

Visualizing Patterns over Time

Statistics 4868/6610 Data Visualization

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Introduction

Today we are going to discuss the presentation of time series data.

More [R](#).

Introduction to [Inkscape](#).

Or [Adobe Illustrator](#) if you have access to it.

Questions about R

Does anyone have any particular questions about R?

How to **run** it?

How to **create** a script? How to **save** a script?

How to **install** a library? How to **load** a library?

```
install.packages("ggplot2")
```

```
library(ggplot2)
```

```
read.csv("****.csv" )
```

Questions about R

Do any undergraduate or graduate students have any particular questions about the following in R?

R Presentation

R Markdown

Both run and include the results from R in the document and can be saved in pdf, html, and posted to RPubS.

I like notebooks!

- [jupyter](#)
- [ipython](#)
- [beaker](#)
- [zeppelin](#)

R Cheatsheets

- [RStudio Cheatsheets](#)

For the IDE, Shiny, Data Visualization, Package Development, Data Wrangling, R Markdown.

- [Functions for Time Series Analysis](#)

Questions about tableau

Does anyone have any particular questions about tableau?

Try to watch a training video with the provided data.

Last time I mentioned TreeMaps

Try the [TreeMap](#) tutorial.

Time Series Data

When working with Time Series Data it is useful to consider if the data is **quantitative discrete** or **quantitative continuous**.

Discrete Time Series Data are collected at specific points in time on a regular basis.

Continuous Time Series Data is sampled, usually at regular intervals, over time, from a continuous source.

Discrete Time Series Data

Discrete Time Series Data is often presented using **bar graphs** where the x-axis is time.

Sometime stacked bar graphs are used to subset the data within the time period, day/month/year.

This is how graphs are often presented in the Wall Street Journal and other newspapers.

Continuous Time Series Data

Continuous Time Series Data is often presented using **time plots** where the x-axis is time.

Sometime multiple time series are presented on a single time plot. Sometime with different scales, right and left.

The dots are connected!

This is how graphs are often presented in the Wall Street Journal and other newspapers.

Examples

[HDX](#)

[gallop](#)

[FRED](#) [GeoFRED](#)

Time Series

What to look for in time series data.

- trends
- cyclical patterns
- seasonal patterns
- irregularity (error, white noise)
- homoskedasticity (stationarity)
- heteroskedasticity (transformation, log)

Time Series

Basic models

- Additive model

$$Y_t = T_t + S_t + I_t$$

- Multiplicative model

$$Y_t = T_t * S_t * I_t$$

What would a **log** transformation do to the **multiplicative model**?

In R

```
decompose( )
```

Time Series

What is [autocorrelation](#)?

What is [crosscorrelation](#)?

Time Series

What is an [autoregression model](#)?

Time Series Books online

- [Quick-R Time Series and Forecasting](#)
- [A little book of R for Time Series](#)
- [Time Series Analysis with R](#)
- [Time Series Analysis with R - Part I](#)
- [Time Series Analysis and Its Applications](#)
- [Financial Time Series Plotting](#)
- [fpp](#)
- [ref card](#)

InkScape

Try out [Inkscape](#) to add description to the plot and the Source.

Not as easy as it looks!

Try it.

Slide With R Code

From the [Quick-R](#) website.

[Advanced Graphs](#)

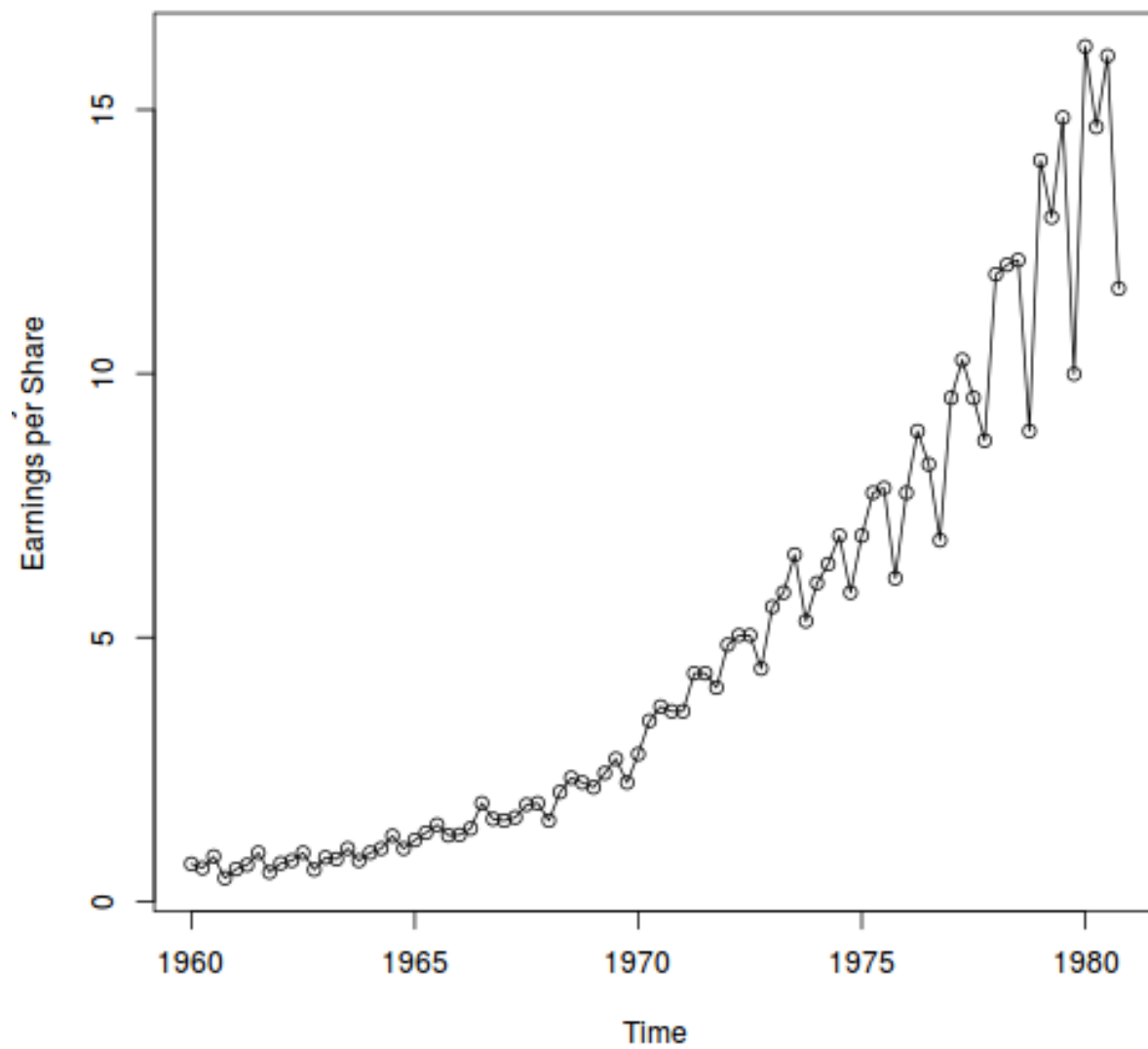
Try some plots using [ggplot2](#)

ASTSA

From [Shumary and Stoffer](#)

```
library(astsa)

plot(jj, type="o", ylab="Quarterly
      Earnings per Share")
```



ASTSA

```
plot(log(jj), type="o", ylab="Quarterly  
Earnings per Share")
```

