Econometrics 475 Spring 2024
Homework #4 Due in Canvas Wednesday, March 6th

Download the Excel dataset "HW4 Data.xlsx" from the class website. The "ManfSales" tab has a monthly data series over the period Jan. 1992 – Dec. 2023, for U.S. Manufacturers Sales in millions of dollars, not seasonally adjusted.

1. Provide a time-series plot of the overall series.
2. Create a "training" data set ending December, 2022 and use the ets() function to estimate the following four models:
    a. Multiplicative errors, additive trend, additive seasonal (MAA)
    b. Multiplicative errors, additive trend, multiplicative seasonal (MAM)
    c. Multiplicative errors, additive damped trend, additive seasonal (MAA) (note that you will need to set damped=TRUE in the ets function)
    d. Multiplicative errors, additive damped trend, multiplicative seasonal (MAM)
    e. Report the AIC, AIC_c, and BIC values for the four models – which model fits best?
3. Have R generate forecasts from each of the four models for the 12 months Jan. 2023 – Dec. 2023. Using a "test" set for the same period, report the forecasting accuracy measures for the four models. Does one of the models clearly outperform the others on these forecast accuracy measures.
4. Generate a series of One-Step-Ahead forecasts for the four models, updating the models with an extra month of data at each iteration. That is, use the training set ending Dec. 2022 to forecast Jan. 2023. Re-estimate the models with a training set ending Jan. 2023 to generate forecasts for Feb. 2023, etc. Report the forecasting accuracy measures for the four models. Does one of the models clearly outperform the others on these forecast accuracy measures.
5. Provide a plot of the 'best' One-Step-Ahead forecasts along with the original data.
6. Estimate a final model using the full data set allowing the ets function to choose the best model: ets(data, "ZZZ"). Use this model to provide a forecast of January 2024 Manufacturers Sales with upper and lower 90% confidence limits.

Organize your results in a PDF document to upload to Canvas.