Exponential Smoothing Techniques

Problem Statement:

To apply Exponential Smoothing techniques to forecast the consumption of omellette's in a hospital

Data Description:

The data is a time series data with two variables Date and Omellette. The data consists of the consumption of omellette on each day for 4 month period from October 2014 to January 2015 on daily basis with monthly cycle. There are a total of 115 data points with no missing values.

Splitting train and test:

The given data is split into training and test data since there is no separate test data. Out of the 115 data points, 92 are used for training the model and the rest is used for testing. (80:20 principle)

Applying the technique:

Single and Double Exponential Smoothing techniques are used for forecasting with smoothing constant (alpha) as 0.2, 0.5 and 0.85 while Triple Exponential Smoothing technique is used with smoothing constant 0.5.

Single technique does not take into consideration the seasonality and trend component of the data. Thus, the output plot is a straight line as seen in Figure 1. (Predictions at alpha 0.5 and 0.85 are almost the same)
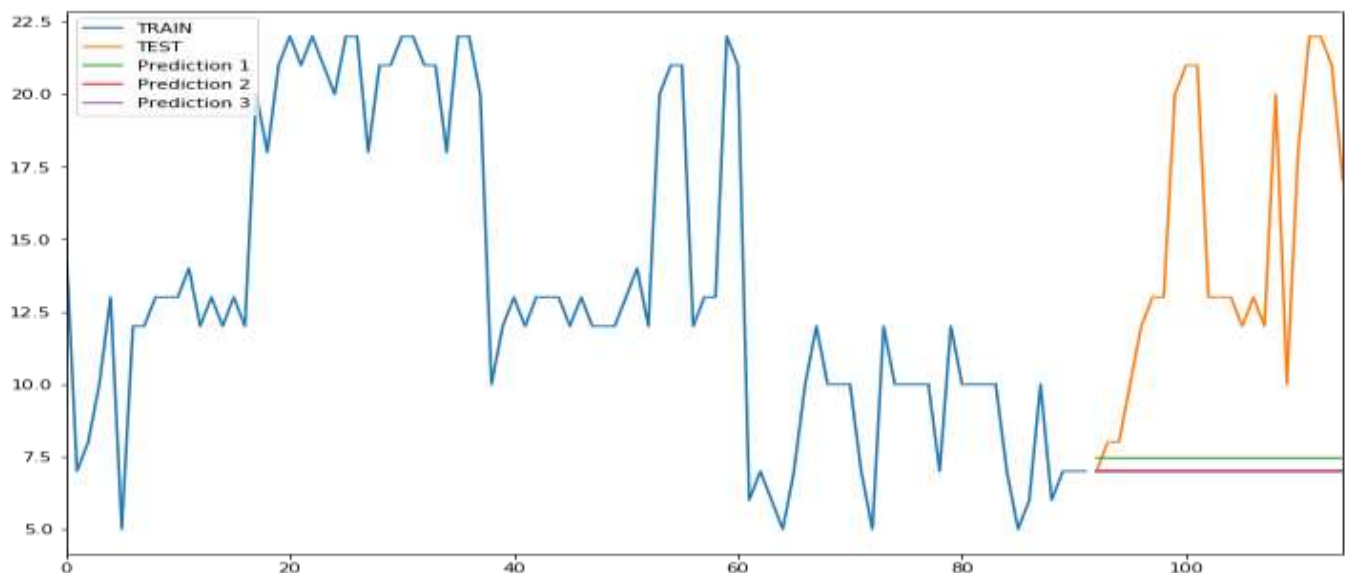

Figure 1: Output graph for Single Exponential Smoothing.

The Double Exponential Technique takes into consideration the trend component of the data but not the seasonality component as represented by figure 2.
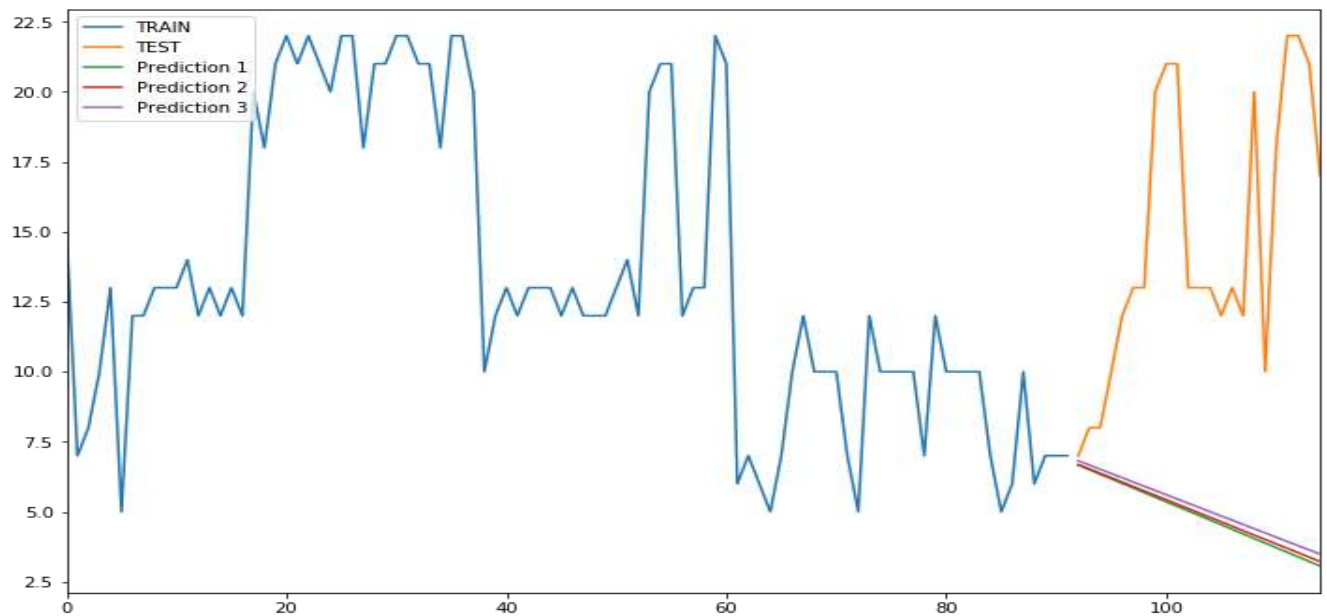

Figure 2: Output graph for Double Exponential Smoothing

The triple Exponential Smoothing takes into consideration both trend and seasonality components of the data which can be seen by the trend-line in the graph in figure 3.
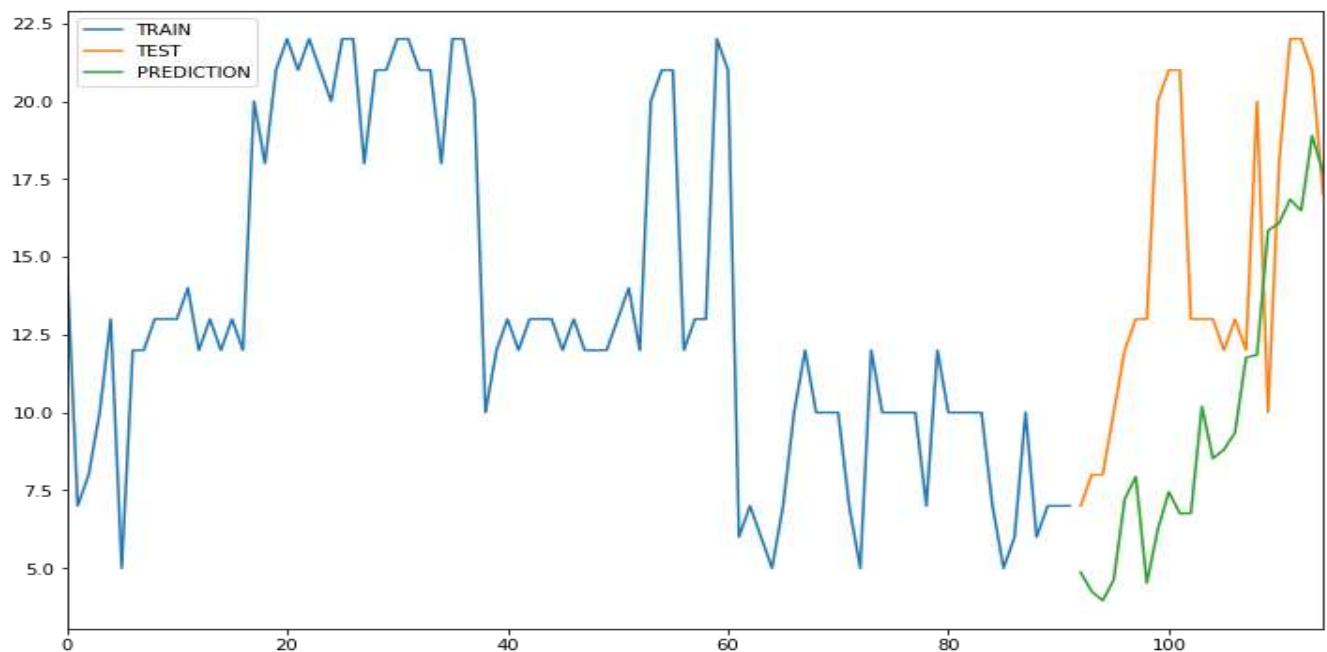

Figure 3: Output graph for Triple Exponential Smoothing

Finding Error:

	Alpha	RSME	MSE	MAPE
SES	0.2	8.72226	76.07782	0.496705
_	0.5	9.098042	82.77437	0.524344
_	0.85	9.109458	82.98223	0.525186
DES	0.2	11.32243	128.1974	0.67022
_	0.5	11.22971	126.1063	0.664137
_	0.85	11.04296	121.947	0.650669
TES	0.5	6.646994	44.18253	0.369121

Conclusion:

The **Triple Exponential Smoothing is the best technique** as all the error values are minimum in the triple exponential smoothing. The model is the best way to predict the consumption of omellettes using the time series data. It is however seen that the consumption will **reduce towards the end of January and may continue to decline for further few weeks based on its historical trend.**