

Advanced Time Series Analysis

Homework one

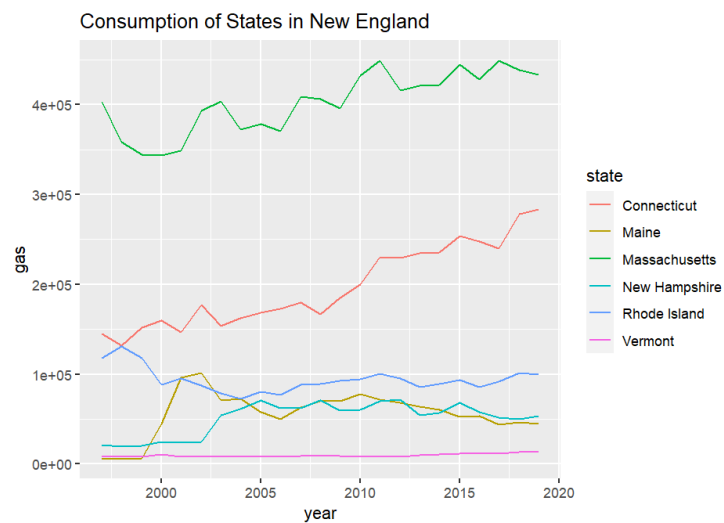
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2.10

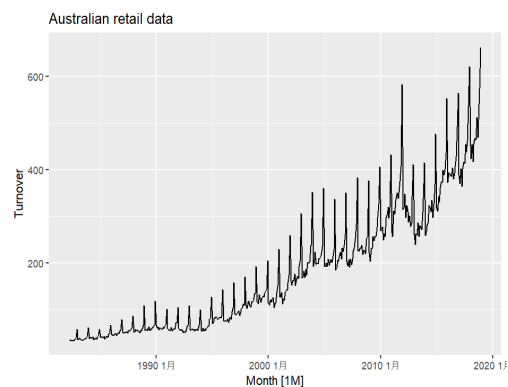
4a. use `install.packages("USgas")` to Install the USgas package

4b. to Create a tsibble: `my_data <- as_tibble(us_total, index=year, key=state)`

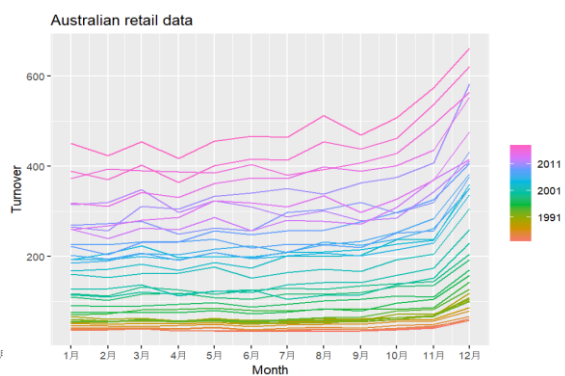
4c. This is a picture of the annual natural gas consumption by state for the New England area.



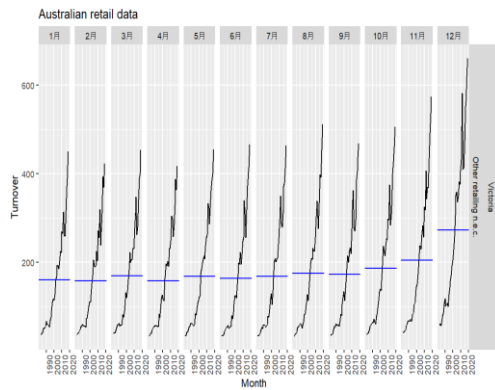
8



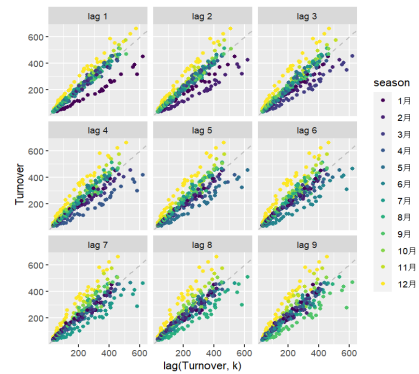
`Autoplot()`



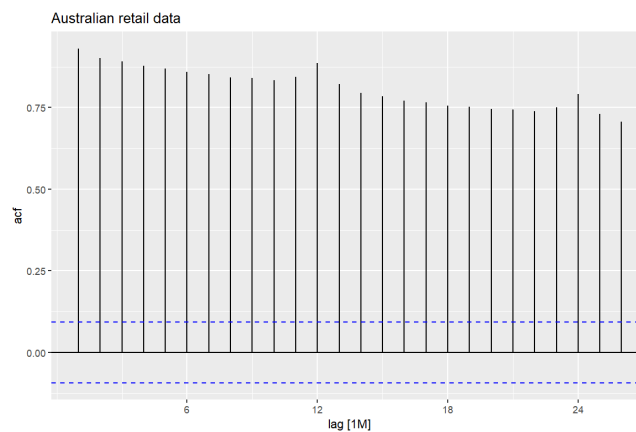
`gg_season()`



gg_subseries()



gg_lag()



Can you spot any seasonality, cyclicity and trend? What do you learn about the series?

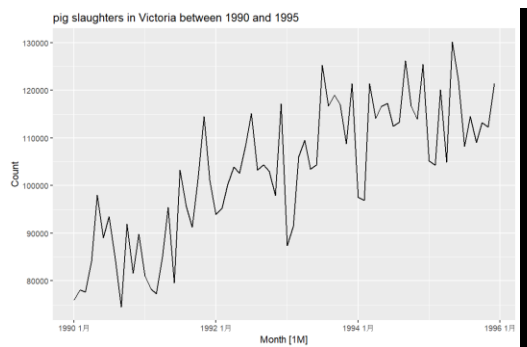
There is an overall upward trend. It can be seen through above pictures that there is a certain seasonality and cyclicity. Retail sales in October, November and December have a slight increase and the overall upward trend has a certain cyclicity.

10.

1C;2A;3D;4B

11.

Use filter() to extract pig slaughters in Victoria between 1990 and 1995. Use autoplot() and ACF() to visualize this data.



Autoplot()



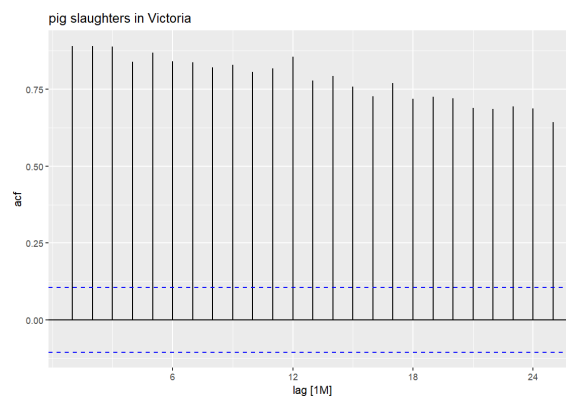
acf()

How do they differ from white noise?

Compared with white noise, it shows a certain upward trend

If a longer period of data is used, what difference does it make to the ACF?

With longer period of data is used, the ACF looks like:



We can see that the autocorrelation is more pronounced

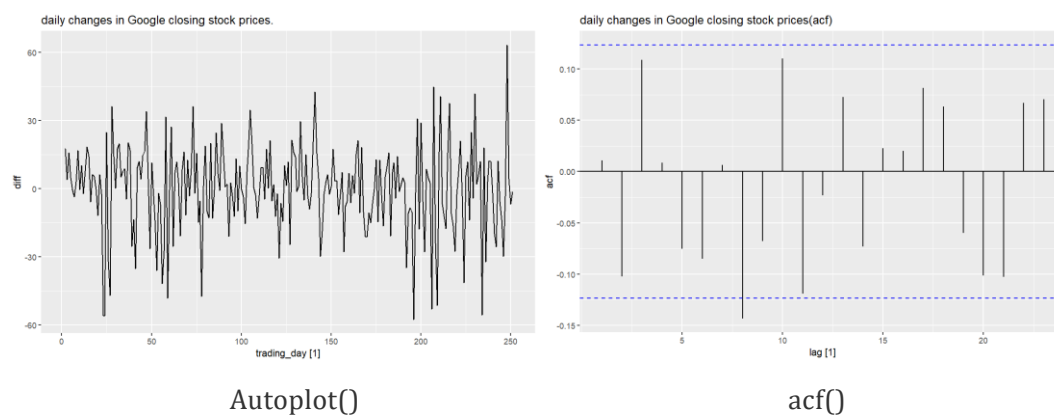
12b Why was it necessary to re-index the tsibble?

To ensure that the data is properly ordered, either chronologically or by some other criterion.

To make it easier to perform operations on the data, such as filtering or aggregating, by making it easier to locate specific rows or groups of rows.

To fix errors or inconsistencies in the existing index, such as duplicate values or missing values.

12c

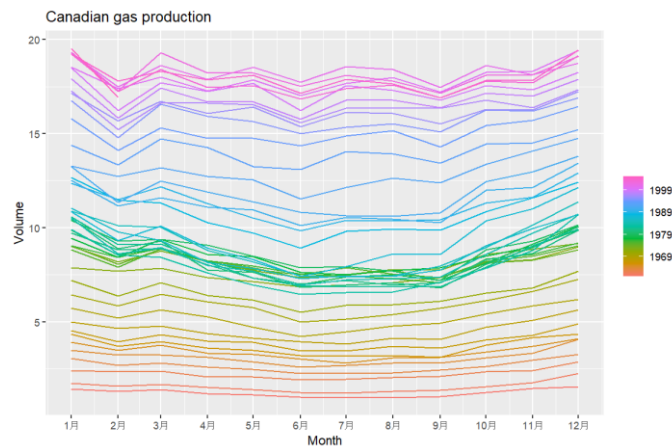


12d Do the changes in the stock prices look like white noise?

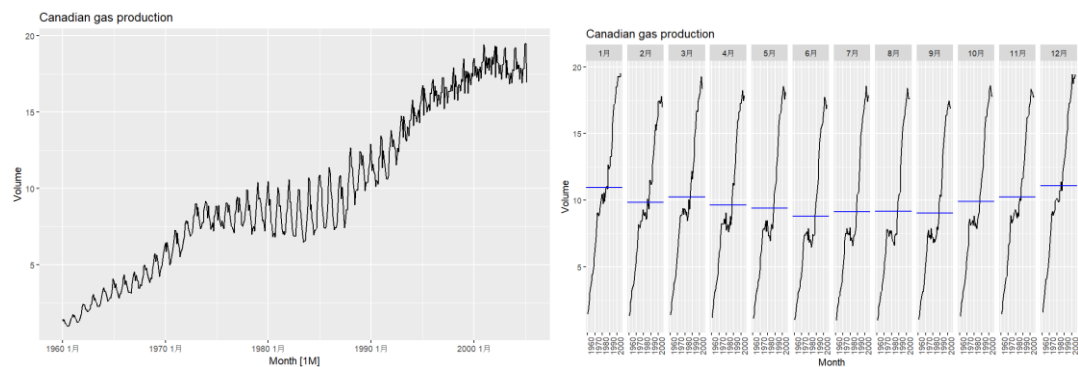
Yes, it does.

3.7

10a look at the effect of the changing seasonality over time



`gg_season()`



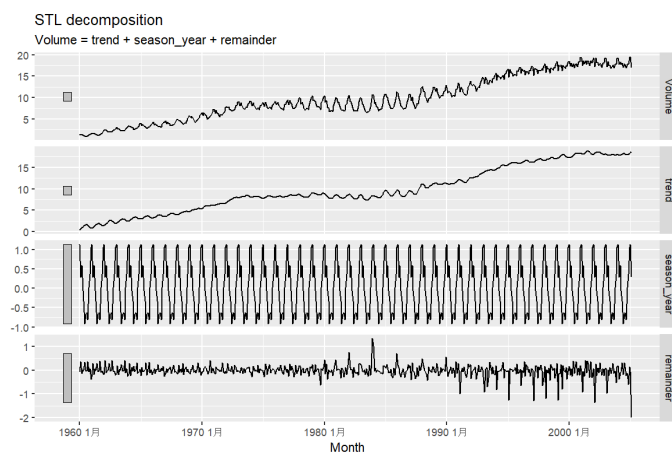
`Autoplot()`

`gg_subseries()`

Throughout the year, gas production shows a trend of first declining and then rising. Mid-year production is lower than at the beginning and end of the year, It is possibly due to changes in the regulation of gas prices.

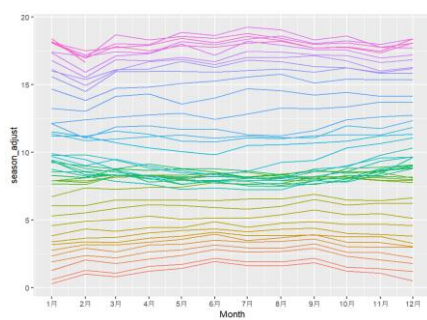
10b

Do an STL decomposition of the data:

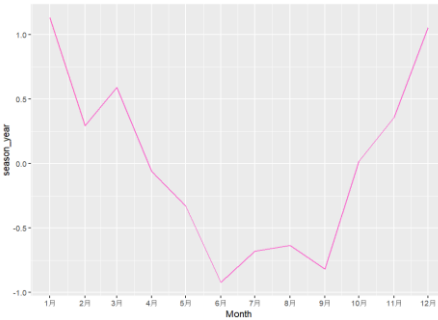


`STL decomposition()`

10c How does the seasonal shape change over time?



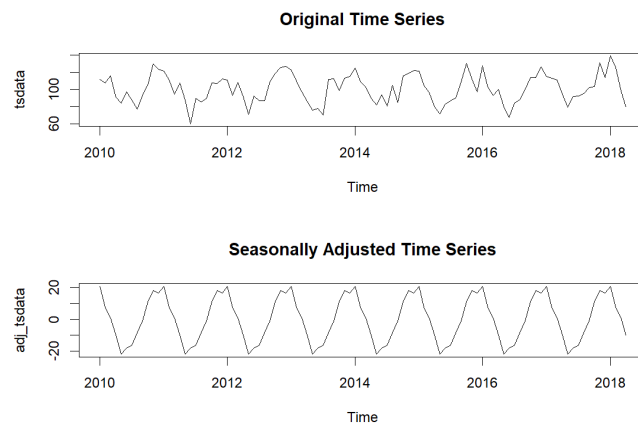
gg_adjust()



gg_year()

The overall trend each year is to decline first and then rise. The overall trend each year is to decline first and then rise. Seasonally adjusted values are rising over time

10d Can you produce a plausible seasonally adjusted series?



In this example, the tsdata is generated using random normal noise with a mean of 100 and a standard deviation of 10, and a seasonal component added by cosine function. The stl function is used to perform seasonal adjustment on the tsdata by removing the seasonal component. The resulting seasonally adjusted series is stored in the adj_tsdata object. Finally, the original and adjusted time series are plotted and compared.