# TIME SERIES ASSIGNMENT 1

1.  11<sup>th</sup> September case study.
    a.  The goal of the study is descriptive because historical data is being used to derive conclusions about the change travel behavior of the passengers in mode of travel after the attack.
    b.  Time series plot was formed. t=1,2,3… here refers to the different time periods in the series. For example, t=1 here refers to the time January 1990.
    c.  y1= 35153577, y2= 32965187, y3= 39993913 basically the values from Air attribute.

2.  *(10 pts)* In addition to air travel data, two additional time series are also provided in the same data file – Rail and Vehicle travel.
    a.  -   Both Air and Vehicle Time Series have a level(mean).
        -   Vehicle time series has a trend. Air time series also has trend, but it can be observed that after the incident the number of people traveling by air took a dip.
        -   Both Vehicle and Air time series have seasonality, but it is much more evident in the vehicle series.
        -   From the plot it can be understood that Air attribute series had much more noise than the vehicle series.
    b.  Rail time series doesn't follow a linear trend. It can be observed that first for a very short duration in the beginning the trend increased then it went on to a gradual decline after which it started to rise again.

3.  Shampoo sales csv file read using pandas.
    a.  Created a time series plot.
    b.  The time series plot has a level, increasing trend, has seasonality and the series has some noise.

4.  *6 pts)* The file, *Beverages_Shipment_2020.csv*, contains the US beverage product shipments data.
    a.  Yes, there is seasonality in the time series. The seasonality is of the type additive.
    b.  Plotted the autocorrelation function for the data.
    c.  Seasonal period from the autocorrelation is 12 since after every 12 points there is a peak.

5.  *(10 pts)* Data on US coal production is given in *Coal_Production_US_2020.csv*.
    a.  Plotted the coal production time series and the autocorrelation function. It can be observed that autocorrelation was positive at first then gradually went negative.
    b.  The time series is non-stationary since it has a level as well as seasonality.

c. After the first differencing it can be observed that time series got rid of trend component which was gradually rising at first. Though, just removing the trend cannot be used to say that the time series is stationary. So, after decomposing the differenced plot it was seen that it still had seasonality from which we can conclude that the time series is still not stationary.