Course Outline: Time Series Data in R

Harrison Brown

2022-05-06

Contents

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 1

Introduction to time series data

1.1 Lesson: What is Time Series Data

- Learning Objective: Learner will be able to understand why and how TS-data differs from non-temporal data
- LO: What kinds of inferences and results can be obtained from TS-data
- LO: Converting to and from time-based data formats, such as `numeric`, `Date`, and `POSIXct` classes
  - Functions: `as.Date()`, `lubridate::`, etc.

1.2 Lesson: How to Interpret Time Series Data

- LO: Learner will understand how to interpret attributes of a basic time series plot
- LO: "Signal and Noise" in the context of TS data
- Introduction to Stationarity: Most real-world data are not stationary and require additional steps to work with

1.3 Lesson: Components of Time Series Data

Chapter 2

Creating and Manipulating Time Series

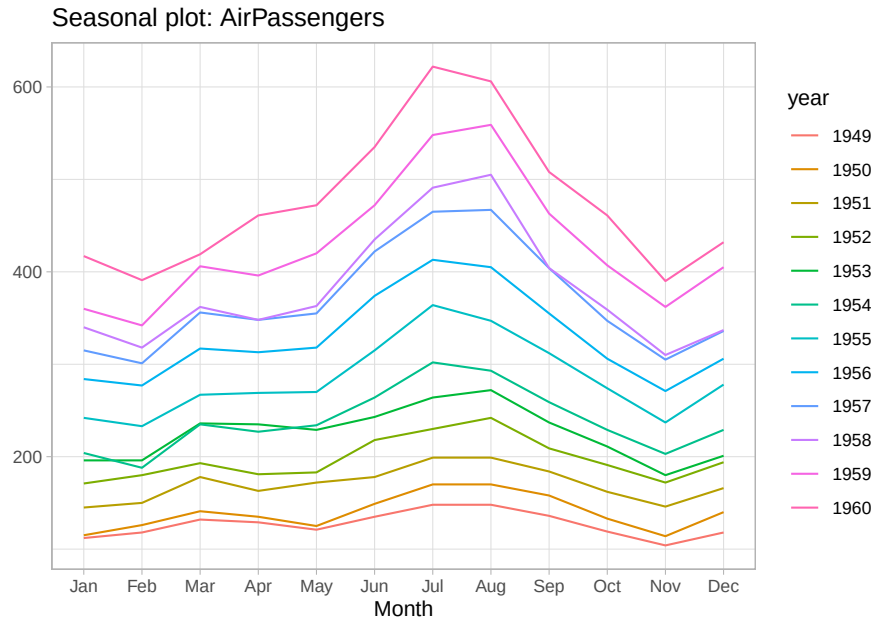
2.1 `ts` Class

2.2 Creating a `ts.plot()`

2.2.1 Interpreting Plots

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

2.2.2 Seasonality Plot



2.2.3 Polar Seasonality Plot

2.3 Trends and Seasons

2.3.1 Decomposition

2.3.2 De-trending Data

Chapter 3

Rolling and Expanding Windows

3.1 Rolling Window

- Moving lower and upper bound

3.1.1 Data

3.1.2 Calculating a Rolling Window

Chapter 4

Introduction to Forecasting in R

4.1 Methods for Forecasting

4.1.1 Exponential Smoothing

Chapter 5

Final Exercise

The final exercise for this course involves performing a time series analysis on real-world sales data. You'll go step-by-step from reading the data and checking attributes like stationarity, to normalizing, decomposing, adjusting, and interpreting the results.

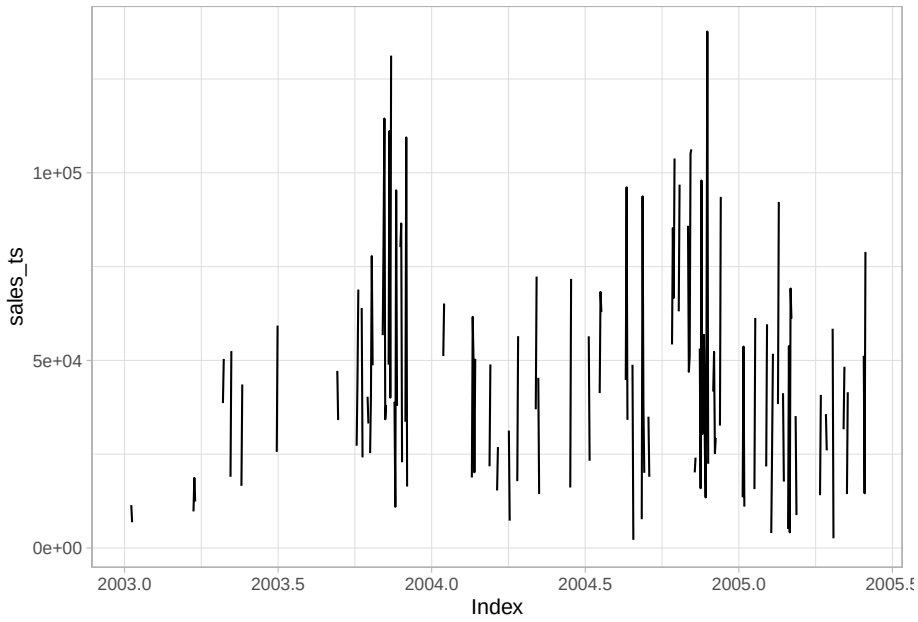
5.1 Importing the Data

5.2 Visual Check

```
sales_ts <- tsbox::ts_ts(sales)
```

```
## [time]: 'date' [value]: 'sales'
```

```
autoplot.zoo(sales_ts)
```



5.2.1 Quarterly summary