**Portfolio: Task 4**

**Time series forecasting with the decomposition technique.**

**INTRODUCTION:**

For a business analytics consulting company, we are performing research using a portion of monthly data. The number of monthly airline passengers in the United States in the 1950s is shown using a typical beginning time series data collection.

**ANALYSIS:**

We have the passenger information for each month from January 1949 to December 1960 from the paperwork that was given to us. The number of travellers from January 1960 to December 1960 must be predicted. Let's use (Y t) to represent the passenger column. We will first draw a graph showing Passenger(Y t) vs. time from January 1949 to December 1959. To illustrate the movement of the data through time and the relationship between these two variables, we will also draw a trendline.

Given the variances around the trend line's growing size and the upward trend in the graph, it is clear from the graph that it is a multiplicative model. We may deduce from the graph that there is a seasonal element since there are recurrent data points above and below the trendline. We can tell from the statistics that there are 12 seasons.

The trend (M t) and seasonal component (S t) will now be calculated. Moving average (12 MA(t)) and centre moving average (12 CMA(t)) calculations will now be performed. The average of the first 12 data values from the (Y t) columns will be used to produce (12 MA(t)). We shall begin with 1949–2007 since we lack the data point necessary to compute the moving averages of the first six data points. The Centre Moving Averages will be computed once the Moving Averages for each data point have been computed. The Trend Factor, represented by (M t), is the name given to the centre moving average. We will use the average of the first two data points from the 12 MA(t) column to calculate the centre moving average. As our model is multiplicative, Y t =M t\*S t\*E. From this, we will calculate the seasonal factor by dividing Y\_t by M\_t.

Table

Description automatically generated

As we can see, the first record that we have pertains to July 1949 and is 1.17. As shown below, we will create a table of years and months for all possible values of (S t) based on this information.

To calculate the Moving Average (MA) we have take the average for the first 12 values of Y\_t(passengers). Because we have 12 seasons .To calculate Center Moving Average(CMA) we have taken the average of the first two values of MA .

As we have the value of S\_t we can put them in the tabular form to indicate the values of each month and calculate the average of each month to find the correction factor.

To calculate the Seasonal Factor (S\_t) we have divided the (Y\_t) by (M\_t).

Graphical user interface, application, table, Excel

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Description automatically generatedWe will now calculate the mean of all the data for a specific month between 1949 and 1959. In order to determine the adjustment factor, we shall divide 12 by the monthly average (11.97). The average of each month is multiplied by the adjustment factor (1.002) to determine the typical SF. These numbers represent each month's usual seasonal component (S1 -S12). By dividing (Y t) by typical SF up to December 1959, we may get the deseasonalized data (Y\* t) from typical SF. We will use Y\* = a + b \*t to project the values from January 1960 to December 1960, where a represents the intercept, b the slope, and t the time period.

**CONCLUSION :**

From January 1960 to December 1960, the anticipated passenger volume was calculated. As we can see, there is a discrepancy between the predicted and actual numbers. In order to explain the discrepancy between real and predicted values, we computed the MAE and MSE.