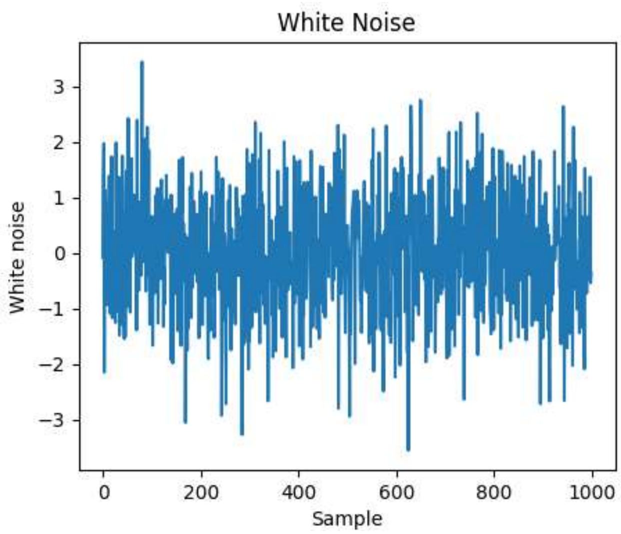
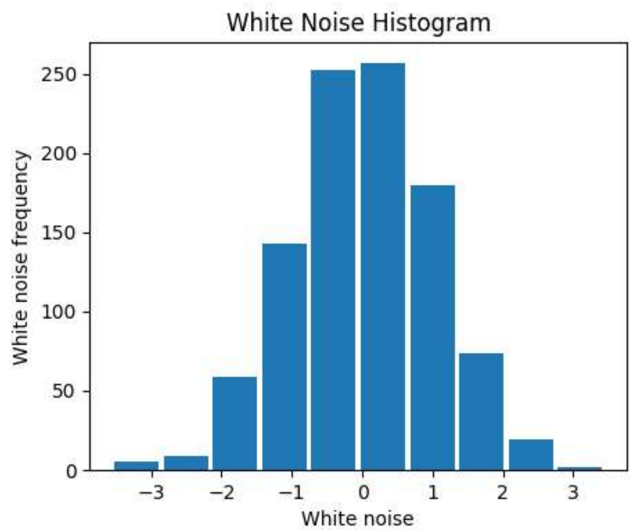
# Time Series Analysis Lab 2

Rajkumar Conjeevaram Mohan

Question 2

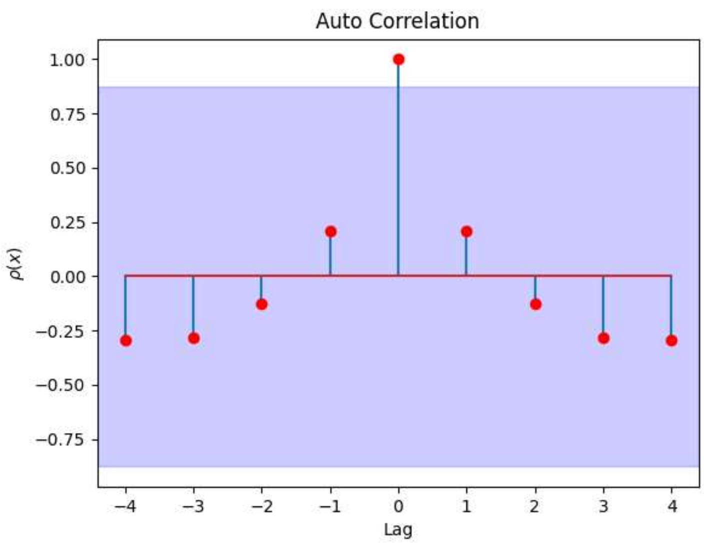


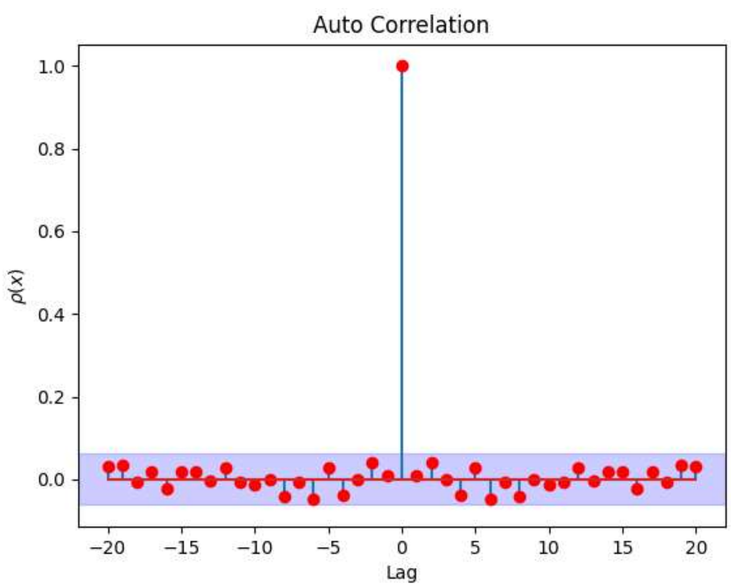

The sample has a mean of 0.006800741251157822 and a standard deviation of 1.0138395645359175

Question 3

a. ACF of the made-up dataset from Question 1



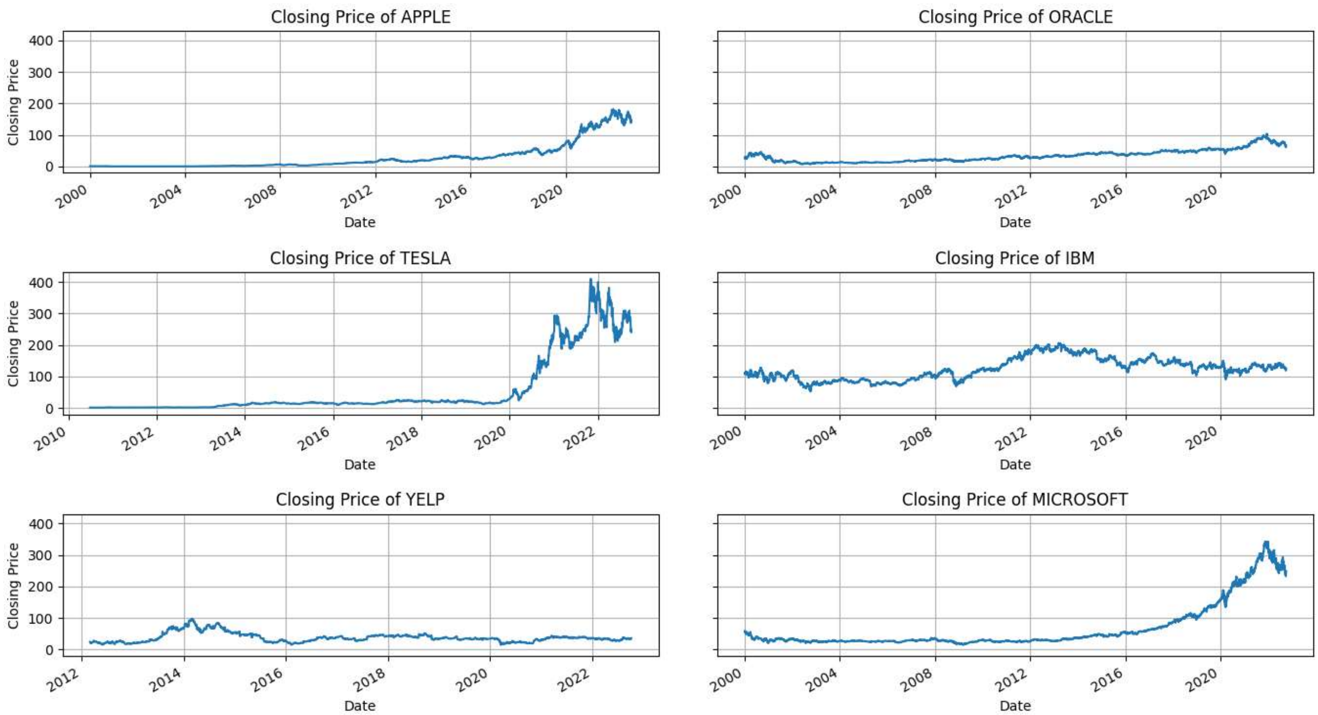

b. ACF of the white noise



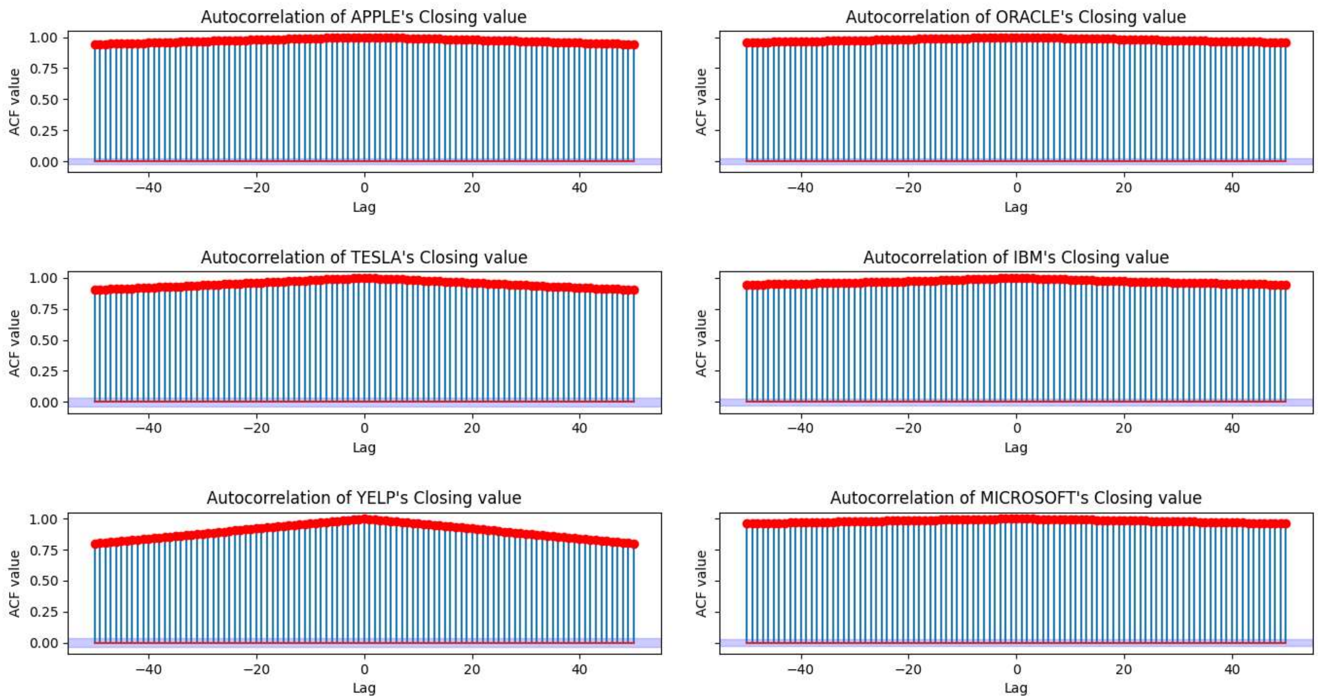

c. White noise data is certainly stationary and is intuitive from the plot in 3. b part of the question. While the ACF at lag 0 would always be 1 for all data because the data would perfectly match with itself, in case of any lag above 0, there is no significant autocorrelation that can be identified in the plot. My understanding is that data is i.i.d generated and is expected to have zero connection with each other.

Question 4

a. Plot the Close value of the stock for all companies

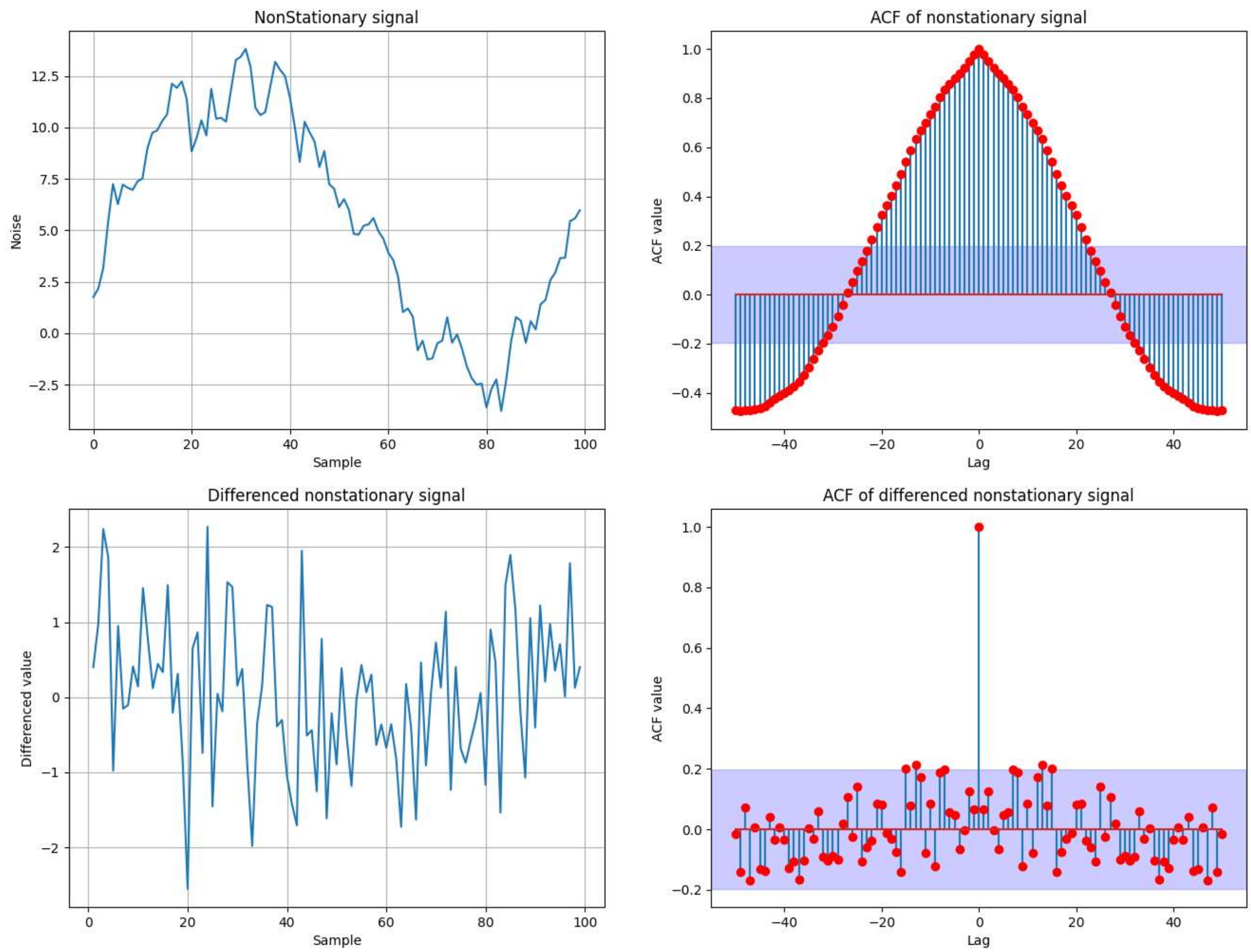


b. Plot the ACF of the Close value of stock for all companies versus lag in one graph




## Question 5

As we know, autocorrelation measures the strength of linear association between lagged values of a time series. Just to talk about the correlation between nonstationary and stationary from the perspective of ACF, I generated a non-stationary signal and transformed it into stationary




My understanding is that there is no correlation between the ACF plots of stationary and nonstationary other than at lag 0, the ACF value is 1, which is true for all data. Speaking about autocorrelation itself, it shows how much a time signal at time t is related to the lagged version of itself.

# Time-Series Homework2

## ACF for Question1

$$y = [3, 9, 27, 81, 243]$$

1 2 3 4 5

$$\boxed{\hat{R}_y(\tau) = \sum_{t=\tau+1}^{T} \frac{(y_t - \bar{y})(y_{t-\tau} - \bar{y})}{\sum_{t=1}^{T} (y_t - \bar{y})^2}}$$

$$\bar{y} = \frac{3+9+27+81+243}{5} = 72.6$$

$$\hat{R}_y(0) = \frac{(3-72.6)^2 + (9-72.6)^2 + (27-72.6)^2 + (81-72.6)^2 + (243-72.6)^2}{(3-72.6)^2 + (9-72.6)^2 + (27-72.6)^2 + (81-72.6)^2 + (243-72.6)^2}$$

$$= 1 \; //$$

I deliberately wrote this so I can use this in the subsequent calculation

$$y = \begin{array}{ccccc} [3, & 9, & 27, & 81, & 243] \\ 1 & 2 & 3 & 4 & 5 \end{array}$$

$\hat{R}_y(1) =$

$$\frac{(9-72.6)(3-72.6)+(27-72.6)(9-72.6)+(81-72.6)(27-72.6)+(243-72.6)(81-72.6)}{(3-72.6)^2+(9-72.6)^2+(27-72.6)^2+(81-72.6)^2+(243-72.6)^2}$$

$$= \frac{8375.04}{40075.2} = 0.208983$$

$$\hat{R}_y(2) = \frac{(27-72.6)(3-72.6)+(81-72.6)(9-72.6)+(243-72.6)(27-72.6)}{40075.2}$$

$$= \frac{-5130.72}{40075.2} = -0.12802$$

$$\hat{R}_y(3) = \frac{(81-72.6)(3-72.6)+(243-72.6)(9-72.6)}{40075.2}$$

$$= -11422.08/40075.2 = -0.285016196$$

$$\hat{R}_y(4) = (243-72.6)(3-72.6)\,/\,40075.2$$

$$= -11859.84/40075.2 = -0.2959396$$

ACF Plot for question 1