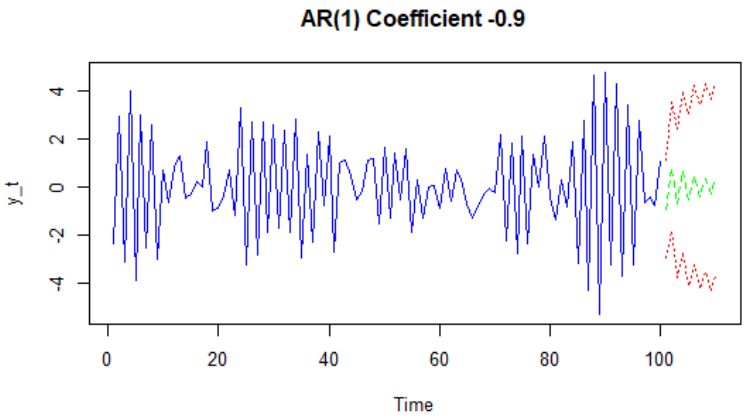
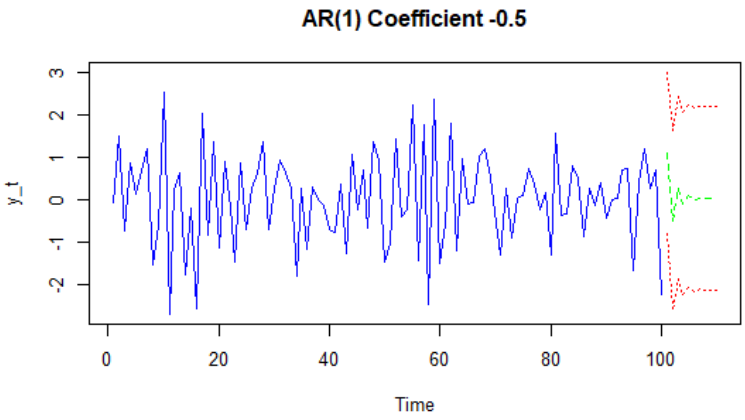
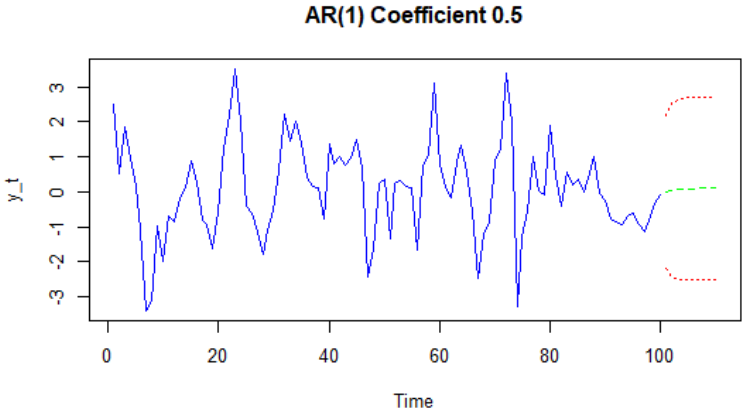
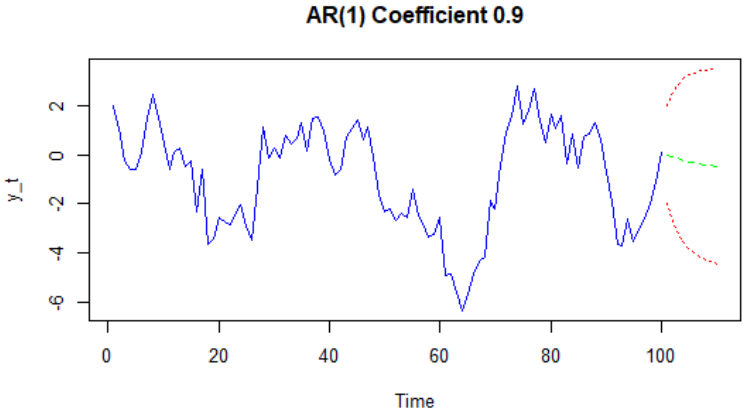
KOMYA, KITU
404-491-375
Due: 10/26/18
Homework 2

Question 1a









Equations of estimated models:

When alpha is -0.9

$Y_t = 0.050 - 0.90*Y_{t-1} + w_t$

When alpha is -0.5

$Y_t = -0.043 - 0.47*Y_{t-1} + w_t$

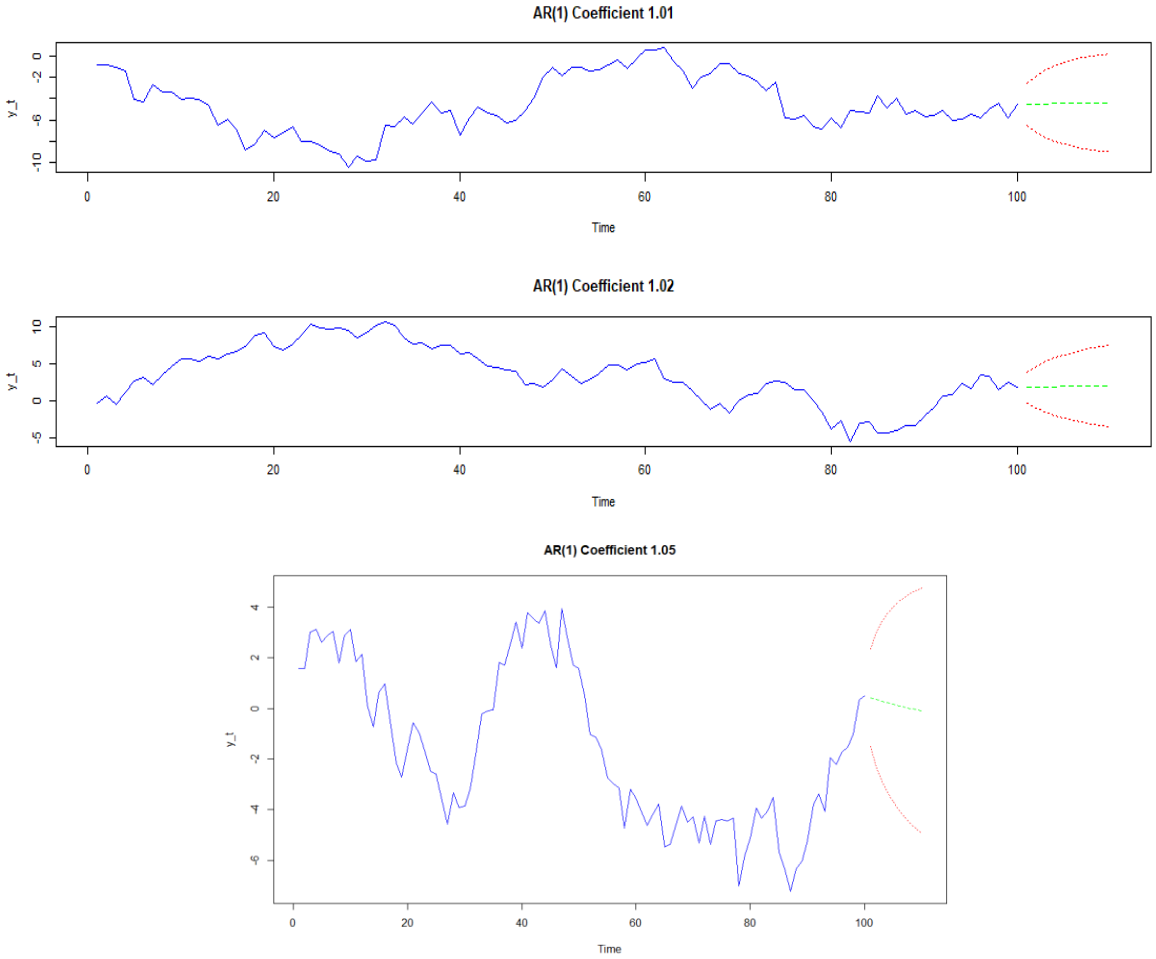
When alpha is 0.5

$Y_t = 0.23 + 0.56*Y_{t-1} + w_t$

When alpha is 0.9

$Y_t = -0.89 - 0.82*Y_{t-1} + w_t$

Question 1b



Roots of models:

When alpha is 1.01 = 0.990099
When alpha is 1.02 = 0.9803922
When alpha is 1.05 = 0.952381

All these AR(1) processes with corresponding alphas are non-stationary because the roots of their polynomials are less than 1.

Equations of estimated models:

When alpha is 1.01

$Y_t = 9.0 + 0.98*Y_{t-1} + w_t$

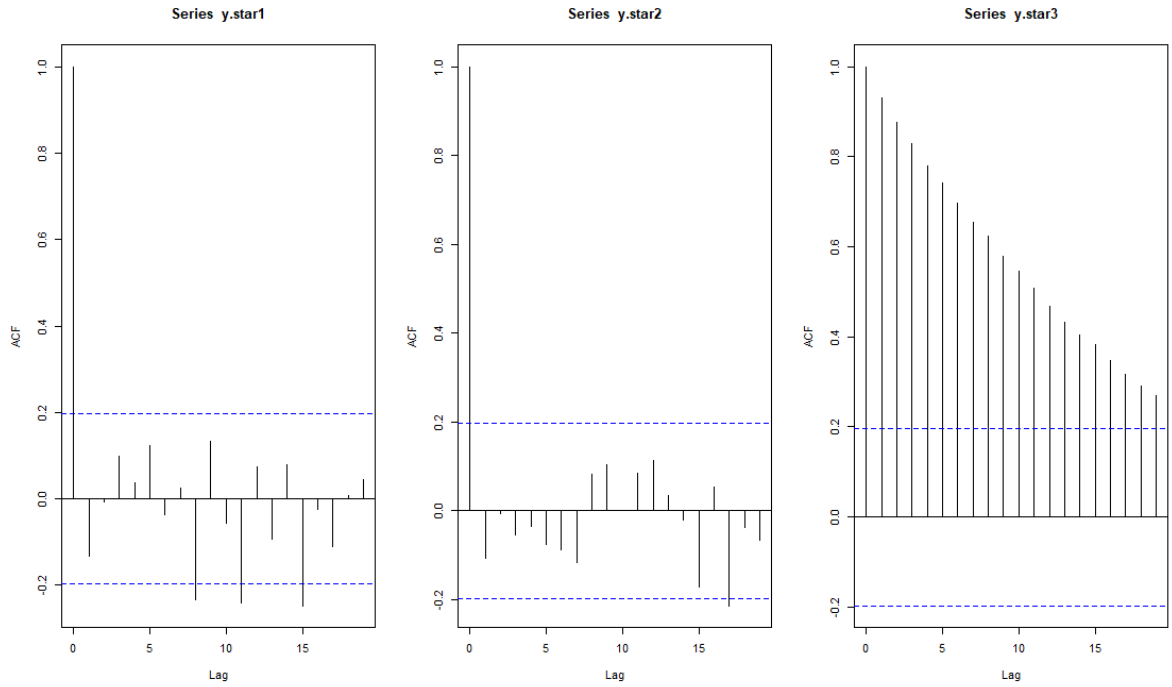
When alpha is 1.02

$Y_t = -12.0 + 0.99*Y_{t-1} + w_t$

When alpha is 1.05

$Y_t = 3.3 + 0.95*Y_{t-1} + w_t$

Question 1c



These plots correspond from left to right for alphas = 1.01, 1.02, 1.05.

Equations of estimated models:

When alpha is 1.01

Estimated model

$Y_t = 0.071*Y_{t-1} + w_t$

Forecasted models

$Y_{t+1} = 0.071*Y_t + w_{t+1}$

$Y_{t+2} = 0.071*Y_{t+1} + w_{t+2}$

$Y_{t+3} = 0.071*Y_{t+2} + w_{t+3}$

When alpha is 1.02

Estimated model

$Y_t = -0.15*Y_{t-1} + w_t$

Forecasted models

$Y_{t+1} = -0.15*Y_t + w_{t+1}$

$Y_{t+2} = -0.15*Y_{t+1} + w_{t+2}$

$Y_{t+3} = -0.15*Y_{t+2} + w_{t+3}$

When alpha is 1.05

Estimated model

$Y_t = -0.044*Y_{t-1} + w_t$

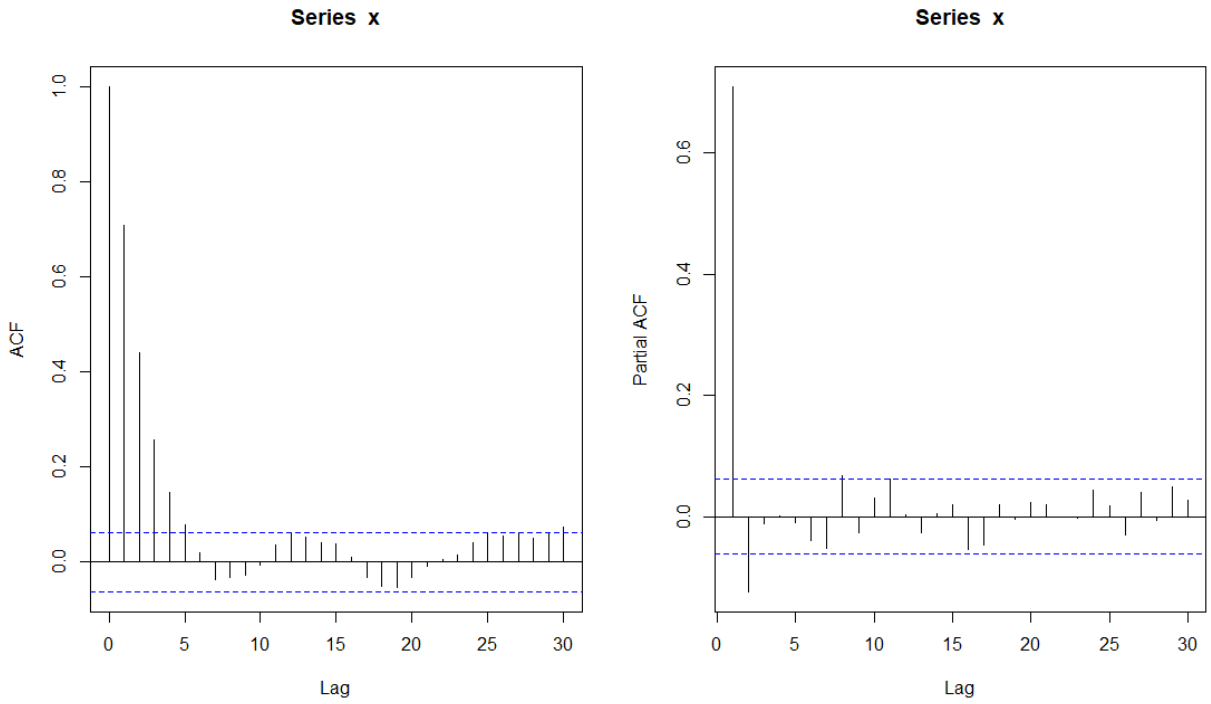
Forecasted models

$Y_{t+1} = -0.044*Y_t + w_{t+1}$

$Y_{t+2} = -0.044*Y_{t+1} + w_{t+2}$

$Y_{t+3} = -0.044*Y_{t+2} + w_{t+3}$

Question 2b



ACF: After differencing, the process seems stationary because there are no autocorrelations after lag 5, showing smoothness.

PACF: Because the autocorrelations at lags 1 and 2 are significant, it verifies that it's an AR(2) model.

Question 2c

Estimated model: $x_t = -0.14 + 0.84*x_{t-1} - 0.18*x_{t-2} + w_t$

Question 2d

AR1 hat:

Estimate: 0.83

SE: 0.03

CI: $0.83 \pm 1.96*0.03 = (0.78, 0.90)$

AR2 hat:

Estimate: -0.18

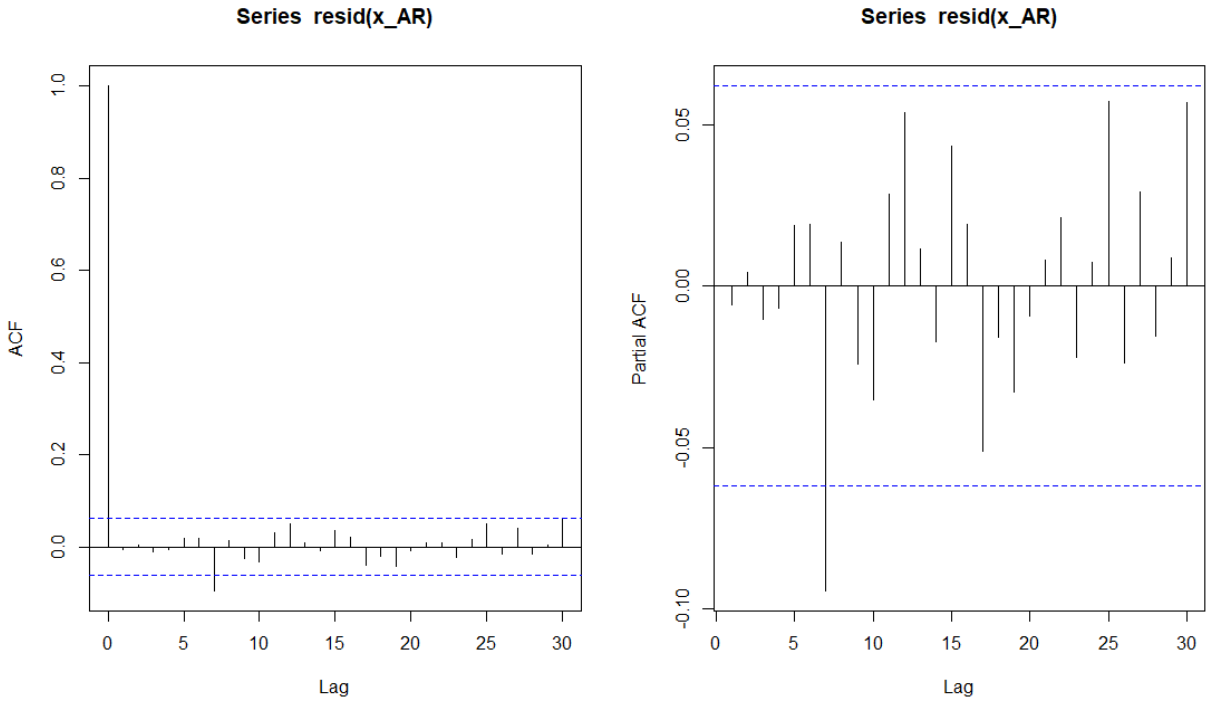
SE: 0.03

CI: $-0.18 \pm 1.96*0.03 = (-0.24, -0.11)$

Question 2e

The process is stationary because the polynomial roots are 2 and 3 which are outside the unit circle.

Question 2f



ACF: No significant autocorrelation in the lags.
PACF: No significant autocorrelation in the lags.

Thus, the residuals are white noise.

Question 3a

Because the polynomial roots are 1 and 2, which are outside the unit circle, the process is not stationary.

Question 3b

Since the polynomial roots are outside of the unit circle, the process is not stationary.

Question 3d

AR1 hat:

Estimate: 0.49

SE: 0.03

CI: $0.49 \pm 1.96*0.03 = (0.43, 0.55)$

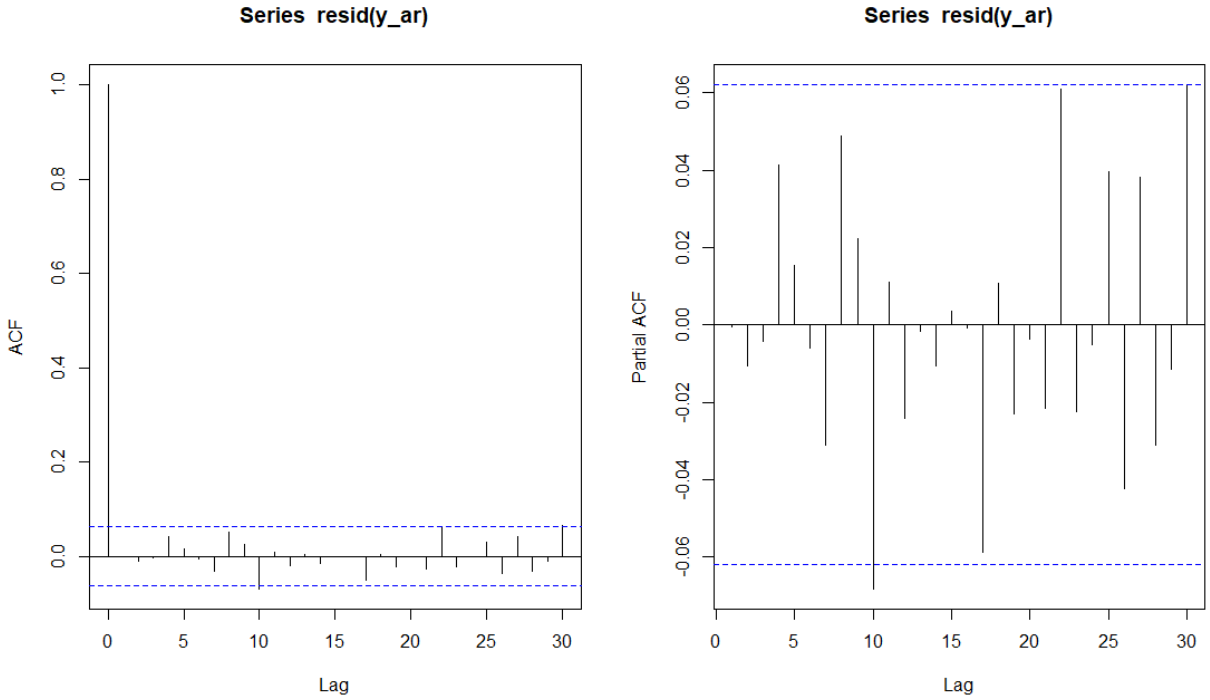
AR2 hat:

Estimate: 0.01

SE: 0.03

CI: $0.01 \pm 1.96*0.03 = (-0.05, 0.076)$

Question 3e



ACF: no significant autocorrelations.

PACF: no significant autocorrelations.

Thus, the residuals are white noise.