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

Your Name Here

Homework #2 - Spring 2023

The purpose of this assignment is to enhance your understanding of time series and data patterns. It is intended to be rather straightforward and simple.

Instructions:

- **Where necessary, please ensure that your graphs and visuals have proper titles and axes labels.**
- Recall that you can use `help()` or `?seriesname` **in your consoles** to get a general overview of the dataset.

Question 1: Basic Visualization of Time Series Data

i. Create time plots of the following time series: `Bricks` from `aus_production`, `Hare` from `pelt`, Closing prices for `AMZN` from `gafa_stock`, `Demand` from `vic_elec`.

- Please use the `grid.arrange` function from the `gridExtra` package to arrange your plots as a `2 x 2` grid.

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

Question 2: Assessing (Potential) Seasonality

A cool feature of `R` is the ability to draw a "random" sample of your data. In the code chunk that follows, we will pull a random draw of the `aus_retail` data set by selecting a `Series ID` according to our seed. You will need to change the seed to ensure that we both get a different draw of the data.

```
set.seed(12345678) #Change this to your preferred seed
myseries <- aus_retail %>%
  filter(`Series ID` == sample(aus_retail$`Series ID`,1))
```

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

- Please use the `grid.arrange()` function from the `gridExtra` package to arrange your plots. **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 pigs slaughtered in **Victoria** between 1990 & 1999, inclusively. Store this variable as `pigs`. **Along with other necessary conditions, I would like to see you use the `year()` and `%in%` commands to extract the relevant time periods.**

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

iii. Now, using the `difference()` and `mutate()` functions, create a new column, `diff` that computes the **month-to-month** changes (`lag = 1`) in your `pigs` series. Store this new data as `d.pigs`. *I would suggest using the head() command on your `d.pigs` series in the console to ensure that the `diff` column looks as you would expect.*

```
#Remember to remove eval = FALSE to ensure your code runs.
#This code should get you started
_____ <- _____ %>% _____(_____ = difference(_____, lag = 1))
```

iii. 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? **Recall that a simple yes will not suffice. You will need to explain your conclusion.**

iv. Return to the `pigs` 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 `pigs` series. Store this new data as `d12.pigs`. *I would suggest using the `head(n = 14)` command on your `d12.pigs` series in the console to ensure that the `diff12` column looks as you would expect.*

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

a. Does the data, differenced **with lags at the data frequency**, now look like white noise? **Recall that a simple yes will not suffice. You will need to explain your conclusion.**

b. Did differencing remove any potential seasonality or trend in the data? If not, can you think of a way that you would solve this? **You are not required to do this. Just an intelligent answer based on the plots will suffice.**