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Degree/Branch : M.Tech / Data Science Semester / Year : 04/02

) Pre-requisites :

) \* To perform ADF test for given data set,  
The data set M2SMoneyStock.csv file is been downloaded and formatted in a proper way, in keeping index as date.

\* check on components of Time-series

Upon checking the components of  
Time-series using decompose method  
on "Multiplicative-model",

- Data clearly has a Linear upward.
- A clear cut Seasonal pattern of Each Year.
- And the pattern form the Every year.

## \* Augmented Dickey Full - Test.

→ The Augmented Dickey - Fuller

test, is used to check the stationarity  
of the dataset, to have the  
Constant mean and Variances

$H_0$  : Time series is non-stationary

$H_1$  : If the  $H_0$  is Rejected, the  
Time series is Stationary.

Test ①:

$$P\text{-value} = \underline{\underline{0.99}}$$

$$\text{Critical Value (5\%)} = -2.88$$

$H_0$  cannot be Rejected

To make the data to be Stationary:

- upon using differencing techniques

Test ②

$$P\text{-value} = \underline{\underline{0.05}}$$

$H_0$  can be Rejected



## Modeling:

### (i) AR model:

\* Upon using ACF and PACF, we can find the  $P=3$ ,  $Q=3$

with respect to this value.

\*  $AR(p)$  is predicted with the value and the data is being distinguished over the period of time.

### Coefficient

$$\text{Const} = 0.70$$

$$\rightarrow \text{Mony. } L_1 = 1.22$$

$$\rightarrow \text{Mony. } L_2 = -0.13$$

$$\rightarrow \text{Mony. } L_3 = -0.08$$

$$\rightarrow \text{Residual Standard Error} : 684.5381$$

$$\rightarrow \text{AIC} = 2322.28$$

$$\rightarrow \text{BIC} : 2359.87$$

Result: The Prediction is more stable and good in using the model.

(ii) ARIMA :

As per the PACF and ACF, the ARIMA model is built upon the (2,1,3), in which

the Co. of each one

$$\begin{array}{lcl} \rightarrow \phi_1 L_1 & = & -0.7118 \\ \rightarrow \phi_1 L_2 & = & 0.8918 \\ \rightarrow \phi_1 L_3 & = & 0.7843 \end{array} \quad \left| \quad \begin{array}{l} \theta_1 L_1 = 1.0827 \\ \theta_1 L_2 = -0.5871 \\ \theta_1 L_3 = -0.8050 \end{array} \right.$$

$$* AIC = 205.261$$

$$* BIC = 207.745$$

\* The model predicts the forecast in a proper way.

(iii) SARIMAX

\* The SARIMAX model compares with the parameters of seasonal data in terms of month and day and this model, as there are no constant and there are missing.

Result :

The ARIMA model is good for this dataset as the seasonal data is missing and not forecasting in a proper way.