

Lab 2: Trend Seasonality and Sample Autocorrelation

Questions

Dataset “dataTempPG.csv”

1. Features of the data

Read the data into R using `read.csv()`.

```
df1 = read.csv("dataTempPG.csv")
```

Extract the “Summer” column and convert it into a time series in R.

```
summer_data = df1$Summer

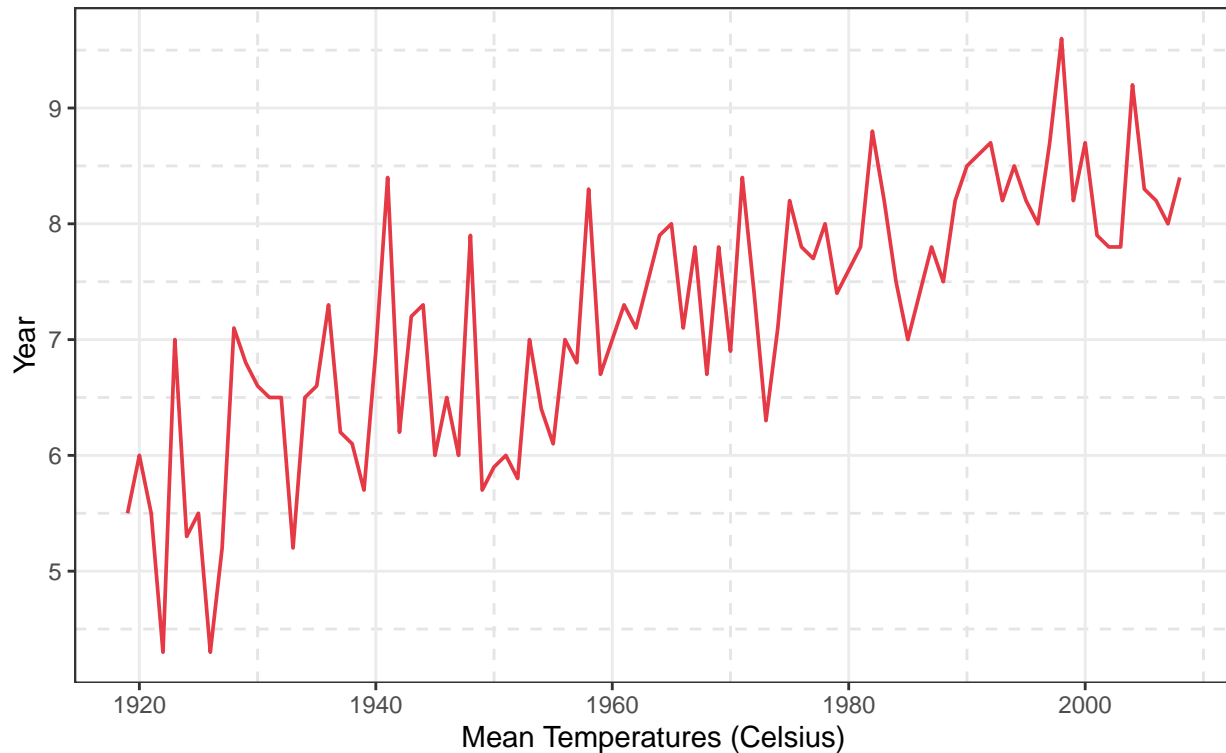
# the data are yearly starting in 1919
summer_series = ts(data = summer_data,
                    start = c(1919),
                    frequency = 1)
```

Plot the time series with appropriate labels.

```
p1data = fortify.zoo(summer_series)
p1 <- ggplot(p1data, aes(x = Index, y = summer_series)) +
  geom_line(color = "#E63946", linewidth = 0.65) +
  labs(
    title = "Summer Temperatures at Prince George, BC",
    subtitle = "Measured in homogenized daily minimum temperatures (C)",
    x = "Mean Temperatures (Celsius)",
    y = "Year"
  ) + theme_bw() +
  theme(panel.grid.minor = element_line(
    color = "grey90",
    linetype = "dashed",
    linewidth = 0.5
  ))
print(p1)
```

Summer Temperatures at Prince George, BC

Measured in homogenized daily minimum temperatures (C)



Comment on the main features of this series (e.g., seasonality, trend).

There doesn't appear to be much seasonality in the data. This makes sense, considering we are already isolating for a season (summer.) However, there does seem to be an increasing (positive) trend to the data.

2. Sample Autocorrelation

- Use `acf()` to create the autocorrelation function for the mean summer temperature data.
- Comment on the behavior of the sample autocorrelation function.

3. Smoothing

- Use `window()` to extract the portion of the time series between 1968 and 2008.
- Plot this recent record of the data.
- Use `rollmean()` with a moving average parameter of `k=5` to add the smoothed series to the plot.
- Add a legend to your plot.

Dataset "LakeLevels.csv"

1. Sample Autocorrelation Function

- Read the data into R and convert it into a time series.
- Use `acf()` to create the sample autocorrelation function for the lake levels.
- Comment on the behavior of this autocorrelation function.

2. Decomposition (Additive Model)

- Use `decompose()` to decompose the time series into trend, seasonal component, and error (additive model).

- Plot the trend, seasonal component, and error.

3. **Decomposition (Loess Method)**

- Use `stl()` with `s.window` set to “periodic” for decomposition.
- Plot the trend, seasonal component, and error using the loess method.