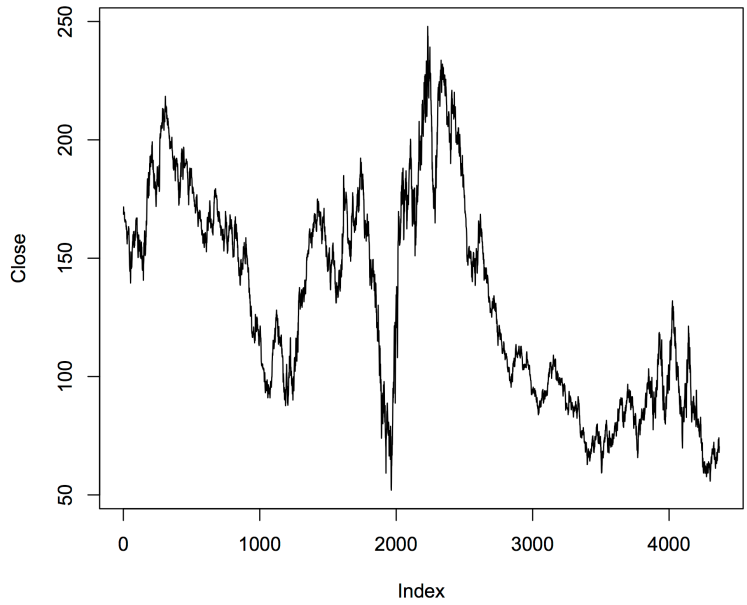
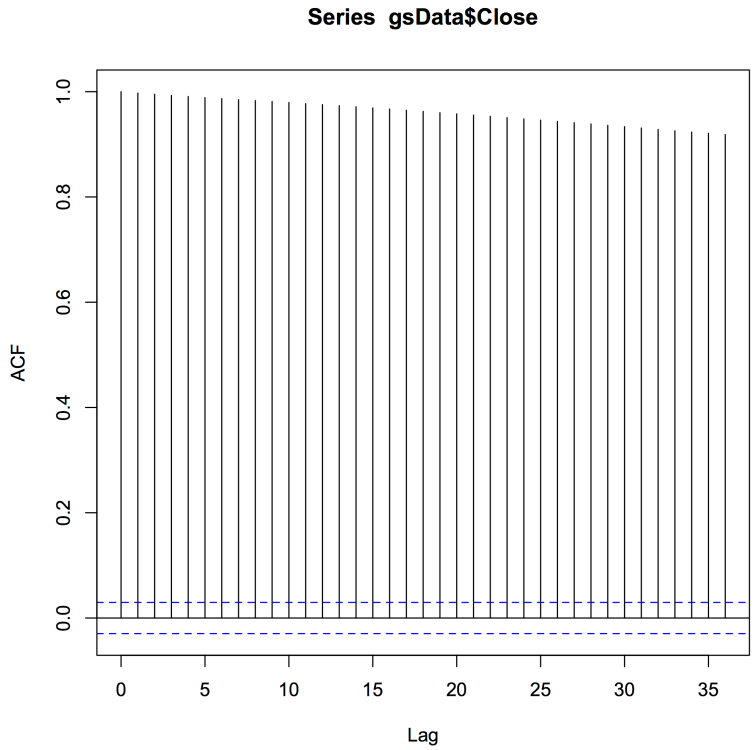
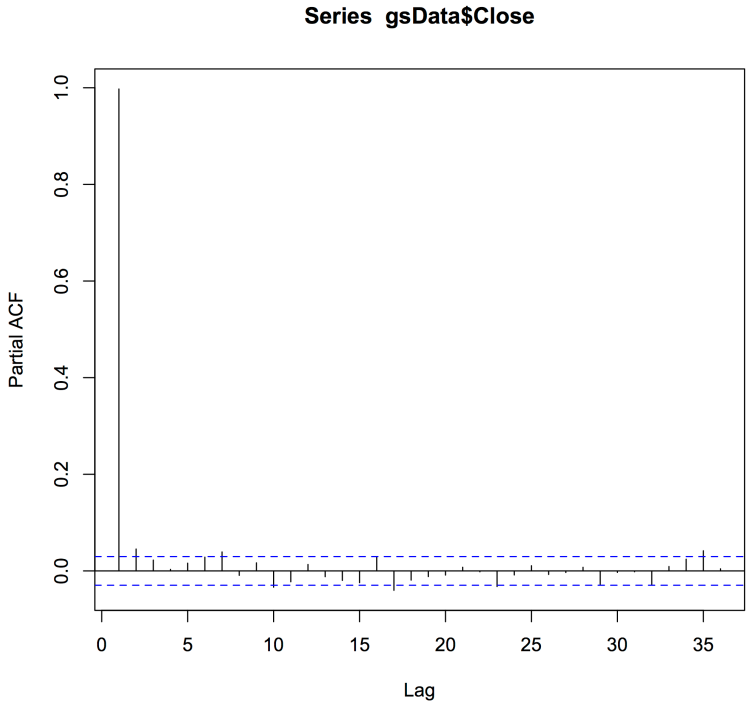
Original data
Plot the original data - Goldman Sachs stock prices over 15 years.



Stationarity
From the plot above, it does not look like the data is stationary, as its statistical properties such as mean and variance are not constant over time

To confirm this, we plot the PACF and ACF. Since the plots do not tail off quickly, we know that the dataset is not stationary.





To make the data stationary, we first do log to scale down the prices and then diff to remove the non-stationarity. The first difference of a time series is the series of changes from one period to the next. If Y_t denotes the value of the time series Y at period t, then the first difference of Y at period t is equal to Y_t-Y_{t-1}.

Then, we confirm the stationarity of the data by doing the Ljung-Box test.
Since p-value = 0.0001268 (<0.05), we can conclude that the time series is stationary.

Decomposition

We decompose the stock data into trend, seasonal and irregular components.