1.1 - The Nature of Time Series Data

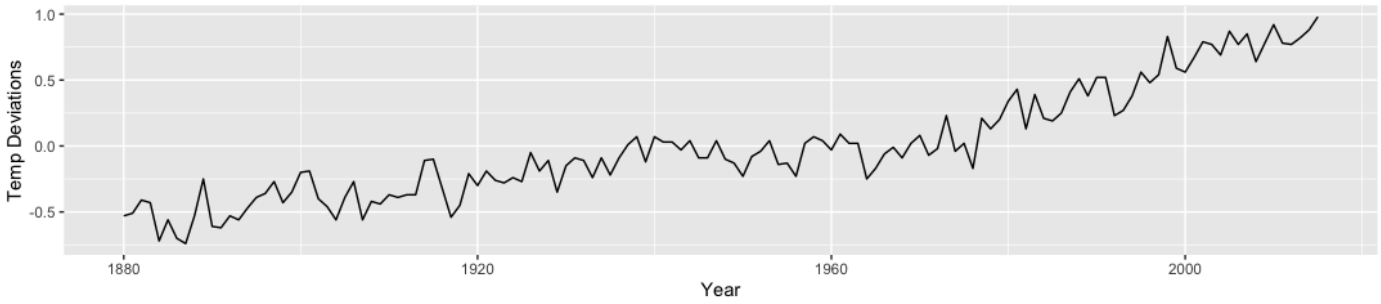
Time series data is useful in several applications. Here we will discuss notable examples from the textbook.

Global Warming

This example is notable because it gives a preview of how time series data is not always a "direct" source, such as monthly average temperatures or daily closing stock prices. Here our data are relative to some "anchor" point, making finding a pattern easier compared to raw temperature data.

```
library(tidyverse)
library(ggfortify)

autoplot(globtempl, xlab = "Year", ylab = "Temp Deviations")
```



Returns on the Dow Jones Industrial Average

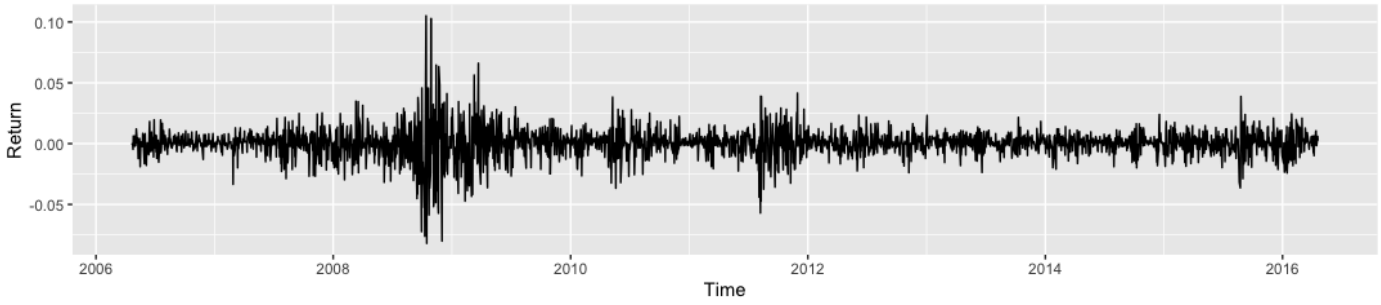
This example follows from the previous one. Instead of plotting the DJIA directly, we first perform the following calculations to get data we want to plot:

$$\text{Return}_t = r_t = \frac{x_t - x_{t-1}}{x_{t-1}}$$

$$1 + r_t = \frac{x_t}{x_{t-1}} \implies \ln(1 + r_t) = \ln(\frac{x_t}{x_{t-1}}) = \ln(x_t) - \ln(x_{t-1}) \approx r_t$$

```
library(xts)

djiR<-diff(log(djia$Close))[-1]
autoplot(djiR, xlab = "Time", ylab = "Return")
```



fMRI Imaging

Here we have an example of a multivariate time series, where we work with vectors instead of single-variable data.

```
autoplot(fmri1[,2:5], facets = FALSE, ylab="BOLD Signal Intensity")
autoplot(fmri1[,6:9], facets= FALSE, ylab="BOLD Signal Intensity")
```

Relevant Problems

Chapter 1 Homework Problems > Problem 1.1