

# ECON 424/CFRM 462

## Introduction to Computational Finance and Financial Econometrics

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# About Me

- Robert Richards Chaired Professor of Economics
- Adjunct Professor of Finance (Foster Business School), Adjunct Professor of Statistics, Adjunct Professor of Applied Mathematics
- Co-Director of UW MS Degree Program in Computational Finance and Risk Management
- UC Berkeley undergrad: Econ and Stat double major
- Yale Ph.D. with emphasis in Econometrics and Finance
- Co-author of *Modeling Financial Time Series with S-PLUS*, Springer-Verlag and writing *Modeling Financial Time Series with R*, to be published by Springer-Verlag, October 2014
- Consultant to BlackRock Alternative Advisors (7 years)

# Course Material on the Web

- ECON 424 Class Webpage:  
[faculty.washington.edu/ezivot/econ424/econ424.htm](http://faculty.washington.edu/ezivot/econ424/econ424.htm)
  - » Official course page
  - » Lecture notes, class slides and R programs
- ECON 424/CFRM 462 Canvas site  
[canvas.uw.edu](http://canvas.uw.edu)
  - » Homework uploads
  - » Discussion boards
  - » Videos
- Course material will be mirrored on Canvas site.
- Coursera course (online videos)
  - » [www.coursera.org](http://www.coursera.org)

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# Add Codes

- If you are not registered for econ 424/CFRM 462 but wish to get into the course, you must sign up on an add code request sheet
- Advisors will check prerequisites, major, graduation year etc and tell me which students can be let into the course
- I will cap enrollment at room capacity

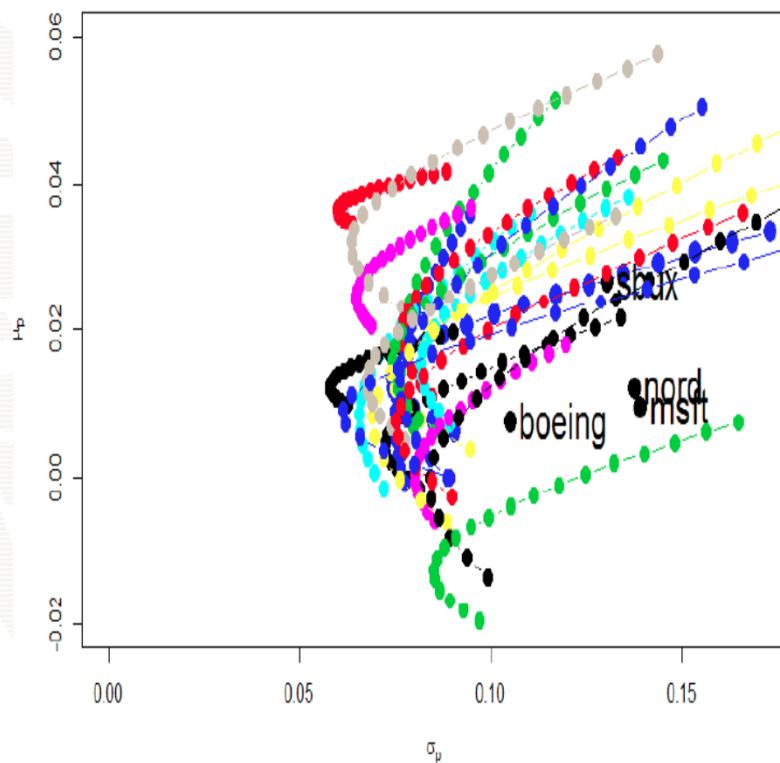
# COURSE MECHANICS

(see syllabus on webpage)

- Course content
- Prerequisites: math, stat, microeconomic theory
- Text:
  - » *introduction to Computational Finance and Financial Econometrics*, by Eric Zivot (manuscript in preparation)
  - » *Statistics and Data Analysis for Financial Engineering*, by David Ruppert, Springer-Verlag, 2010. Free e-book from UW library.
- Additional Readings online.
- Exam Review: Several sets of past exams have been posted on the class web site
- Software: Excel, R
  - » Excel is available on computers throughout campus
  - » Download R from [www.r-project.org](http://www.r-project.org)
  - » Highly recommended to use RStudio from [www.rstudio.com](http://www.rstudio.com)
- Exams, homework, class project
  - » HW due every Tuesday at 8pm (online via Canvas)

# Introduction to Computational Finance and Financial Econometrics

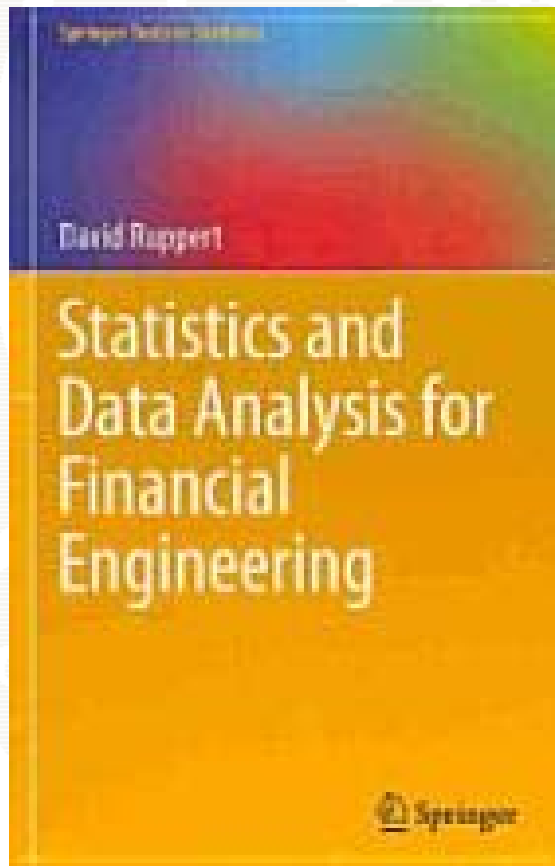
with examples in R



- Textbook in preparation based on course lecture notes
- Chapters are posted on the class webpage
- Feedback is welcomed and encouraged!

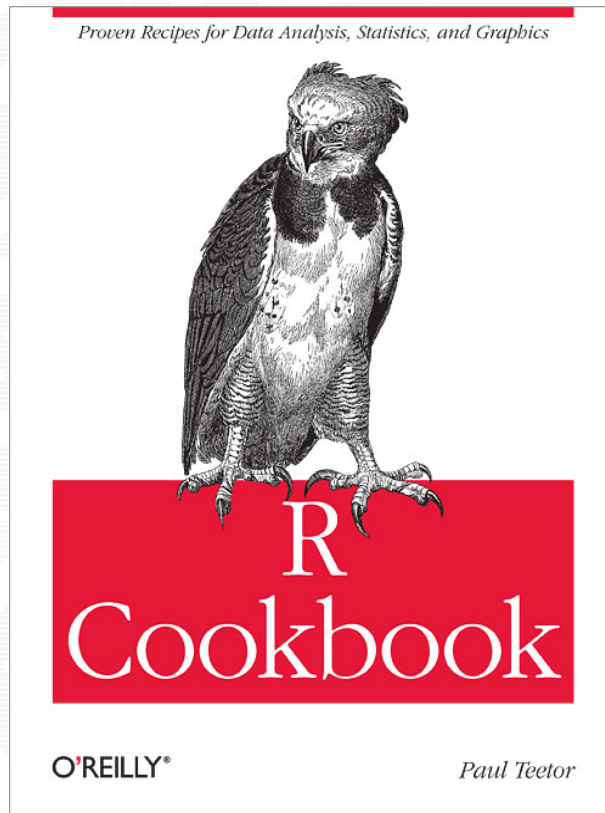


# Statistics and Data Analysis for Financial Engineering



- Excellent statistical treatment of financial data with R integration
- Extensive revision of earlier book *Statistics and Finance: An Introduction*
- Used also in AMATH 542, *Financial Data Modeling and Analysis in R*

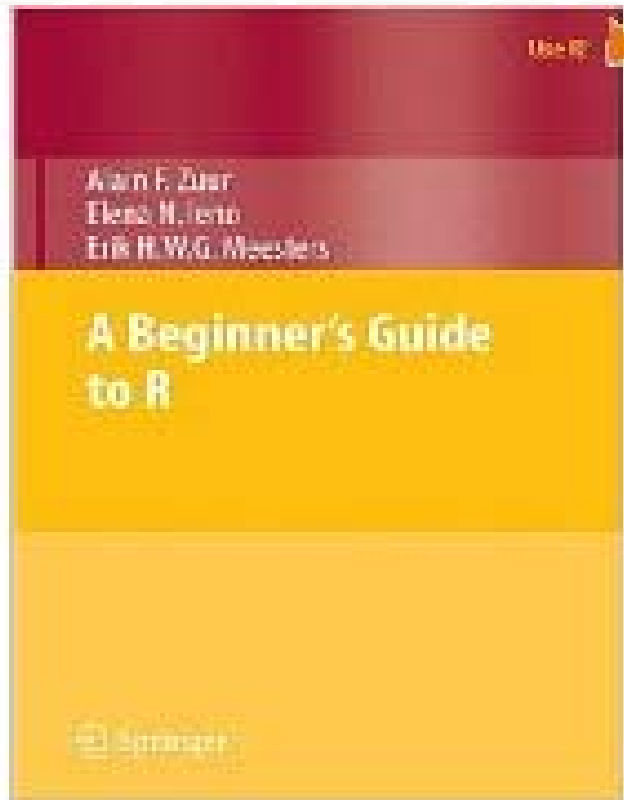
# R Cookbook



- No-nonsense guide to R with more than 200 practical recipes helps you perform data analysis with R quickly and efficiently.
- Written by R finance quant Paul Teetor



# A Beginner's Guide to R



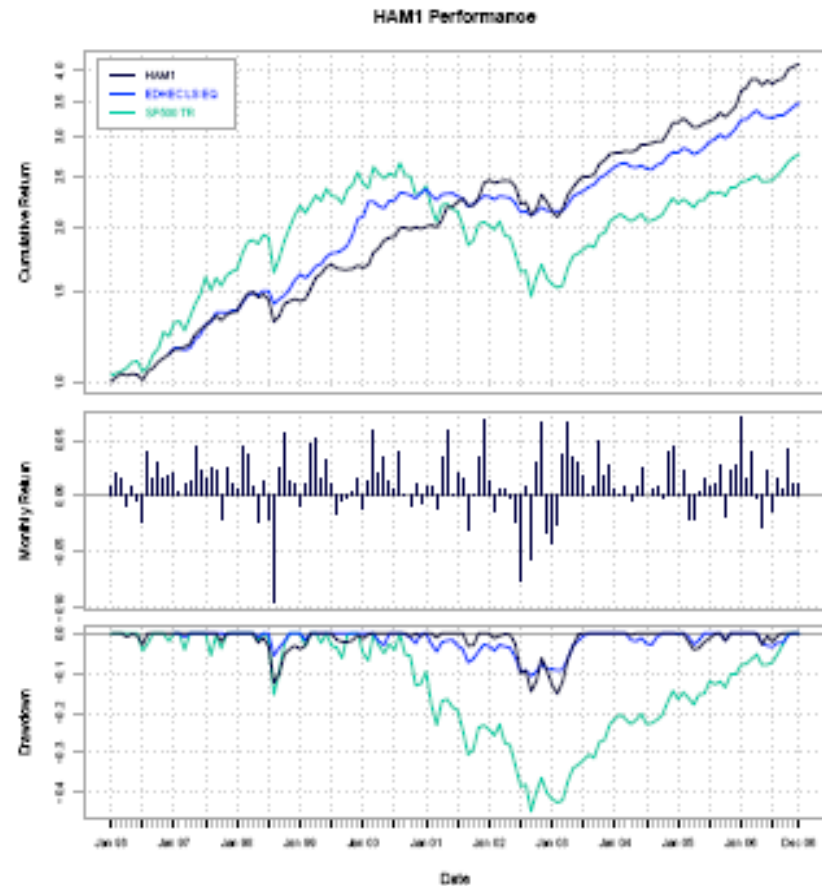
- Gentle introduction to R programming and graphics language
- Not a book about statistical analysis with R
- Short, concise chapters

# Brief History of R

- R is a language and environment for statistical computing and graphics
- R is based on the S language originally developed by John Chambers and colleagues at AT&T Bell Labs in the late 1970s and early 1980s
- R (sometimes called “GNU S” ) is free open source software licensed under the GNU general public license (GPL 2)
- R development was initiated by Robert Gentleman and Ross Ihaka at the University of Auckland, New Zealand
- R is formally known as *The R Project for Statistical Computing*
- [www.r-project.org](http://www.r-project.org)

# What is R great at?

- Data analysis
- Data Manipulation
- Data Visualization
- Statistical Modeling and Programming



Plot from the PerformanceAnalytics package

# S Language Implementations

- R is the most recent and full-featured implementation of the S language
- Original S - AT & T Bell Labs
- S-PLUS (S plus a GUI)
- Statistical Sciences, Inc.
  - » Mathsoft, Inc., Insightful, Inc., Tibco, Inc.
- R - The R Project for Statistical Computing

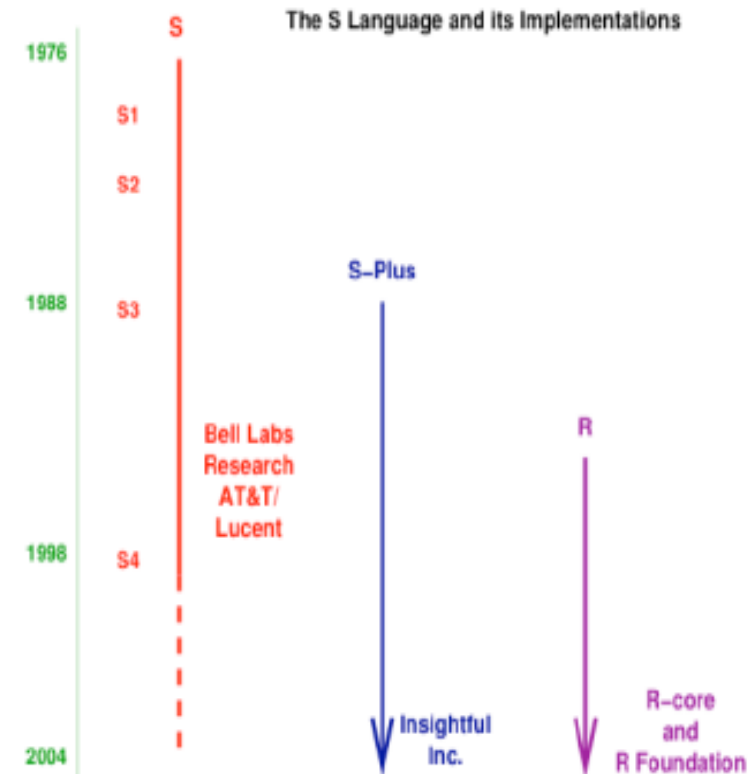


Figure from *The History of S and R*, John Chambers, 2006

## The R Foundation

- The R Foundation is the non-profit organization located in Vienna, Austria which is responsible for developing and maintaining R
  - » Hold and administer the copyright of R software and documentation
  - » Support continued development of R
  - » Organize meetings and conferences related to statistical computing

# R Homepage

- <http://www.r-project.org>
- List of CRAN mirror sites
- Manuals
- FAQs
- Mailing Lists
- Links

The R Project for Statistical Computing - Mozilla Firefox

http://www.r-project.org

The R Project for Statistical Computing

[About R](#)  
[What is R?](#)  
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[Screenshots](#)  
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[The R Journal](#)  
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**Getting Started:**

- R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. To [download R](#), please choose your preferred [CRAN mirror](#).
- If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send a mail.

**News:**

- [The R Journal](#), Vol. 2/1 is available
- R version 2.11.1 has been released on 2010-05-31. The source code is first available in this [directory](#), and eventually via all of CRAN. [Releases](#) will arrive in due course (see [download instructions](#) above).
- [useR! 2010](#), the R user conference, will be held at NIST, Gaithersburg, Maryland, USA, July 21-23, 2010.
- [useR! 2011](#), will take place at the University of Warwick, Coventry, UK, August 16-18, 2011.

This server is hosted by the [Institute for Statistics and Mathematics](#) of the [WU Wien](#).



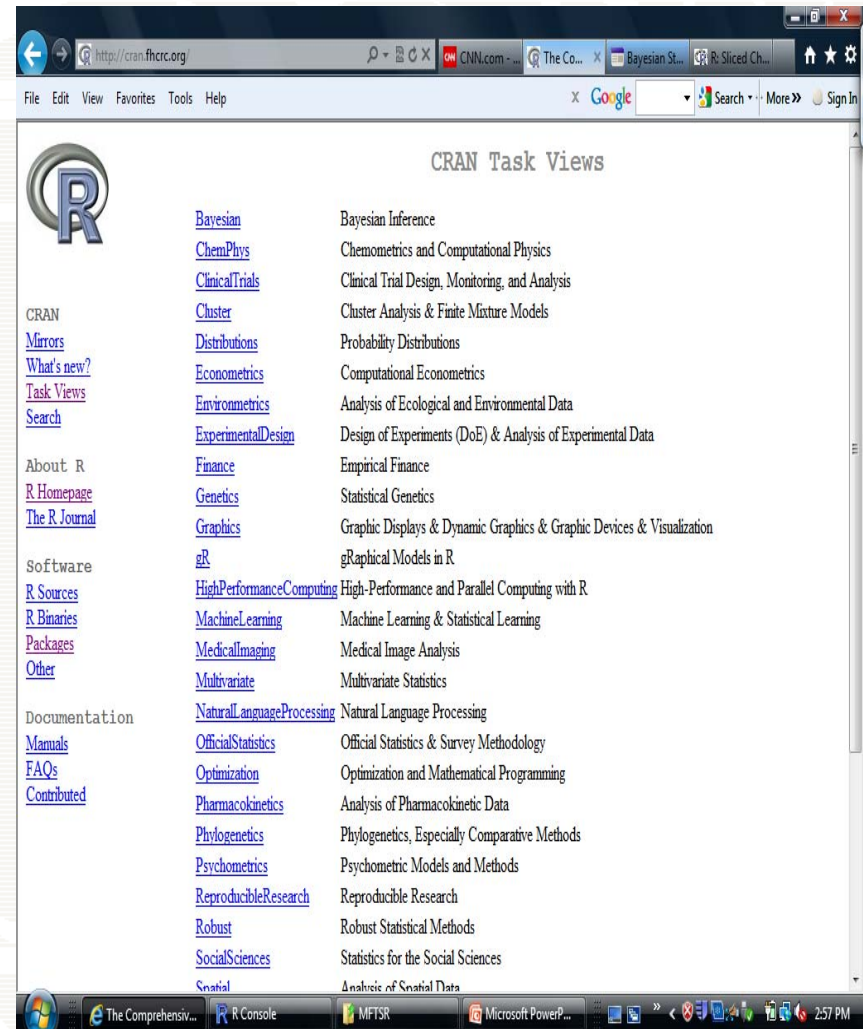
# CRAN – Comprehensive R Archive Network

- <http://cran.fhcrc.org>
- CRAN Mirrors
  - » About 100 sites worldwide
  - » About 25 sites in US
- R Binaries
- R Packages
- R Sources
- Task Views



# CRAN Task Views

- Organizes 6000+ R packages by application
- Relevant tasks computational finance:
  - » Distributions
  - » Econometrics
  - » Finance
  - » MachineLearning
  - » Multivariate
  - » Time Series



# Other Useful R Sites

- R Seek R specific search site:
  - » <http://www.rseek.org/>
- R Bloggers Aggregation of about 100 R blogs:
  - » <http://www.r-bloggers.com>
- Stack Overflow Excellent developer Q&A forum
  - » <http://stackoverflow.com>
- R Graph Gallery Examples of many possible R graphs
  - » <http://addictedtor.free.fr/graphiques>
- Inside-R R community site by Revolution Analytics
  - » <http://www.inside-r.org>
- DataCamp – Learn R online interactively
  - » <https://www.datacamp.com/>