**Assignment**

Total points 100. Submit through D2L in Word/Excel format, single or multiple files. Must show your work, answer all parts of the question, show all relevant graphs, and write necessary explanations to earn full points. Grading depends on three components of your answer- accuracy and completeness of your calculations (numerical results); accuracy of relevant graphs; and accuracy and completeness of necessary explanations/interpretations/conclusions. You must use Excel to solve this numerical problem (project).

The following table gives monthly data for four years in million tons of consumption of ice cream in a country. Plot the series and comment on the visible seasonality and trend. Estimate the centered moving averages for this monthly series. Plot CMA and comment. Next, estimate the S,I component which only includes seasonal and irregular movements of the series. Then find the seasonal indexes for the twelve months removing the irregular component. Find the de-seasonalized levels for the series. Plot De-seasonalized Y and comment. Then estimate the trend values for the four sample years and the 12 months of the year 2022 using linear regression. Finally, make the forecast for the 12 months of 2022 using the **Ratio-to-Moving Average method** to capture the Trend and Seasonal patterns, using Excel. Plot the forecasted values for the 60 periods including 12 months of the year 2022. Plot the errors for in-sample periods and calculate RMSE. Comment on the error plot with respect to the existence of pattern or lack of visible pattern.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Month/Year | 2018 | 2019 | 2020 | 2021 |
| Jan | 110 | 140 | 185 | 220 |
| Feb | 120 | 150 | 195 | 230 |
| Mar | 130 | 155 | 205 | 245 |
| Apr | 140 | 175 | 215 | 265 |
| May | 160 | 200 | 235 | 295 |
| Jun | 180 | 230 | 250 | 330 |
| Jul | 190 | 252 | 270 | 345 |
| Aug | 180 | 232 | 260 | 330 |
| Sep | 170 | 225 | 250 | 315 |
| Oct | 160 | 215 | 230 | 300 |
| Nov | 140 | 195 | 210 | 265 |
| Dec | 130 | 180 | 205 | 250 |

(Hint: **First, you have to type the data in a single column form in Excel**)