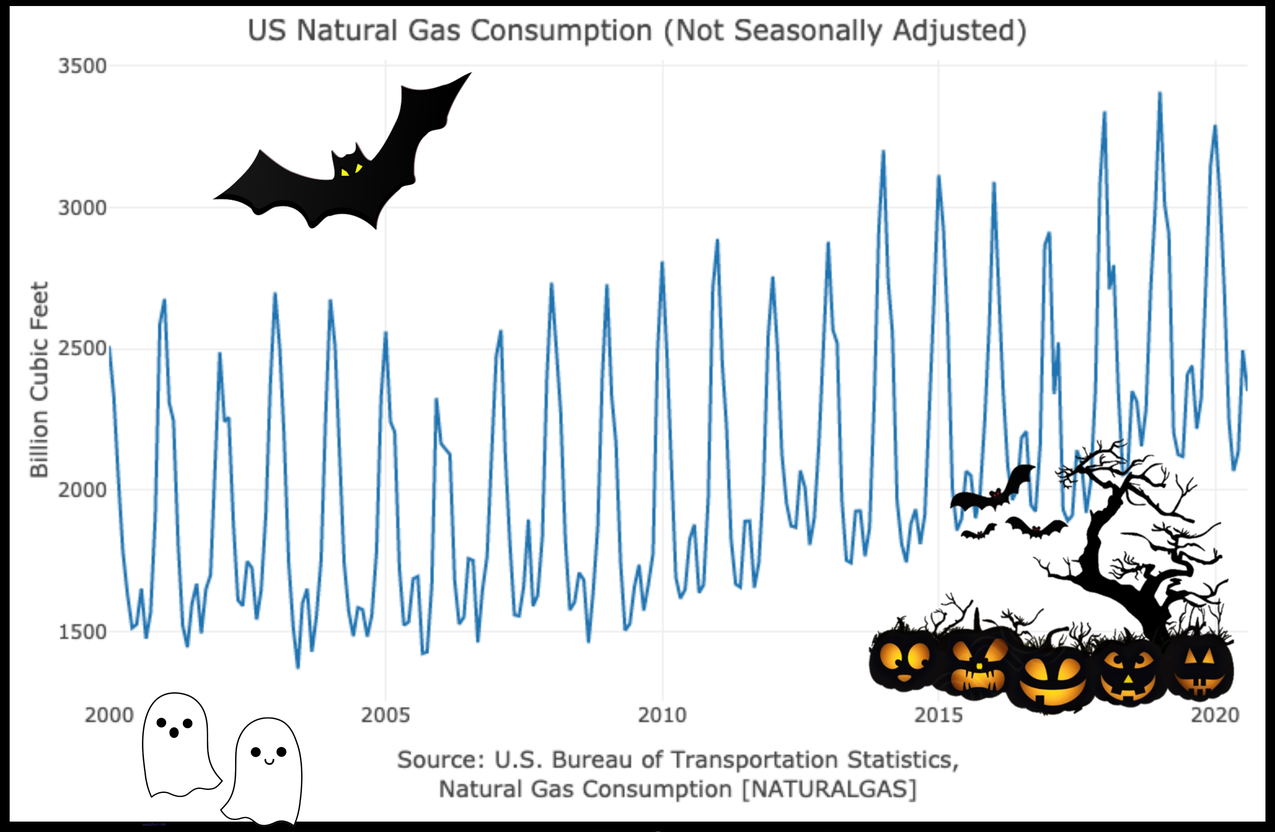
Halloween Time Series Workshop



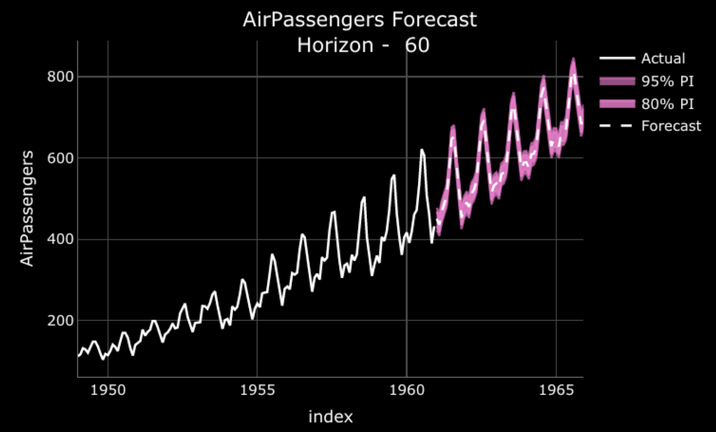
Bay Area useR Group Meetup

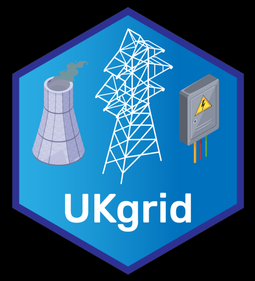
Rami Krispin

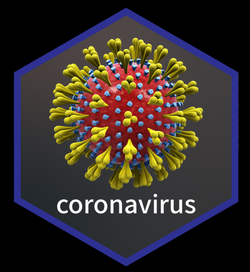
October 31, 2020

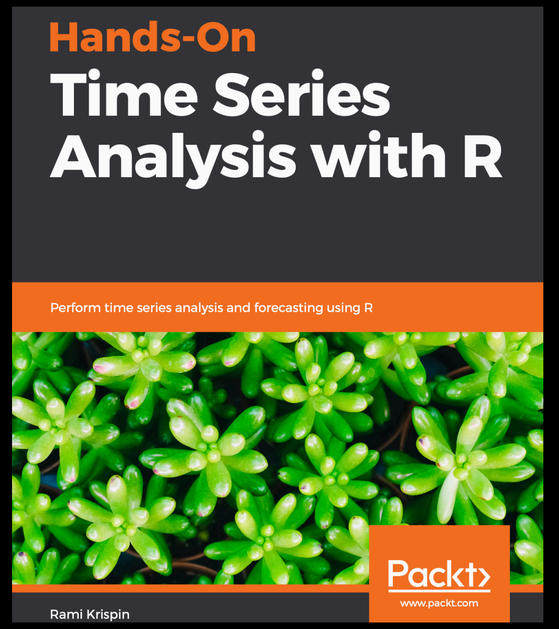
Introduction

- Data scientist
- Love R, stats, time series and data
- Author of “Hands On Time Series Analysis with R”
- Author of several R packages such as the TSstudio, coronavirus, UKgrid, USgrid, etc.









Agenda

- Introduction
- Time Series Objects
- Plotting Time Series Objects
- Decomposition of Time Series
- Seasonal Analysis
- Correlation Analysis

Time Series Analysis Workflow

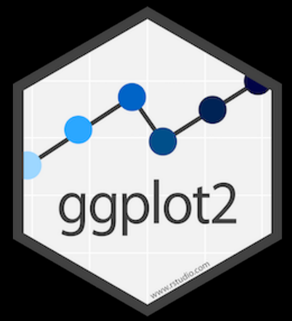
Data Collection

Data Prep

Descriptive Analysis

Predictive Analysis

Reporting



Why Time Series Analysis?

- One of the most common format of data
- Help us to make better decisions
- Reduce uncertainty and help to mitigate risks
- Used in most fields of science - econ, fin, physics, astronomy, etc.

Why Time Series Analysis with R?

- Vast amount of applications
- https://cran.r-project.org/web/views/TimeSeries.html

Goal of Time Series Descriptive Analysis

- Help us to achieve optimization
- Learn from past event
- Extract insights from the data
- Is the base for predictive analysis


The Future?
LIGHTYEAR
Time Series Everywhere

Time Series Objects

Time Series Object

- A sequence of observations that were captured over time
- Each observation mapped to a unique timestamp (index)
- Two type of time series:
    - Regular time series - the series timestamp is equally spaced
    - Irregular time series - the series timestamp is not equally spaced

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Time Series Objects in R

- There are many!
- ts - R core time series object, part to the stats package eco-system
- zoo/xts - advanced time series object, table alike, main usage finance
- tsibble - tidy time series format, fairly new

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Demo

Decomposition Time Series Object

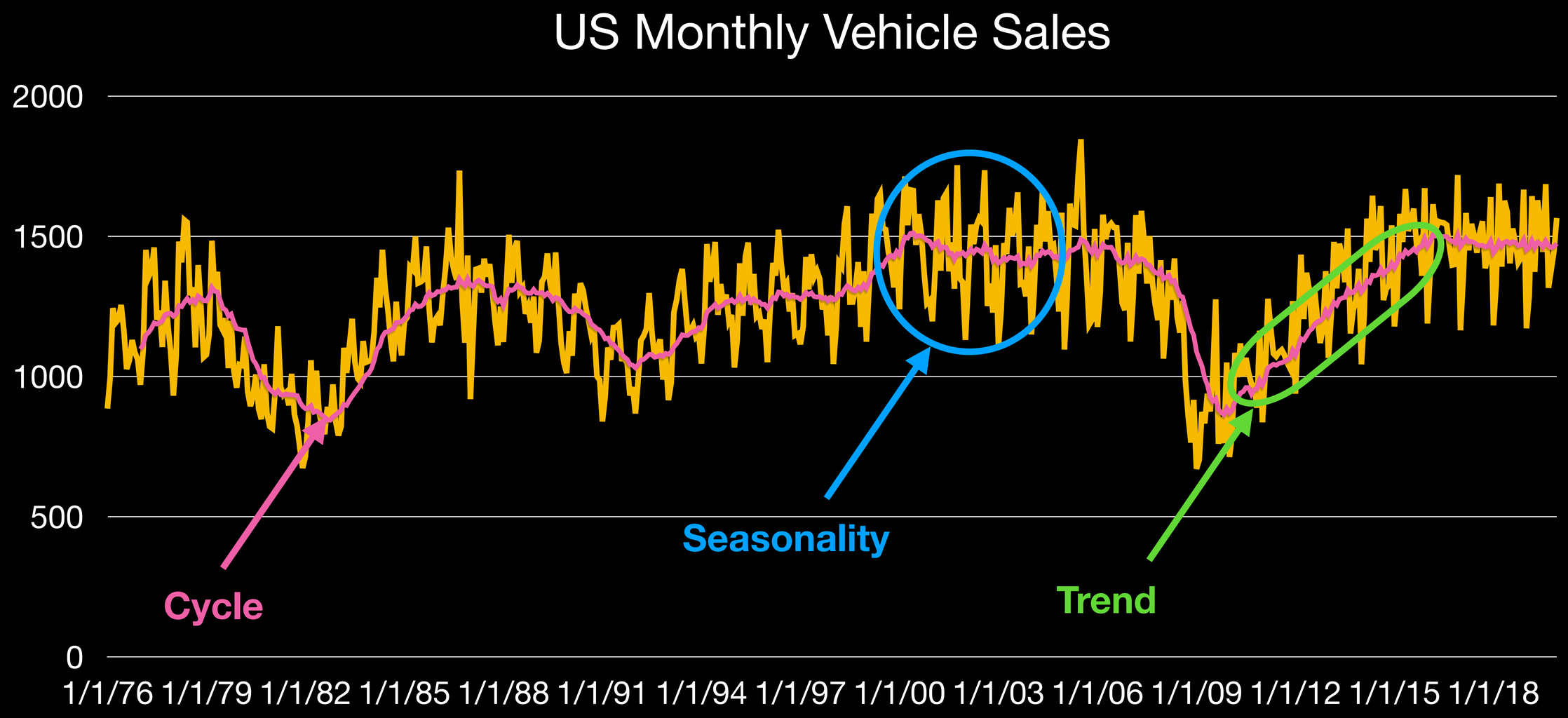
Some Theory Before Jumping to the Demo

Decomposition Time Series Object

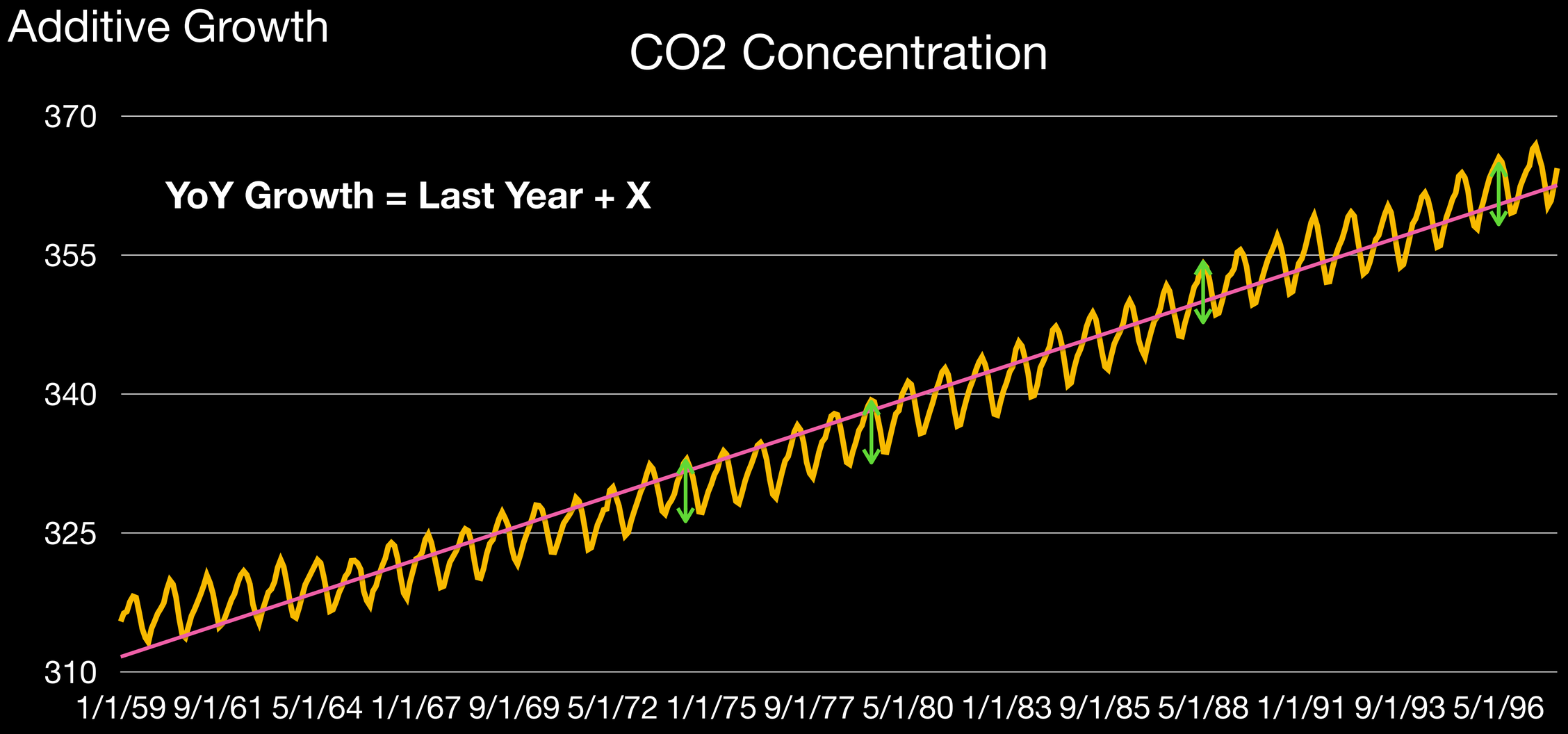
Time series components:

- Structural patterns
  - Trend
  - Cycle
  - Seasonal
- Non-Structural patterns

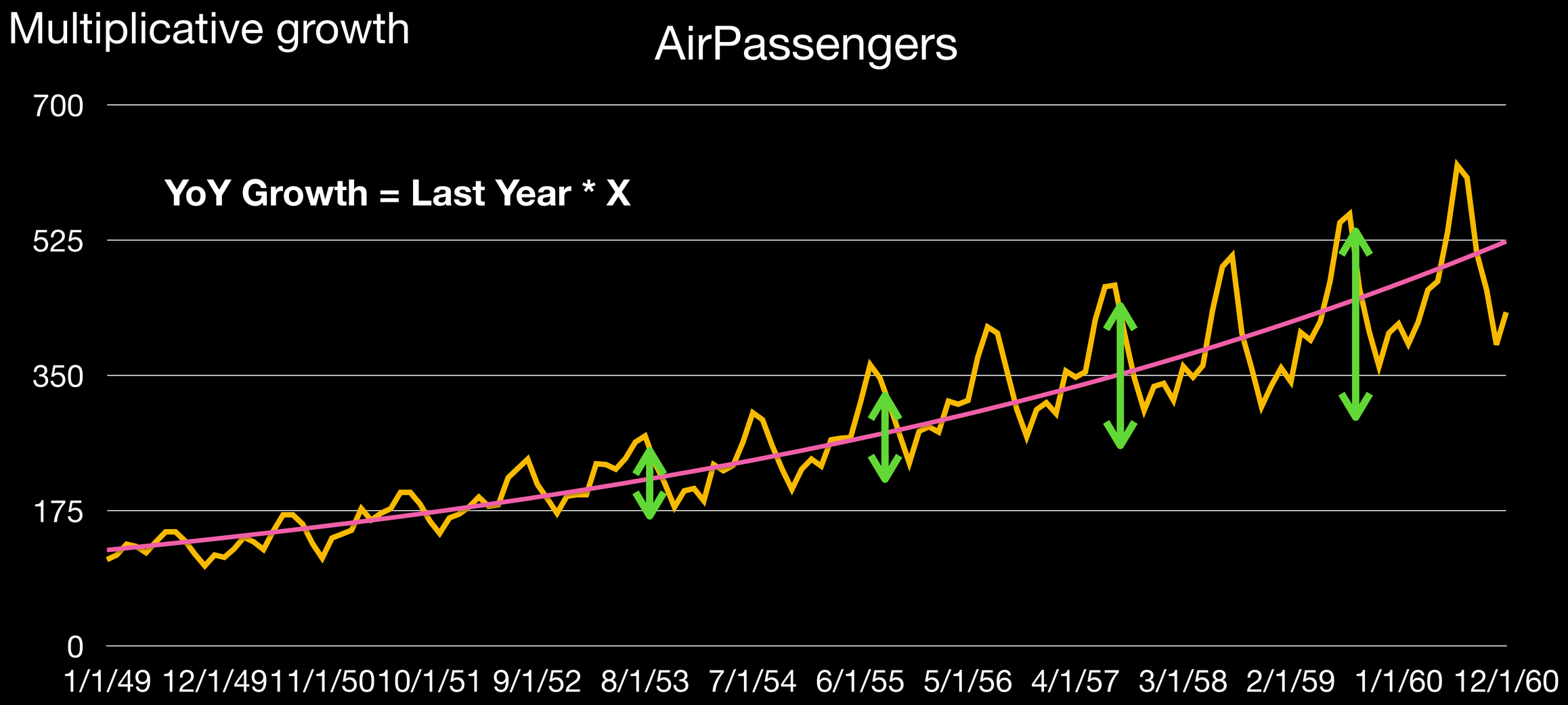
Decomposition Time Series Object



Decomposition Time Series Object



Decomposition Time Series Object



Decomposition Time Series Object

Additive: Y = Seasonal + Trend + Cycle + Irregular

Multiplicative: Y = Seasonal x Trend x Cycle x Irregular

Decomposition Time Series Object

Additive: Y = Seasonal + Trend + Irregular

Multiplicative: Y = Seasonal x Trend x Irregular

Additive: log(Y) = log(Seasonal) + log(Trend) + log(Irregular)

Demo

Resources

- Forecasting: Principles and Practice, Hyndman & Athanasopoulos
    - Fable version: Online,
    - Forecast version: Online, Amazon
- Time Series Analysis and Its Applications, Shumway & Stoffer
    - Online, Amazon
- Hands-On Time Series Analysis with R, Rami Krispin, Amazon
- Practical Time Series Forecasting with R, Shmueli & Lichtendahl, Amazon

Questions?

Thank You!