Course Outline: Time Series Data in R

Harrison Brown

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Contents

Chapter 1

Welcome

Welcome to the course outline for *Time Series Data in R*! This course offers methods and workflows for analyzing and interpreting time series data, an overview of when, why, and how to use time series data, and various utilities and packages in R that are beneficial to analysts.

By the end of this course, students will have the skills to:

- Interpret and understand time series plots
- Import ts data to create and manipulate `ts` objects from the `stats` package
- Understand why time series data is fundamentally different than non-ts data.
- Analyze time series data with plots
- ?Intro to Wavelet analysis?

Chapter 2

Introduction to time series data

2.1 What is a time series

- Sampled at equi-spaced points in time

2.2 Stationary vs Non-Stationary series

Non-stationary time series are defined by:

- Time-dependent Mean
- Time-dependent Variance
- Time-dependent Autocorrelation/Covariance

2.3 Dickey-Fuller Test of Stationarity

Chapter 3

Creating and Manipulating Time Series

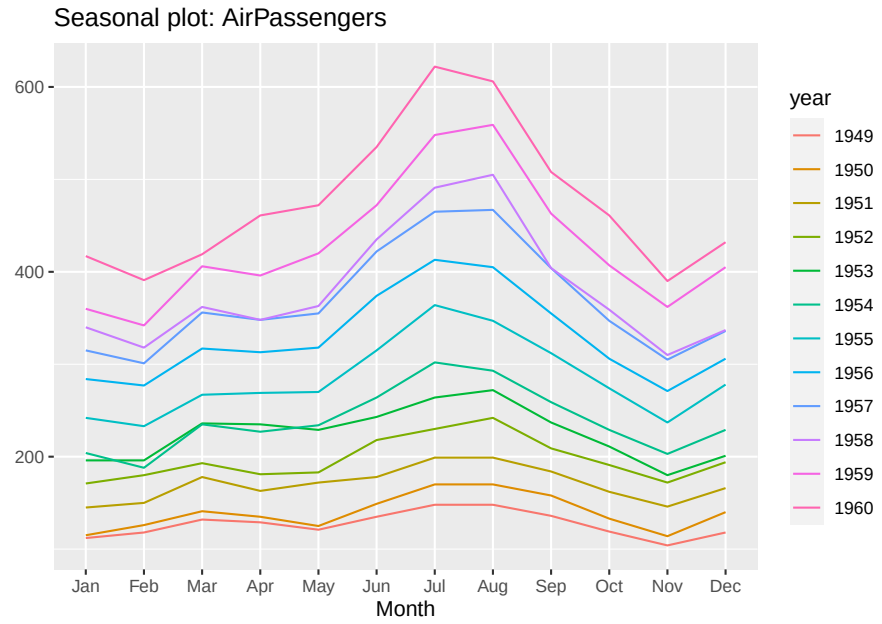
3.1 `ts` Class

3.2 Creating a `ts.plot()`

3.2.1 Interpreting Plots

```
ggseasonplot(x = AirPassengers)
```

3.2.2 Seasonality Plot



3.2.3 Polar Seasonality Plot

3.3 Trends and Seasons

3.3.1 Decomposition

3.3.2 De-trending Data

Chapter 4

Lags and Autocorrelation

4.1 Lag

4.2 Autocorrelation

Chapter 5

Footnotes and citations

5.1 Footnotes

Footnotes are put inside the square brackets after a caret `^[]`. Like this one [1].

5.2 Citations

Reference items in your bibliography file(s) using `@key`.

For example, we are using the **bookdown** package [Xie, 2022] (check out the last code chunk in index.Rmd to see how this citation key was added) in this sample book, which was built on top of R Markdown and **knitr** [Xie, 2015] (this citation was added manually in an external file book.bib). Note that the `.bib` files need to be listed in the index.Rmd with the YAML `bibliography` key.

The RStudio Visual Markdown Editor can also make it easier to insert citations: https://rstudio.github.io/visual-markdown-editing/#/citations

[1] This is a footnote.

Bibliography

Yihui Xie. *Dynamic Documents with R and knitr*. Chapman and Hall/CRC, Boca Raton, Florida, 2nd edition, 2015. URL http://yihui.org/knitr/. ISBN 978-1498716963.

Yihui Xie. *bookdown: Authoring Books and Technical Documents with R Markdown*, 2022. URL https://CRAN.R-project.org/package=bookdown. R package version 0.25.