INTRODUCTION TO TIME SERIES FORECASTING WITH R

HOUSEKEEPING

- Let's connect on LinkedIn:
  - https://www.linkedin.com/in/davelanger/
- All data and code is available from the GitHub repo:
  - https://github.com/EasyD/IntroTimeSeriesForecasting
- Get more goodness on my blog:
  - https://www.daveondata.com
- And more goodness via my talks:
  - https://www.youtube.com/playlist?list=PLTJTBoU5HOCTGwOdA9N_iIMFPLmc-6-Gk

EXPECTATION SETTING

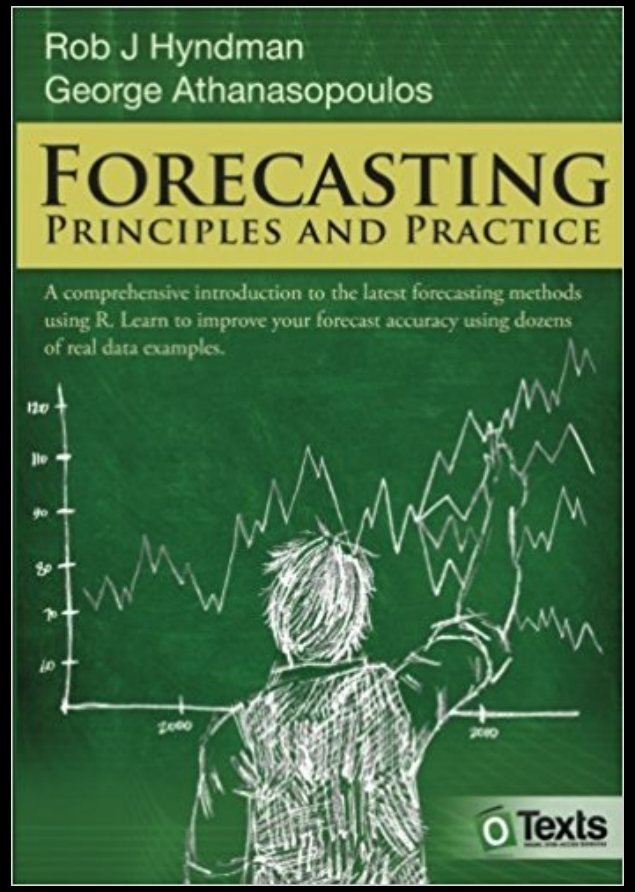
- Focus will be on univariate time series models.

- This series will practice-heavy, not theory-heavy:
  - Minimal mathematics.
  - Preference for “black box” techniques.
  - Evaluating forecast accuracy.

- Topics to be covered:
  - Evaluation metrics for forecasting models.
  - Analysis of univariate time series data.
  - Exponential Smoothing Models
  - ARIMA models
  - Non-parametric machine learning models (e.g., Random Forests) for univariate time series data.

RESOURCES

- We will leverage the *xts* and *forecast* packages extensively.
- Great book on the subject:
  - Latest text also free online at https://www.otexts.org/fpp
- The data used in this tutorial:
  - https://www.kaggle.com/nsidcorg/daily-sea-ice-extent-data



FORECASTING MODELS

- You can think of forecasting as an umbrella term for three types of models.
- Explanatory models:
  - Forecasting models that predict the variable of interest (e.g., daily closing stock price) based on 1 or more predictor features (e.g., national GDP, unemployment rates, etc.).
- Time series models:
  - Forecasting models that only leverage past values (e.g., daily closing stock prices) of the variable of interest. No external data (e.g., national GDP) is used in the model.
- Dynamic regression models:
  - Combination of explanatory and time series models
  - Other names – panel data models, longitudinal models, and linear system models.

EXAMPLES

- The following are examples of univariate time series forecasting models:
  - The HR department would like to forecast employee attrition to ensure recruitment efforts better align to employment levels.
  - A supply chain manager would like to forecast supply of raw materials to assist in reducing sourcing costs by purchasing when supply is plentiful.
  - The IT department would like to forecast demand on the IT infrastructure to assist in optimizing the use of the cloud.

EVALUATION

- Accurate forecasting is very difficult to achieve in practice.
- Understanding, and communicating, the uncertainty in forecasting models is critical.
- We will leverage the following tools to gain this understanding:
  - Evaluation metrics – Mean Absolute Error (MAE) & Root Mean Squared Error (RMSE).
  - Forecasting intervals.