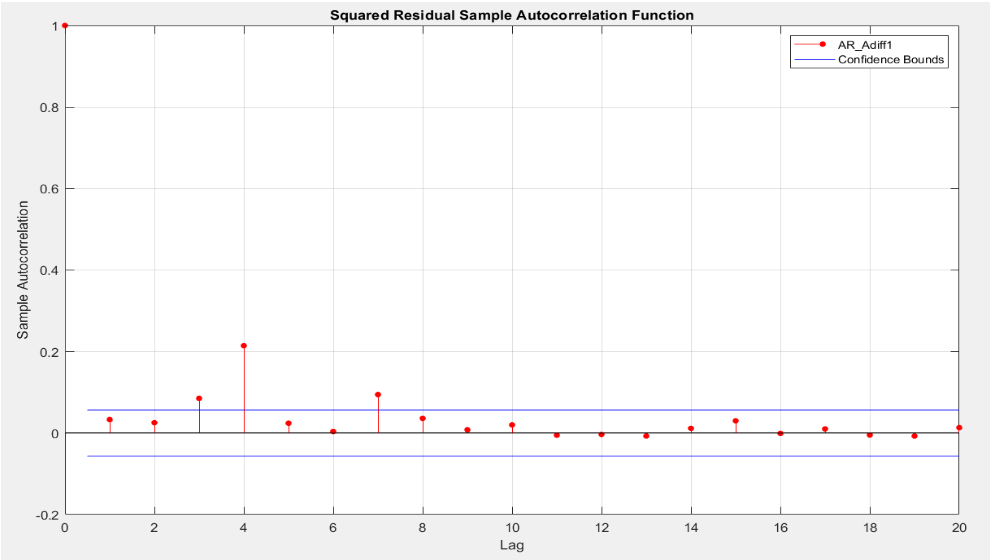
ii) ACF



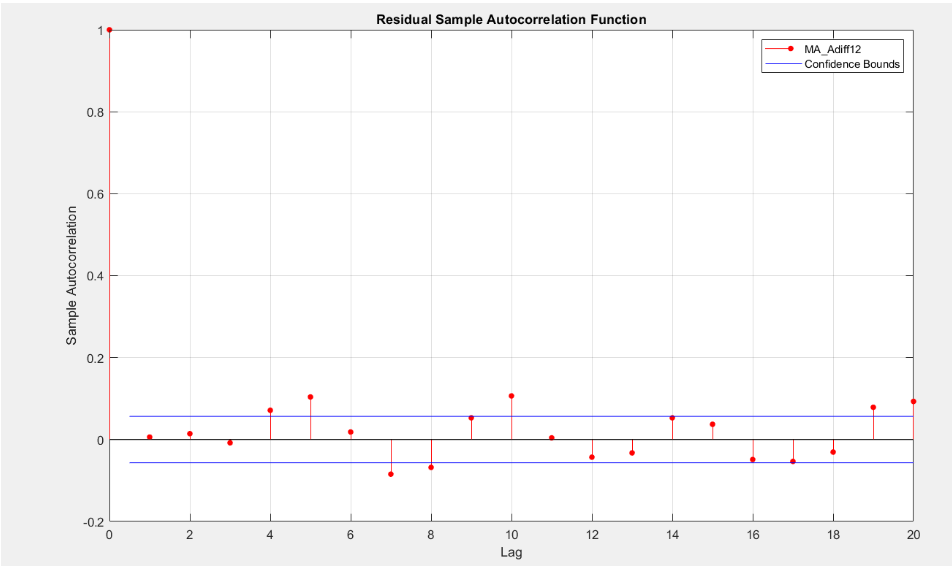
Sample Autocorrelation Function
Adiff1
Confidence Bounds
Sample Autocorrelation
Lag
1
0.8
0.6
0.4
0.2
0
-0.2
0
2
4
6
8
10
12
14
16
18
20

Models:

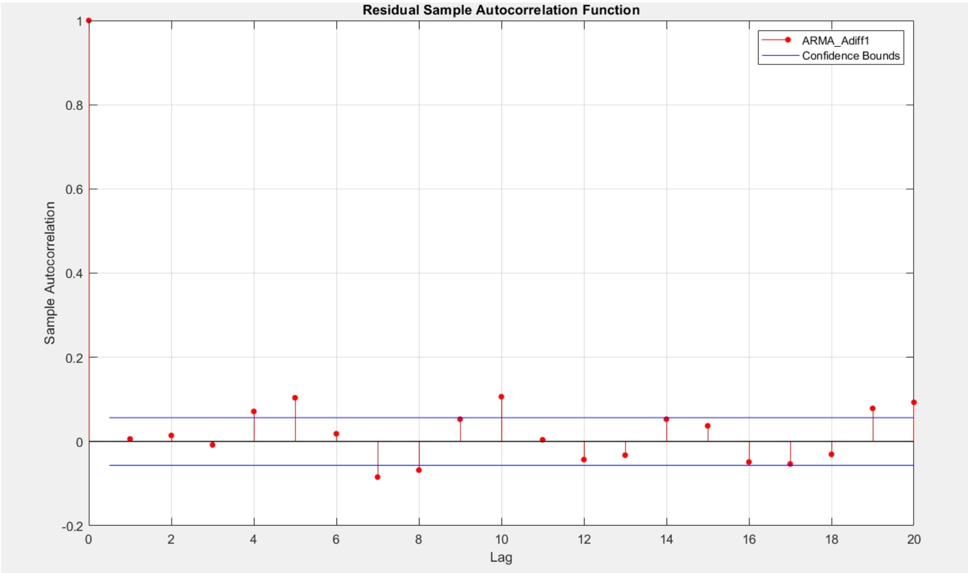
i) AR(3)



ii) MA(3)



iii) ARMA(3,3)



Residual Sample Autocorrelation Function
ARMA_Adiff1
Confidence Bounds
Sample Autocorrelation
Lag
1
0.8
0.6
0.4
0.2
0
-0.2
0
2
4
6
8
10
12
14
16
18
20