Statistics 5350/7110
Forecasting Methods for Management

Professor Stine

Welcome...

- Syllabus
  - Book and software
  - Lecture sequence follows the textbook
  - Requirements: assignments and exams
  - Canvas
- Software
  - Installing R and R-studio
  - Time series functions: astsa
  - Data
- Examples of time series
  - Univariate and multivariate
  - Business: Financial (stock returns) and general (product sales)
  - Science: global temperature
  - Biomed: fMRI

Course Topics

- Follow textbook presentation...
- Smoothing
  - Nonparametric estimates of smooth functions
  - Decomposition of a time series
- Regression analysis
  - Fundamental, interpretable predictive model
  - Assumptions and diagnostics
- ARIMA models
  - The polynomials of time series analysis
  - Forecast a time series based on its own history
  - Connection to regression analysis
- Frequency-domain analysis
  - Another way to look at dependence in a time series
  - Periodic functions

Syllabus

- Things to notice...
- Dates for lectures
  - The course follows the Penn calendar rather than the MBA calendar.
- Exams
  - Midterm and final
- Assignments
  - Roughly every two weeks
  - Printed copy is due in class at scheduled date
  - Focus on applications of the methods, often beyond what we cover in class
- Attendance policy
  - You need to be here
  - Recorded lectures are not routinely available

Software

- R and R-studio
  - Appendix A in the textbook

    Textbook includes instructions on installing the software if you run into a problem when we do this during class
  - Freely available to install on windows or mac; links at the textbook web site
  - Google or ask ChatGPT how to “install R”
  - Google or ask ChatGPT how to “install R-studio”
- Install supplemental libraries
  - Launch R-studio
  - Install libraries: astsa and ggplot2
- Basic R
  - read-eval-print interpreter
  - vectors and time series
  - functions, commands
  - graphics: text uses standard R, we’ll occasionally add ggplot here and there

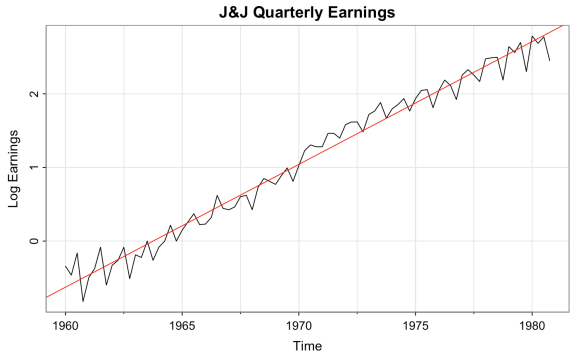
Examples

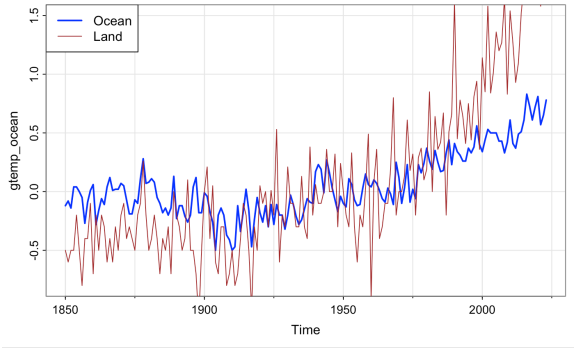
Text, §1.2

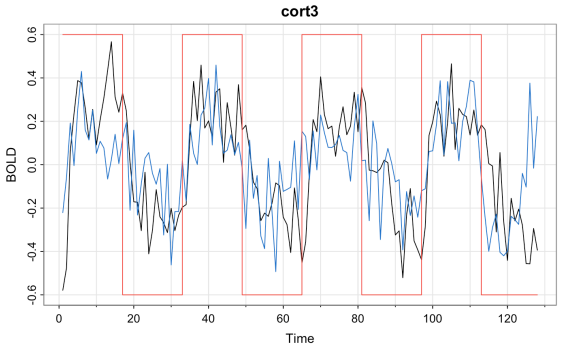
- Example calculations are in the R notebook for this lecture:
  - lecture_01.Rmd

- R commands
  - Basic R, without the use of an auxiliary package
  - The astsa package that accompanies the textbook

- Examples of time series
  - Plot options
  - J&J Earnings
  - Global temperatures
  - fMRI signals







An Assignment

- Before the next class...

- Solve the Exercises listed in Appendix A.4 of the textbook
  - These exercises illustrate basic R commands
  - Not going to collect this one

What next?

- Basic models and statistical assumptions for time series
  - Simulation methods
  - Textbook, §1.3

- Terminology
  - White noise
  - Random walk
  - Smoothing
  - Autoregression