AAEC 4484/ STAT(AAEC) 5484: Applied Economic Forecasting

Your Name Here

Homework #1 - Spring 2025

This assignment aims to enhance your understanding of time series and data patterns. It is intended to be straightforward.

Instructions:

Please ensure that your graphs and visuals have proper titles and axis labels. Recall that you can use `help()` or `?seriesname` in your consoles to get general information on the dataset.

Question 1: Basic Visualization of Time Series Data

i. Create time plots of the following time series: `Bricks` from `aus_production`, `Lynx` from `pelt`, `High` for `AMZN` from `gafa_stock`, `Demand` **for 2014** from `vic_elec`. **Note: In class, we used the `patchwork` package to arrange our plots using `+` and `/`. This package also allows for more control over the arrangement of plots. One such function is `wrap_plots()`. Use this function to arrange your plots in a 2x2 grid.**

ii. Briefly discuss any discernible pattern(s) you noticed in the data.

Question 2: Data Sampling

In class, we explored the idea of drawing a random sample of data. The exercise below offers another practical demonstration.

The `aus_retail` data set contains monthly retail turnover data for various industries and states in Australia. We will pull a random Industry by way of its `Series ID` and explore the data.

i. In the code chunk below, set a seed of your choice to ensure you generate a reproducible draw of the data. Next, use some combination of the `filter()` and `sample()` functions to draw a random sample of the data.

ii. Use the `autoplot()`, `gg_season()`, `gg_subseries()`, and `ACF() %>% autoplot()` functions to explore possible seasonality in your chosen sample.

- Again use the `patchwork` package to arrange your plots as grids. **You are free to organize them however you wish.**
- **It might be useful to change the `lag_max` (how about to 3 years of data?) in the ACF to ensure that you can see a fair bit of the pattern in the correlogram.**

ii. What can you say about the series? Are there any seasonal patterns? Trends?

Question 3: White Noise

The `aus_livestock` series contains data on monthly "Meat production in Australia for human consumption".

i. Using the `filter()` function, extract the number of **Cows and heifers** slaughtered in **Tasmania**. Store this variable as `cows`.

ii. Produce the `autoplot()` of `cows` and its correlogram. **Comment on any pattern noticed in both.** Does this series look like white noise? **Explain your answer.**

iii. Now, using the `difference()` and `mutate()` functions, create a new column, `diff`, that computes the **month-to-month** changes (`lag = 1`) in your `cows` series. Store this new data as `d.cows`.

iv. Produce an `autoplot()` of `diff` along with the associated correlogram. Does the first differenced data now look like white noise? Did differencing remove any potential seasonality in the data? How about any trend? **Recall that a simple yes will not suffice. You will need to explain your conclusion.**

v. Return to the `cows` series and again use the `difference()` and `mutate()` functions to create a new column called `diff12` that computes the **year-on-year** changes (`lag = 12`) in your `cows` series. Store this new data as `d12.cows`.

vi. Produce an `autoplot` of `diff12` along with the associated correlogram.

a. Does this new data, differenced at lag12, now look like white noise? **Recall that a simple yes will not suffice. You will need to explain your conclusion.**

b. Did differencing remove all potential seasonality or trend in the data? If not, how would you solve this? **You are not required to show this. An intelligent answer based on the plots and your observations will suffice.**

Question 4: Gasoline Supplied in the US

Using the following graphics functions: `autoplot()`, `gg_subseries()`, `ACF()`, explore the features of `Barrels` from `us_gasoline`. **Hint: You may want to use the `lag_max` of about 3 years (accounting for the data frequency) in the `ACF()` function to ensure you can see a fair bit of the pattern in the correlogram.**

- Can you spot any seasonality, cyclicity and trend?
- What do you learn about the series?
- What can you say about the seasonal patterns?
- Can you identify any unusual years?