

Financial Analytics with R: Prediction Using Fundamentals

Mark J. Bennett, Adjunct Lecturer
Department of Management Sciences
Graduate Program in Business Analytics



Main Campus, The University of Iowa, Founded in 1847





U.S. Locations:

Iowa City



Pappajohn Business Building
21 East Market Street, Iowa City, IA 52242
319-335-0862 | 800-553-4692

Pomerantz Center
213 North Clinton Street, Iowa City, IA 52242
319-335-1039
See parking and nearby hotels in [Google Maps](#)
[Programs located in Iowa City](#)

Cedar Rapids



Tippie College of Business Cedar Rapids Center
221 2nd Avenue SE, Suite 300, Cedar Rapids, IA 52401
319-365-3569
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Des Moines



John and Mary Pappajohn Education Center
1200 Grand Avenue, Des Moines, IA 50309
515-235-4652
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Quad Cities



Birchwood Learning Center
4620 E. 53rd Street, Davenport, IA 52807
319-335-1039
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Background

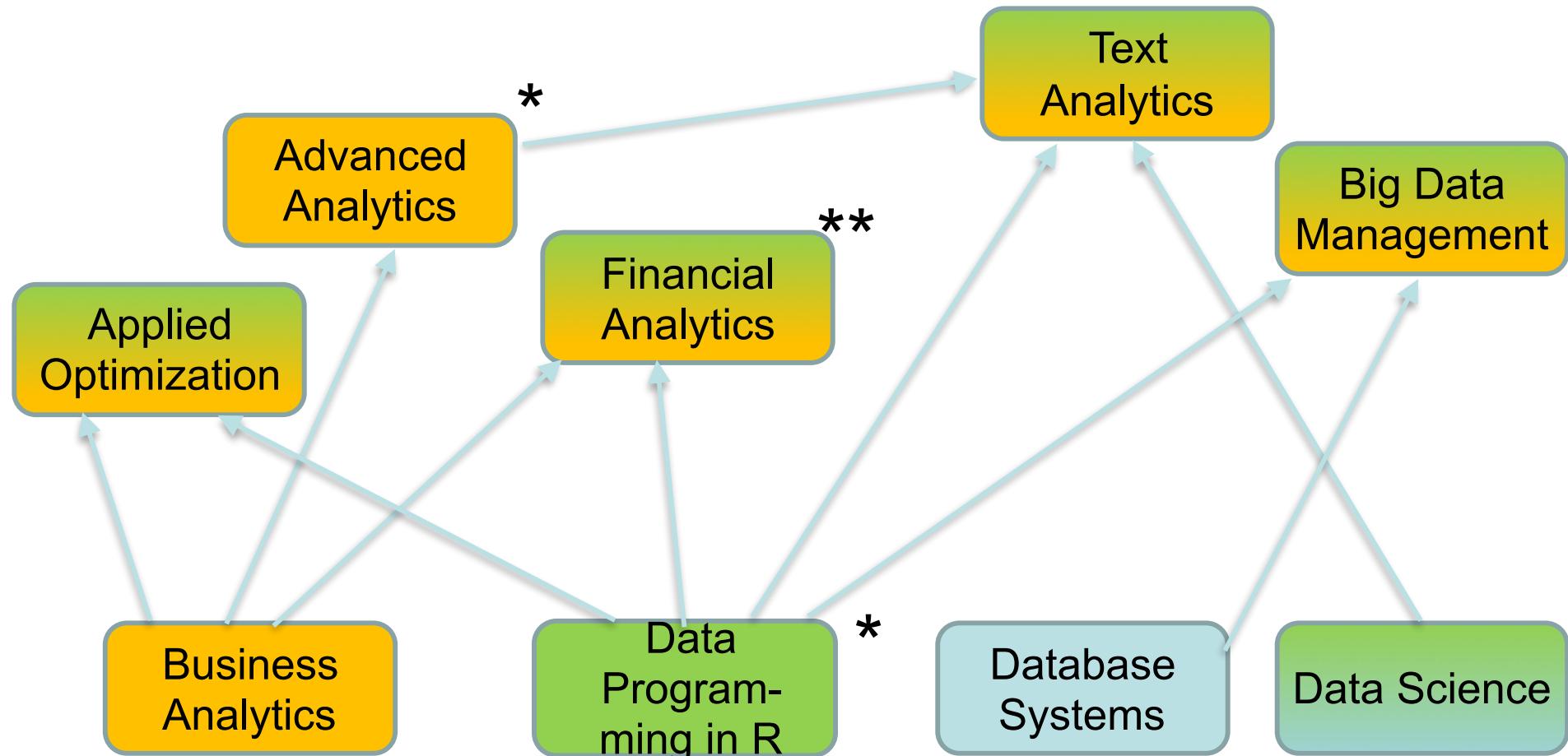
- Mark J. Bennett
- B.S. in Computer Science
- M.S. in Computer Science
- Ph.D. in Computer Science
- Teaching:
 - Data Programming in R
 - Advance Analytics
 - Financial Analytics
- Practice: Aerospace, Nat'l Lab, Telecom, Finance
 - Senior Quantitative Finance Analyst
 - Senior Data Scientist



Types of Analytics

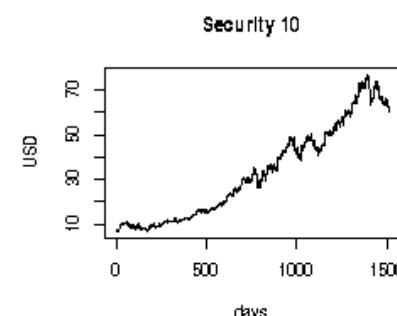
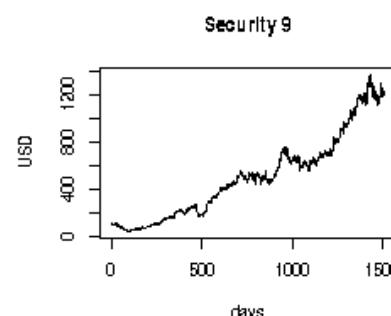
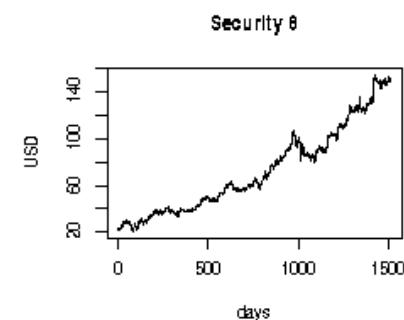
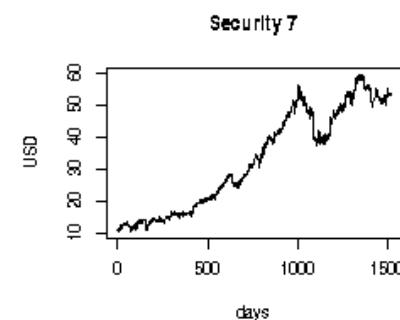
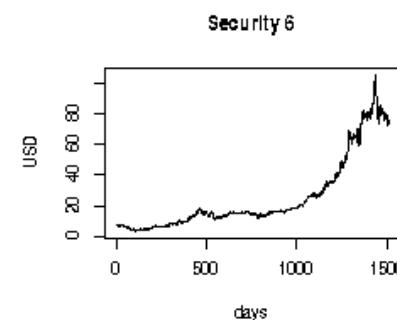
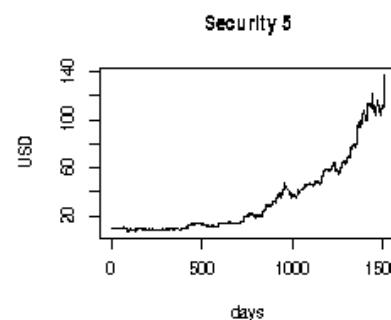
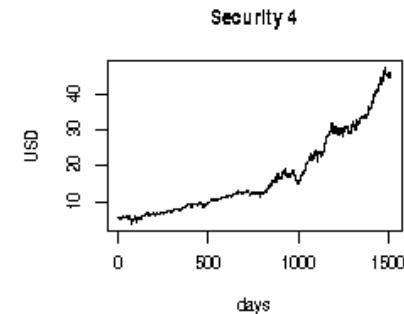
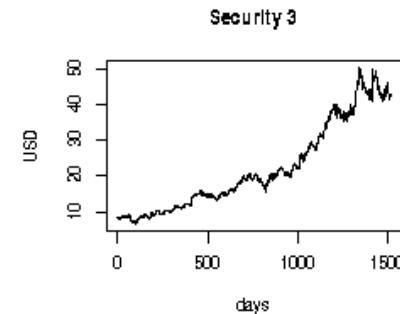
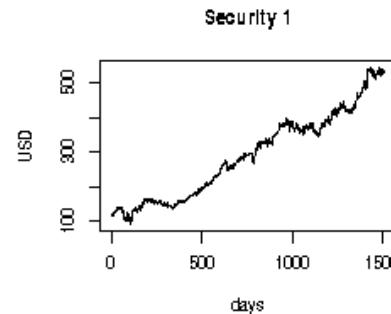
- Descriptive Analytics
 - What's happening?
 - Mean, variance, hypothesis testing.....
- Predictive analytics
 - What's going to happen next?
 - Regression, classification
- Prescriptive analytics
 - What's the best we can do?
 - Decision analysis, optimization

Sampling of Courses: M.S. in Business Analytics

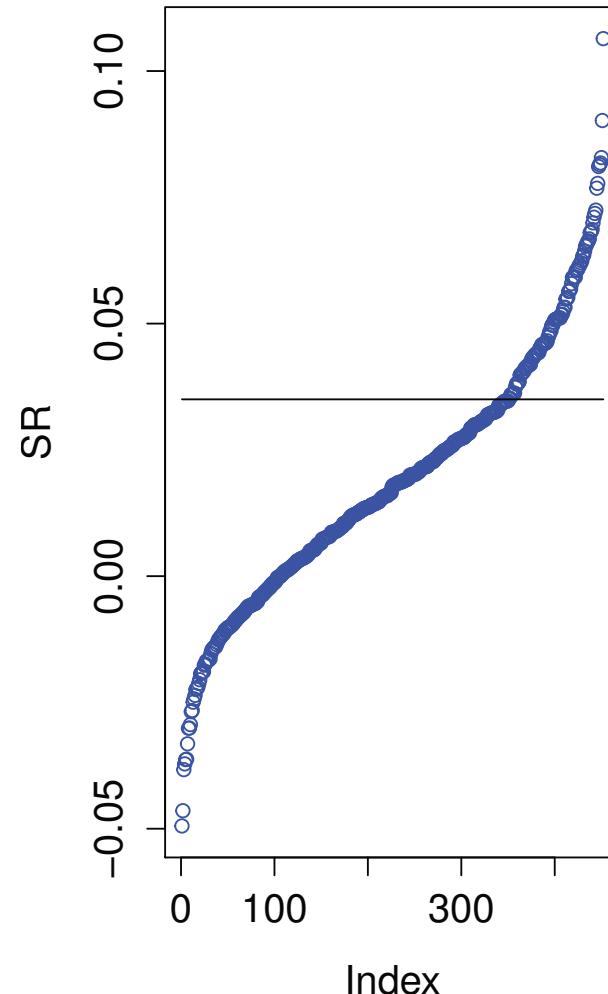
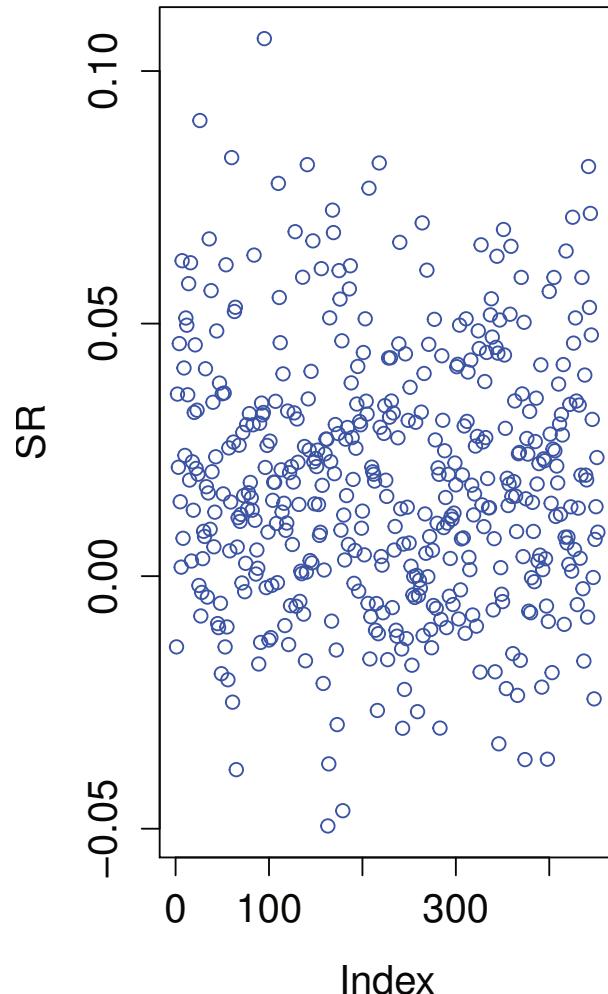




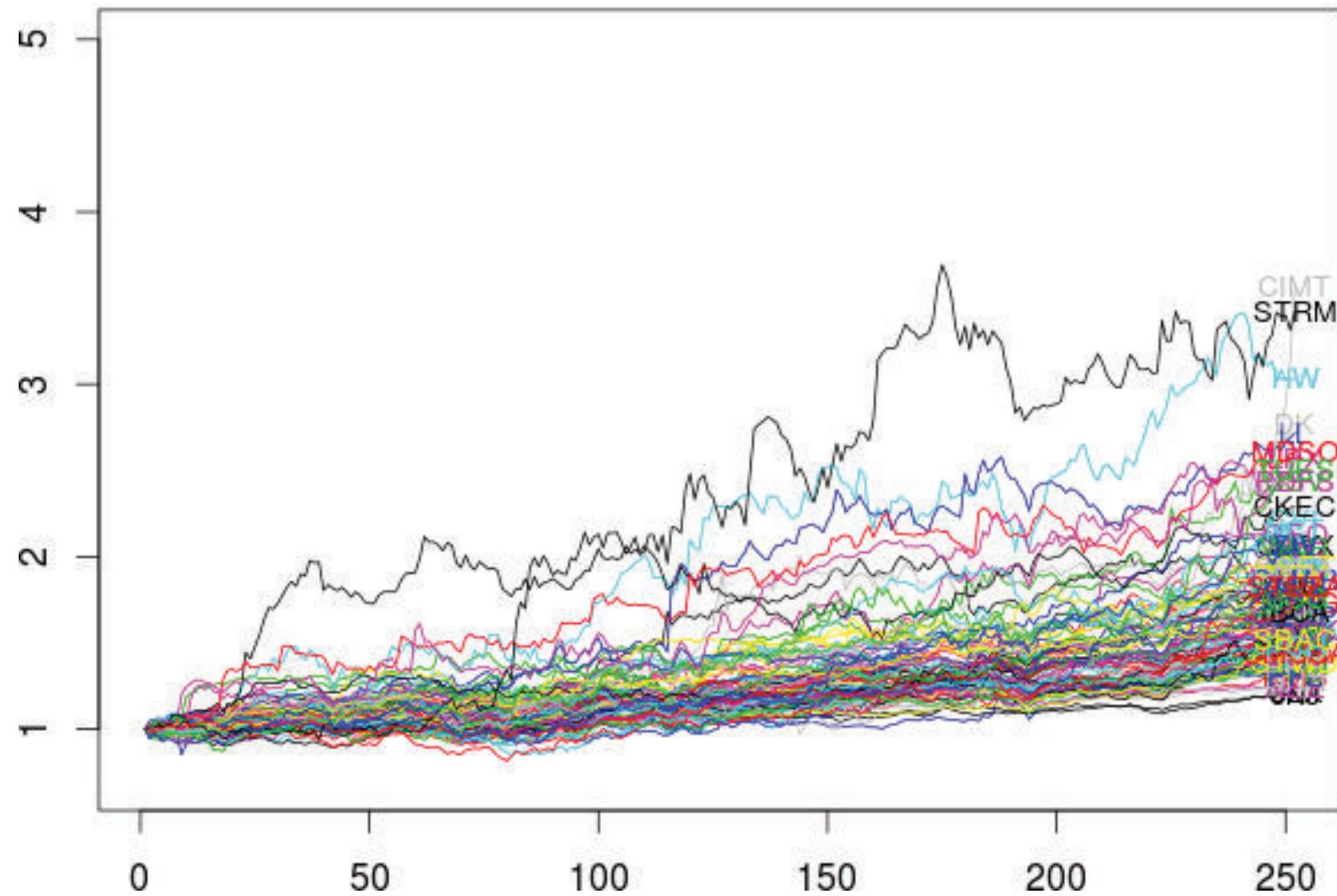
Nice Charts! (good Sharpe ratios)



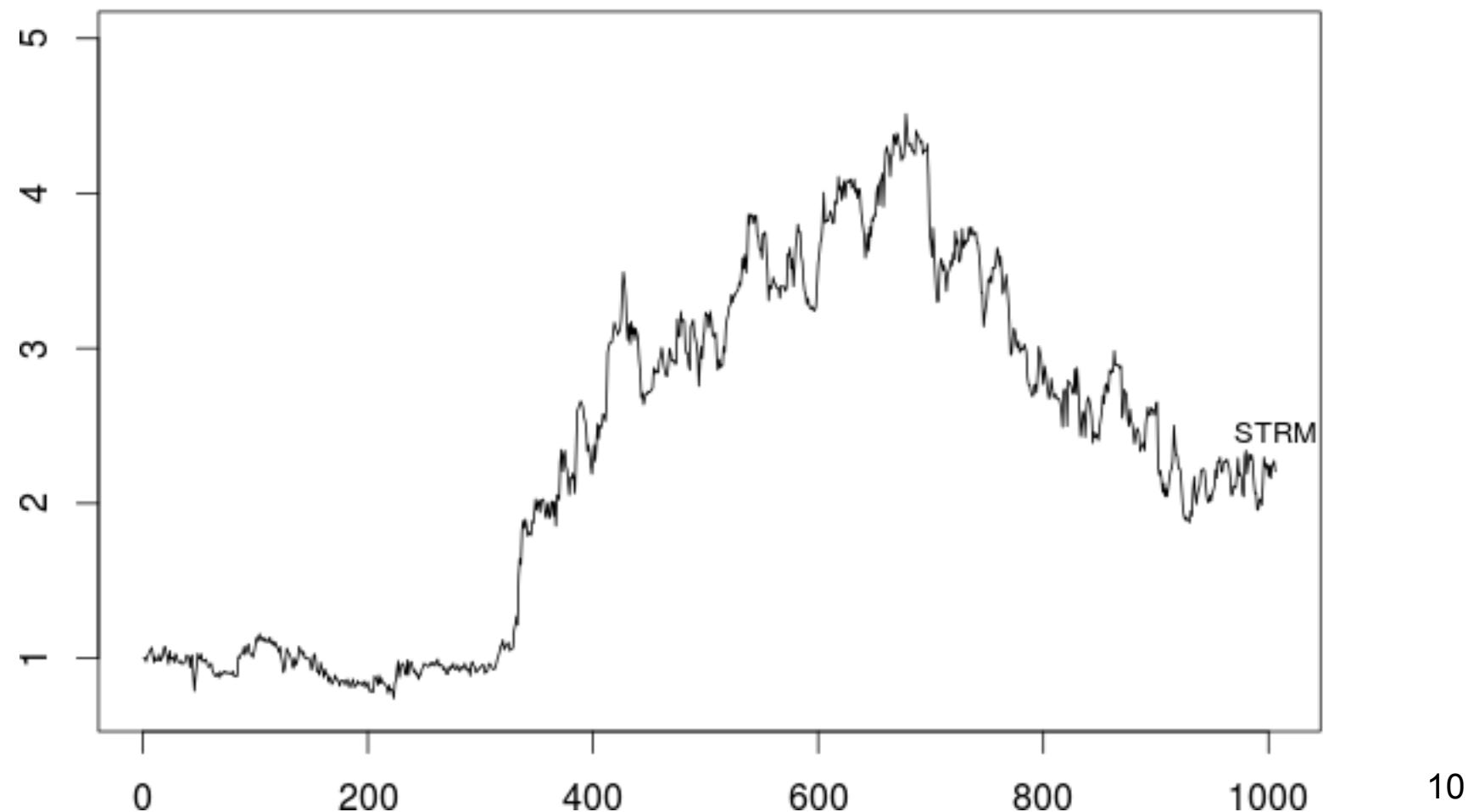
A Sample of Sharpe Ratios



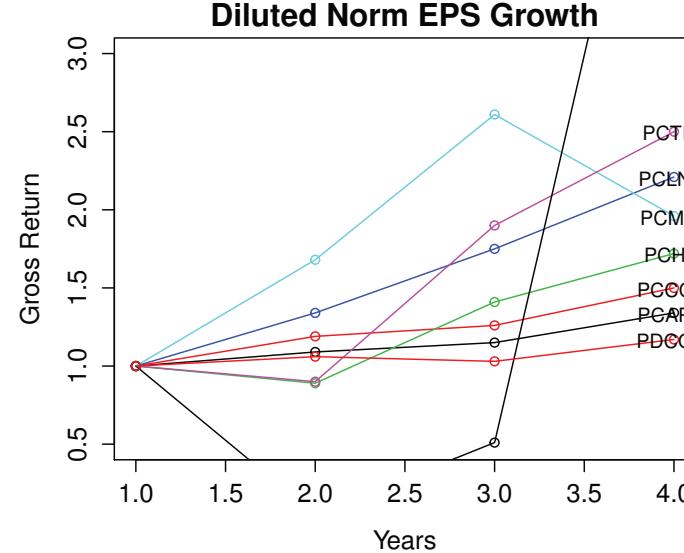
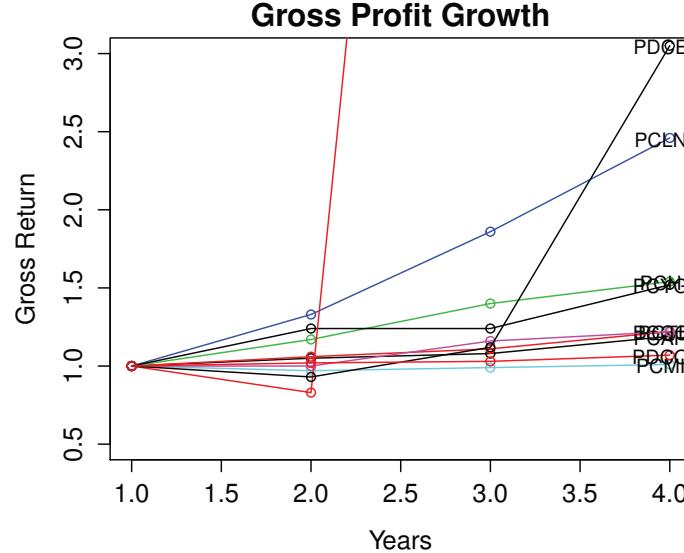
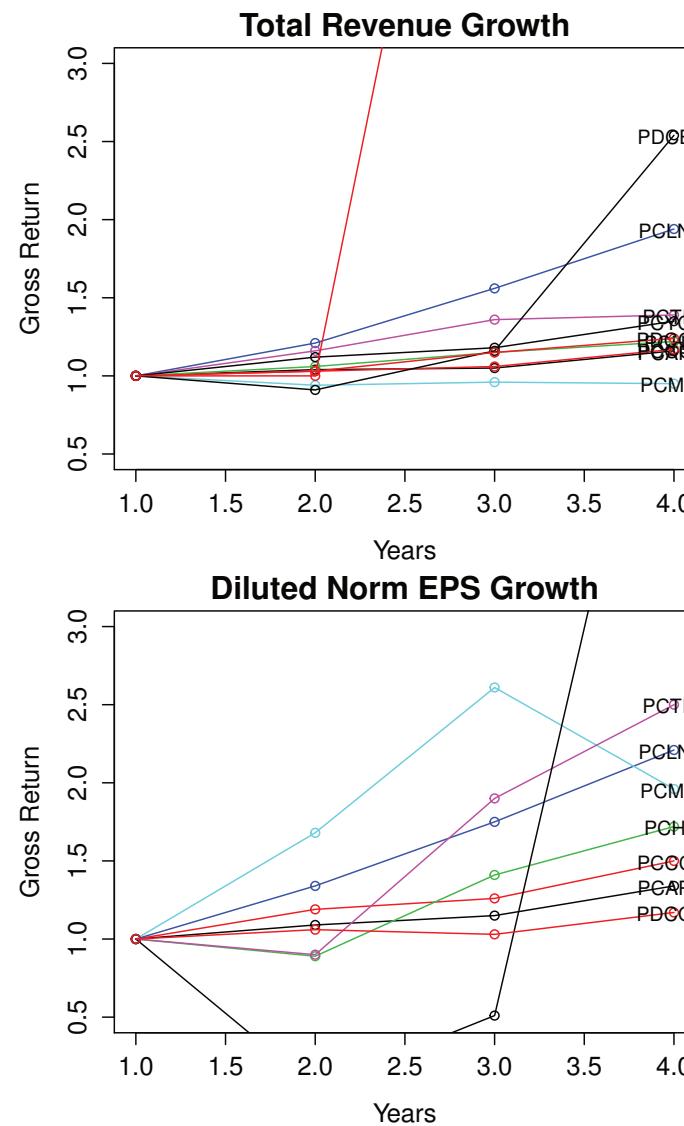
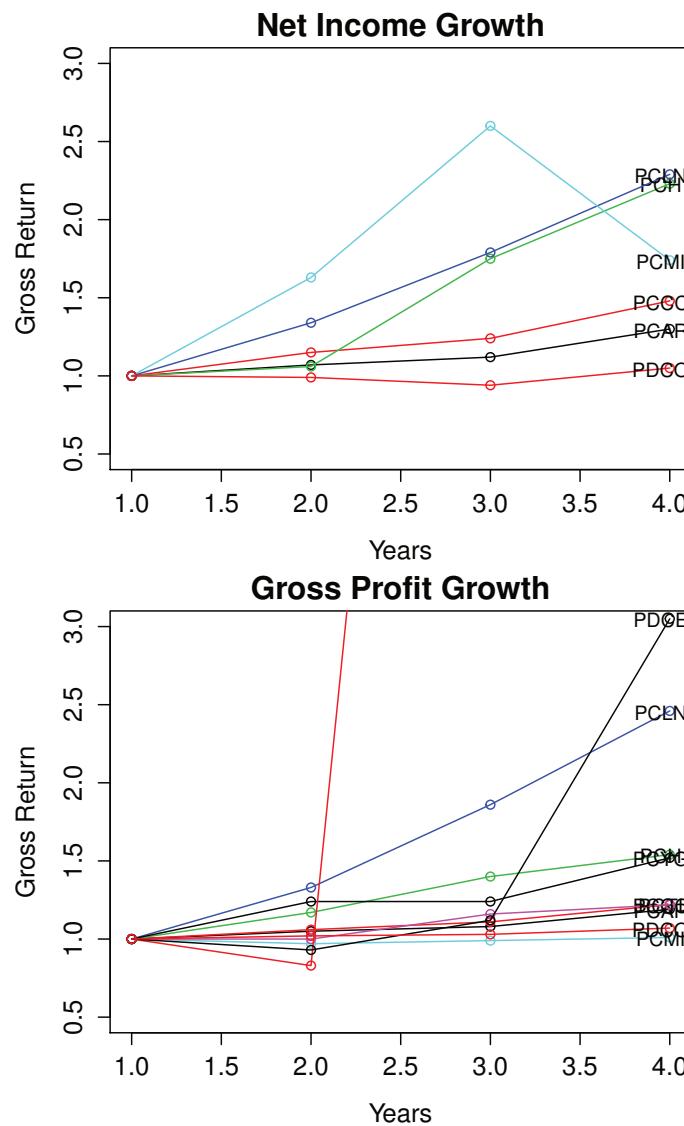
Problems with Small Samples (252 trading days)



Over Long Run Bull can become Bear (STRM 1008 trading days) and Need to Handle It



4 Important Corporate Income Statement Metrics

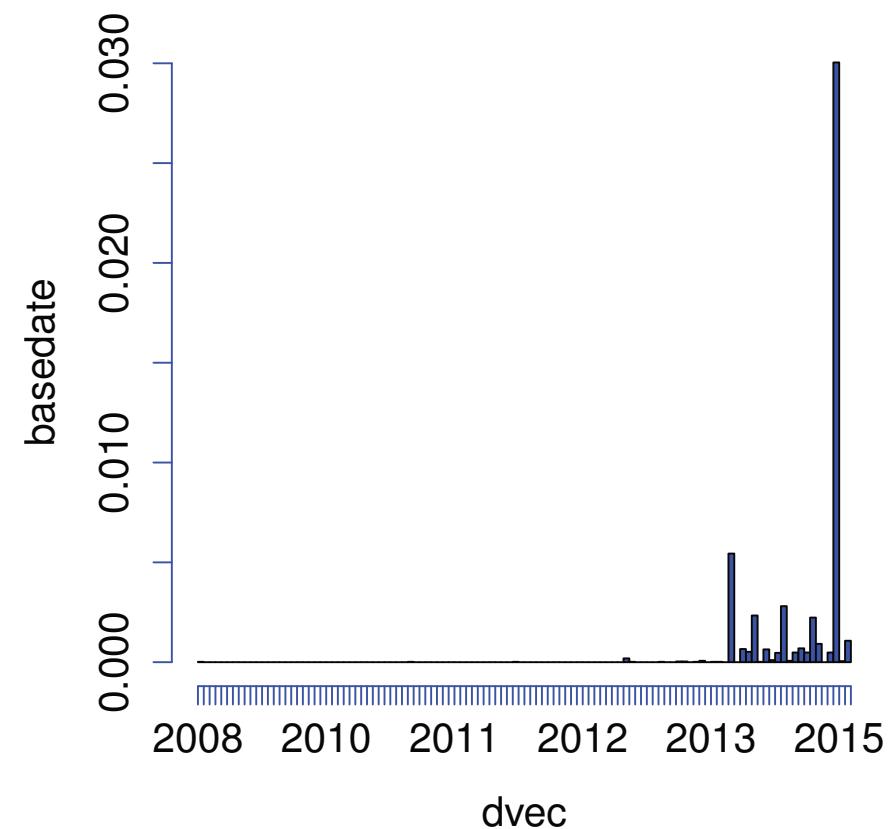
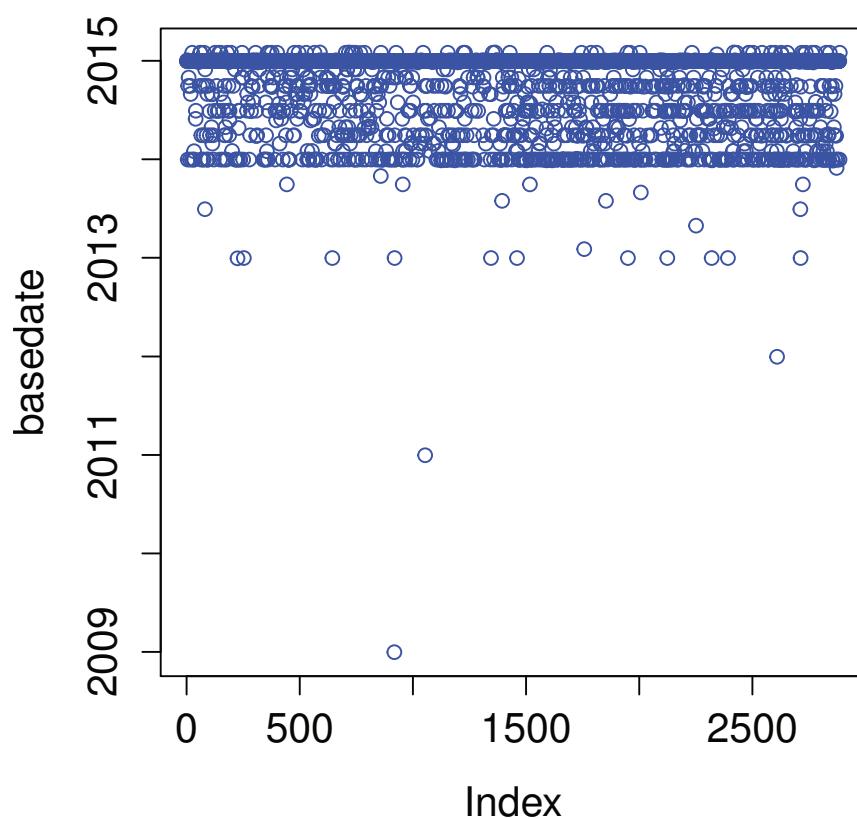


Do Higher Income Statement (IS) Metrics lead to Higher Secures Prices?

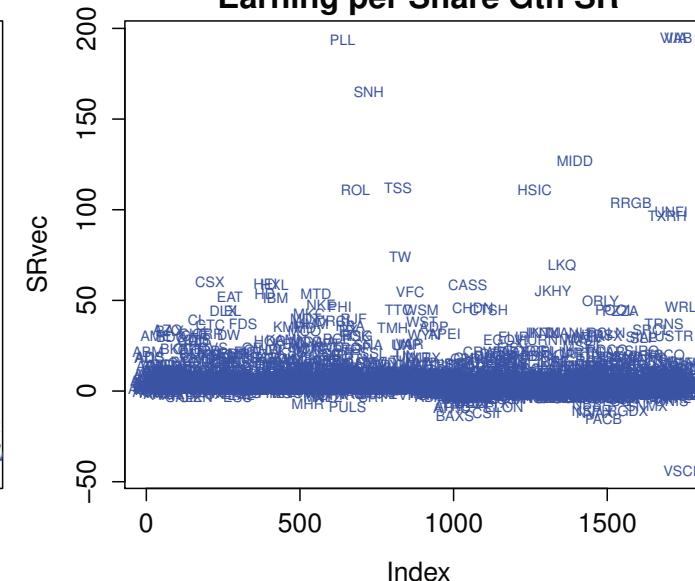
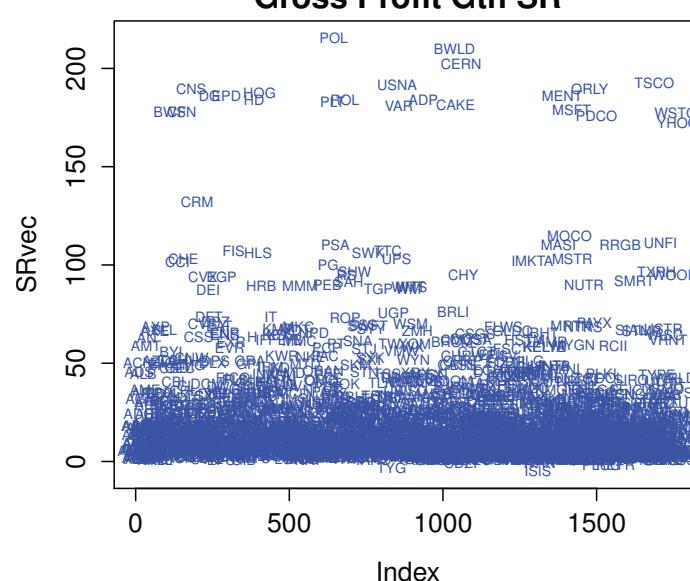
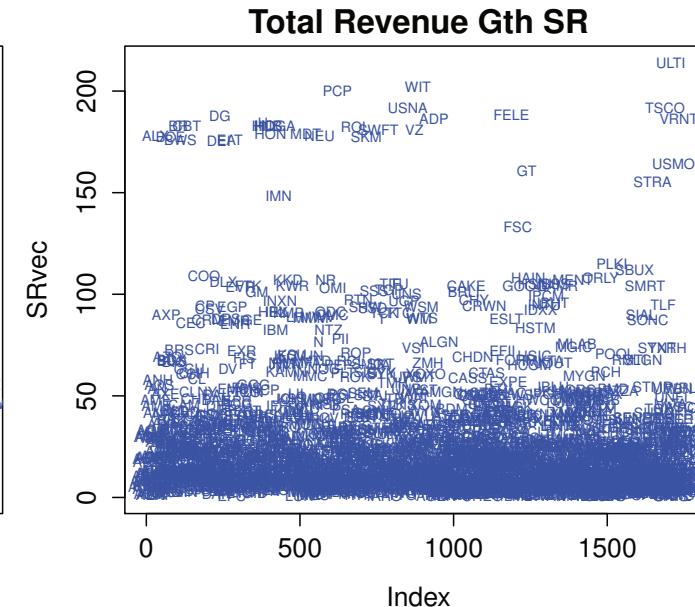
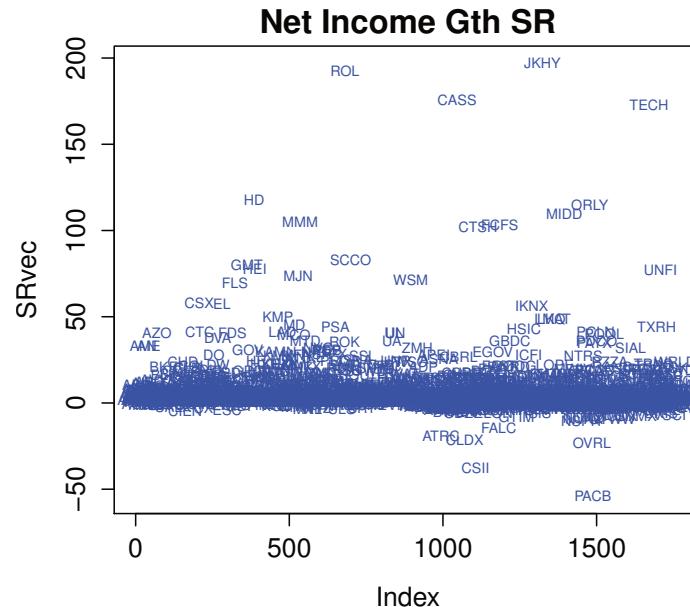
- Validate “Value Investing” Approach with Large Dataset
- Using R quadmod package
- Retrieve Income Statements for 1621 NYSE & NASDAQ Stocks

```
> library(quantmod)
> symbol='GOOG'
> getFinancials(symbol, src="google")
[1] "GOOG.f"
> GOOG.f$IS$A["Diluted Normalized EPS",]
2014-12-31 2013-12-31 2012-12-31 2011-12-31
      20.72      19.77      17.16      15.61
> 20.72/19.77
[1] 1.048053
```

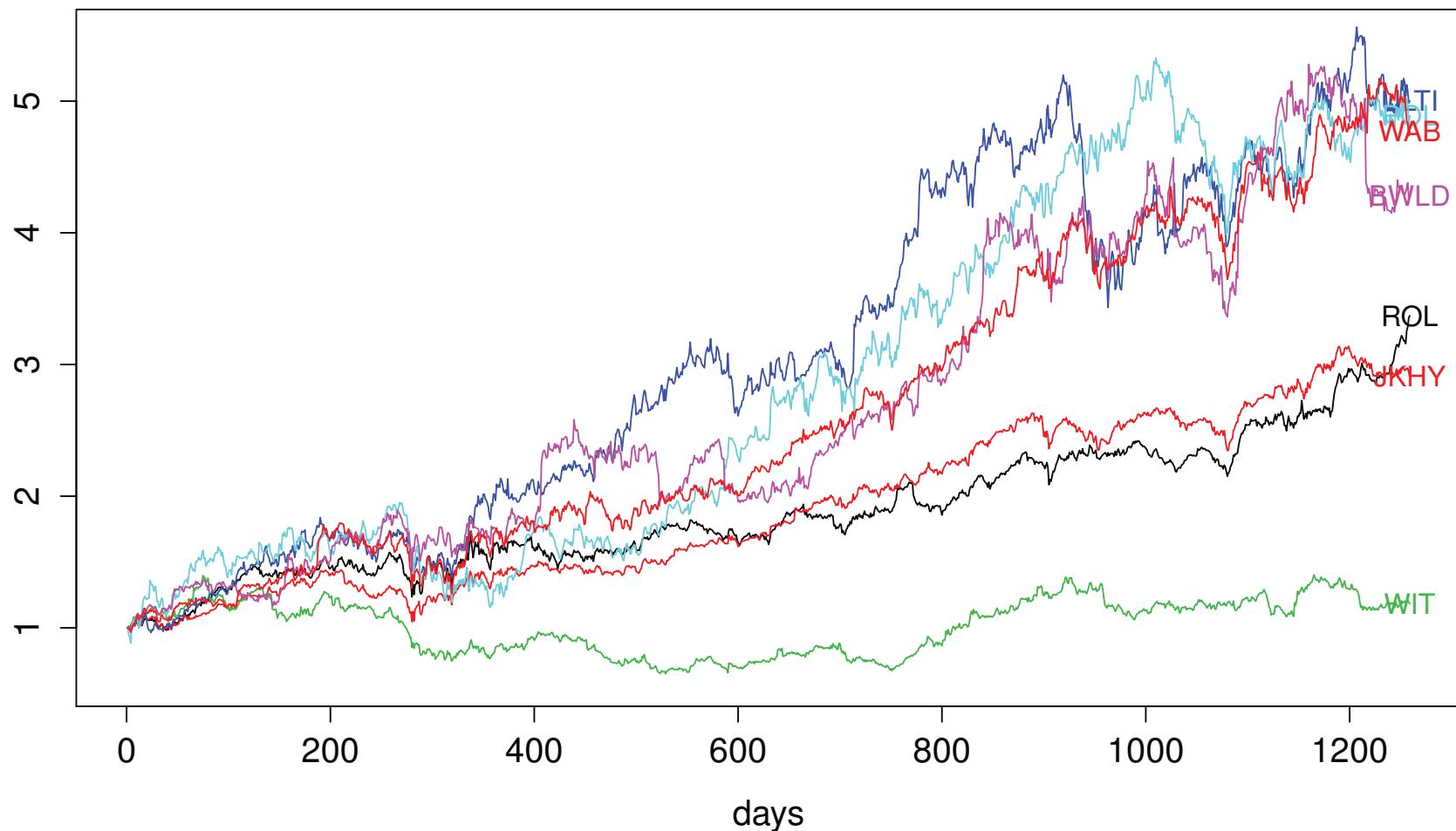
Synchronize IS Figures among Candidate Securities with Our Price Dataset?



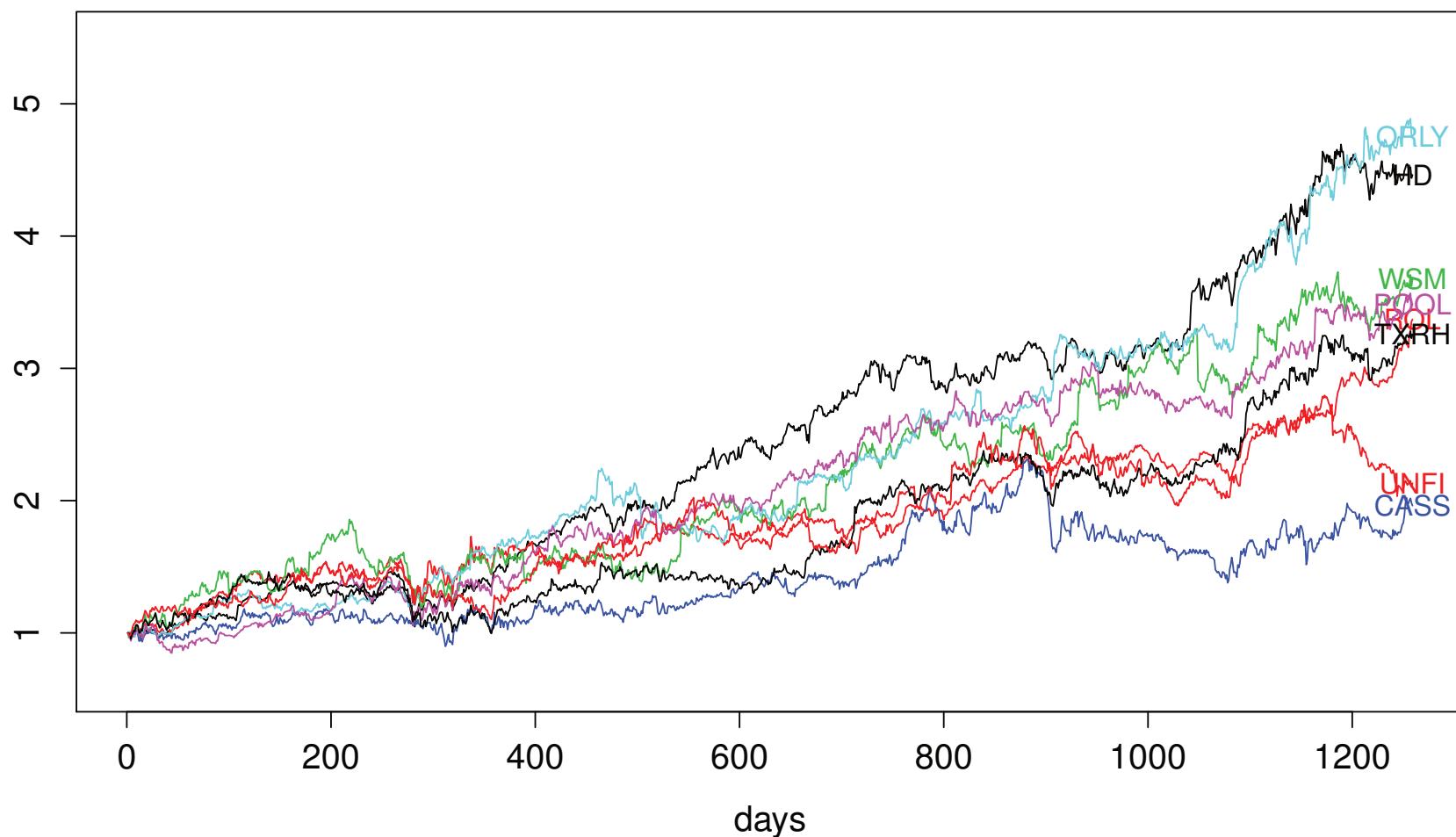
Measure Income Statement Sharpe Ratios (ISSR)



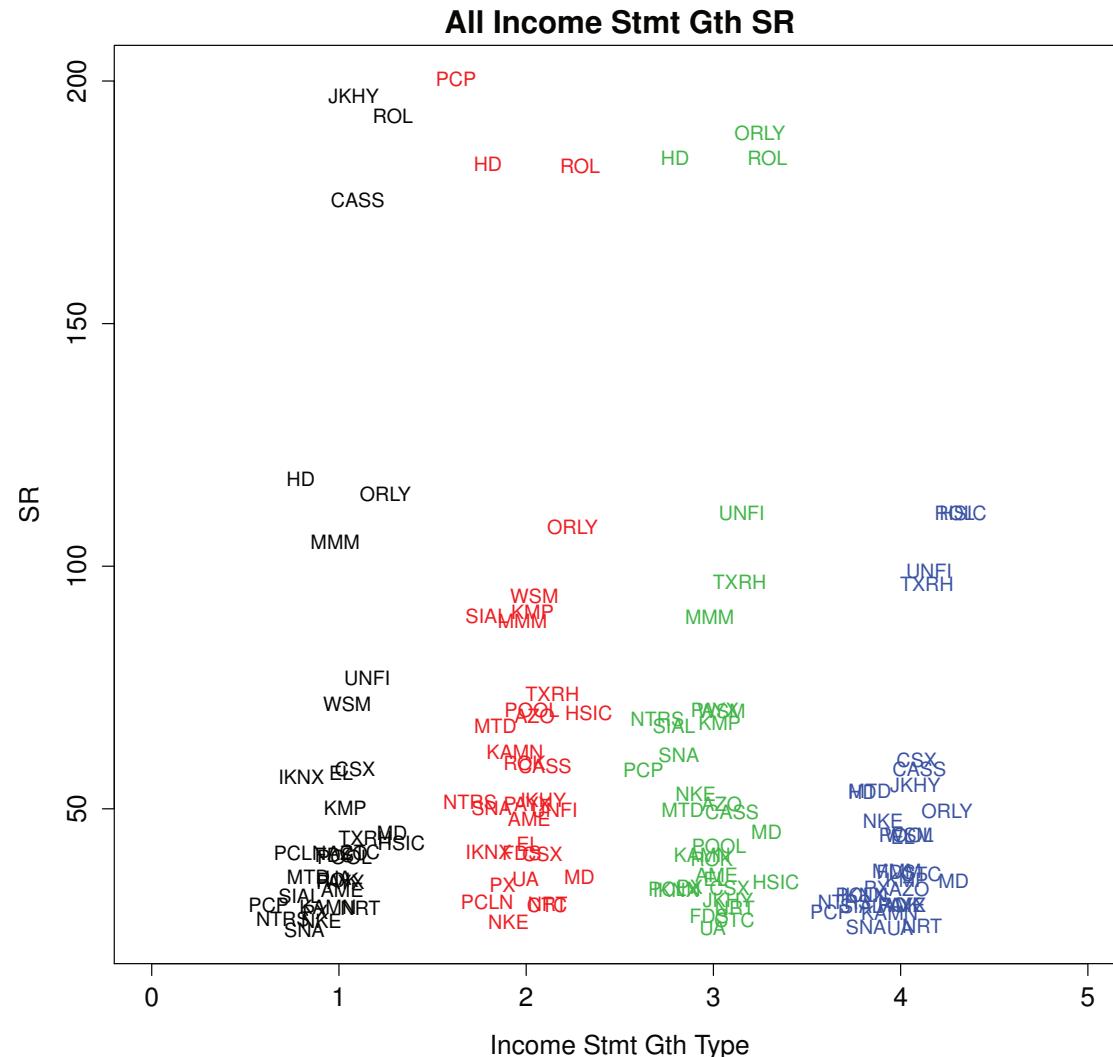
Top 2 Candidates from Each ISSR Category: 8 Stocks from 1621 Stocks, Some Too Volatile



Stricter Criteria: Must Do Well in All 4 ISSR
Categories: Top 8, Better Returns, More Consistent

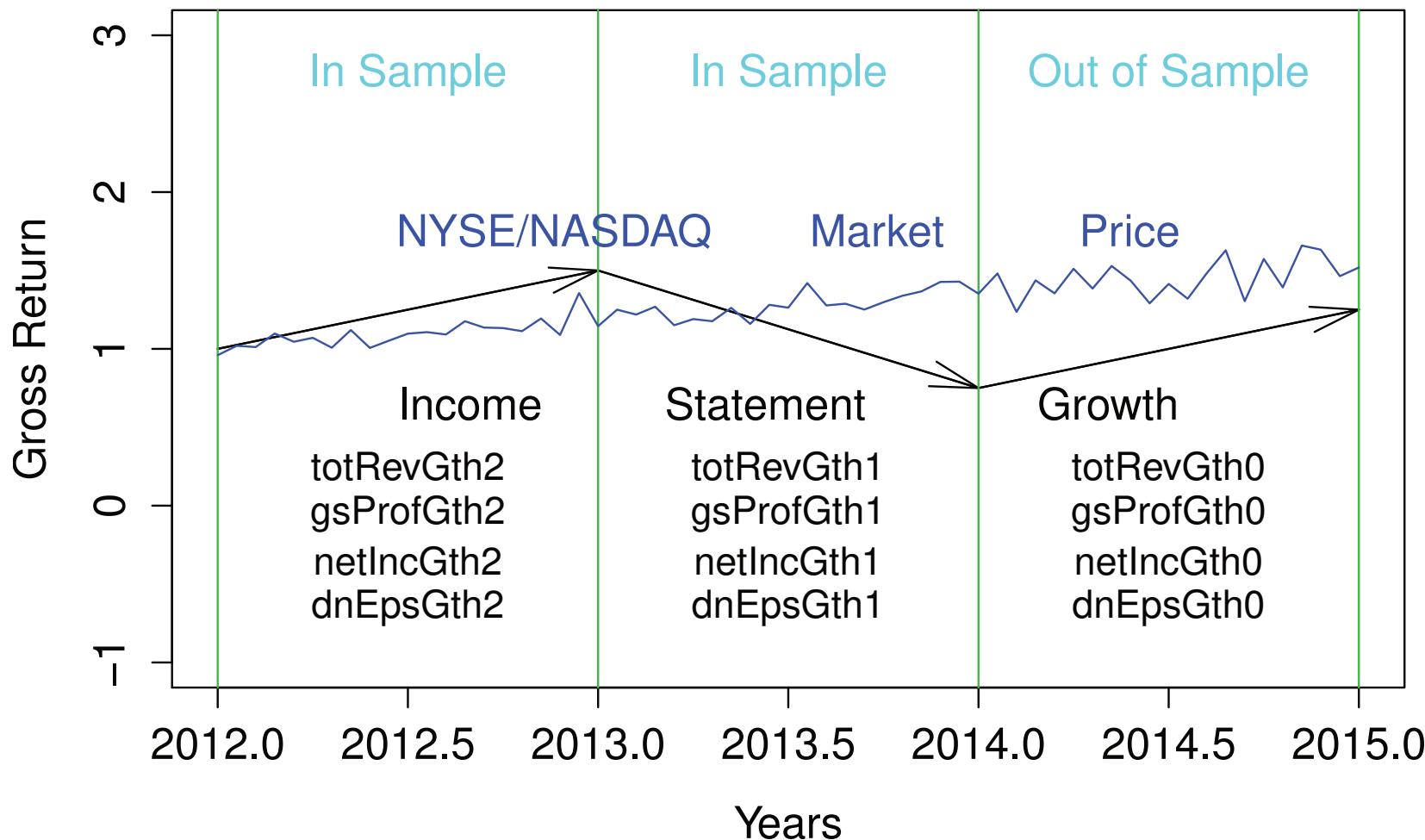


ISSRs reveal Candidates with Strong IS Fundamentals



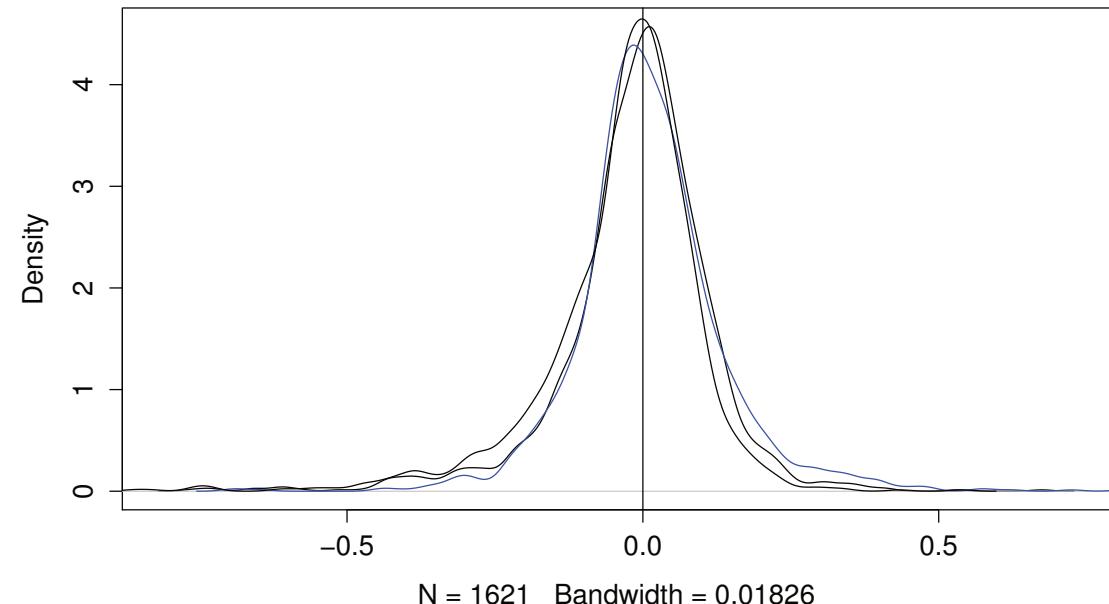
1=Net Income Growth 2=Total Revenue Growth 3=Gross Profit Growth 4=Diluted Norm. E.P.S. Growth

Training (2yrs) and Validation (1yr) (3yrs Daily Quotes 1621 Securities)

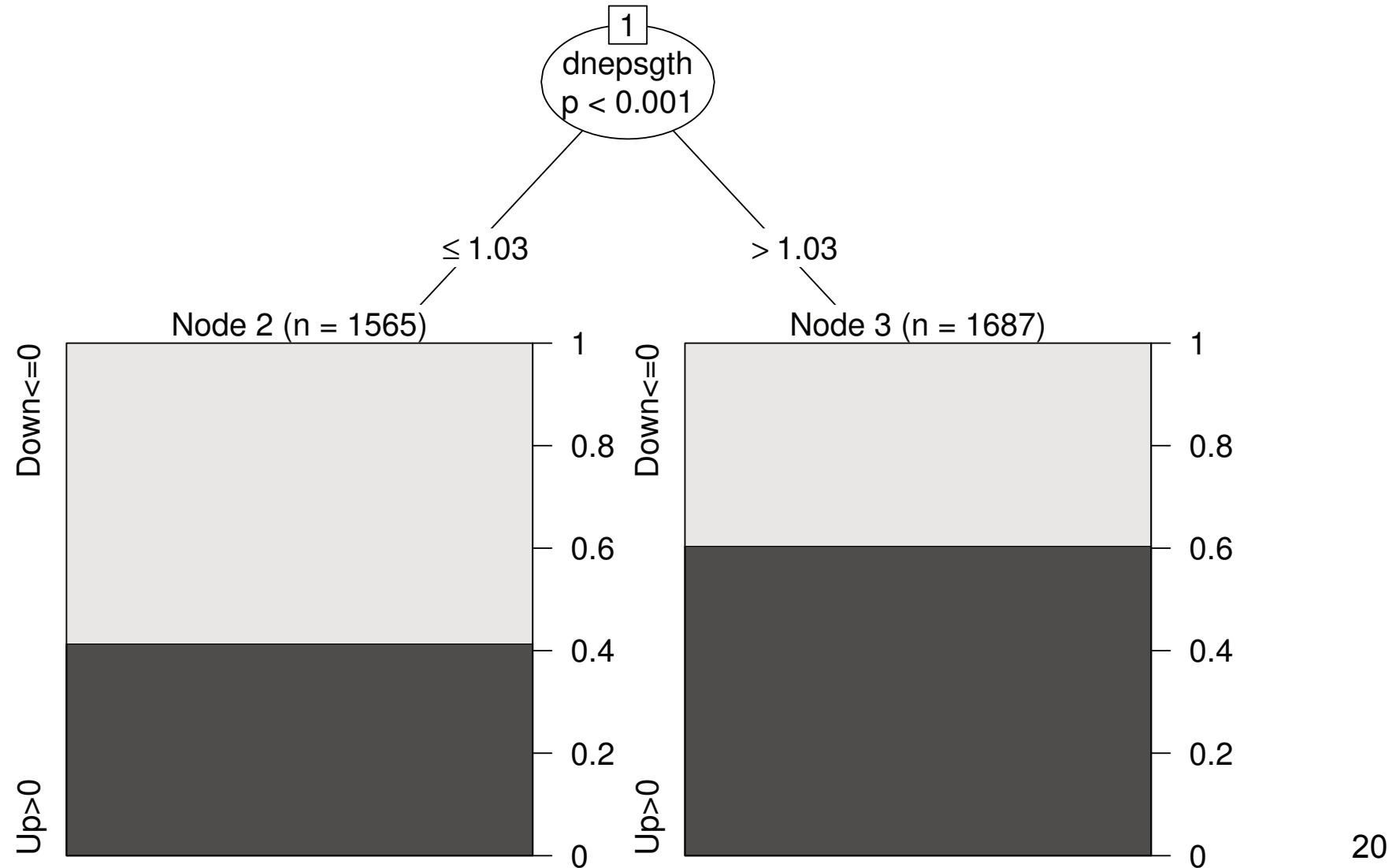


Check Density of : Security Price Log Returns - S&P500 Log Returns (each curve 1yr)

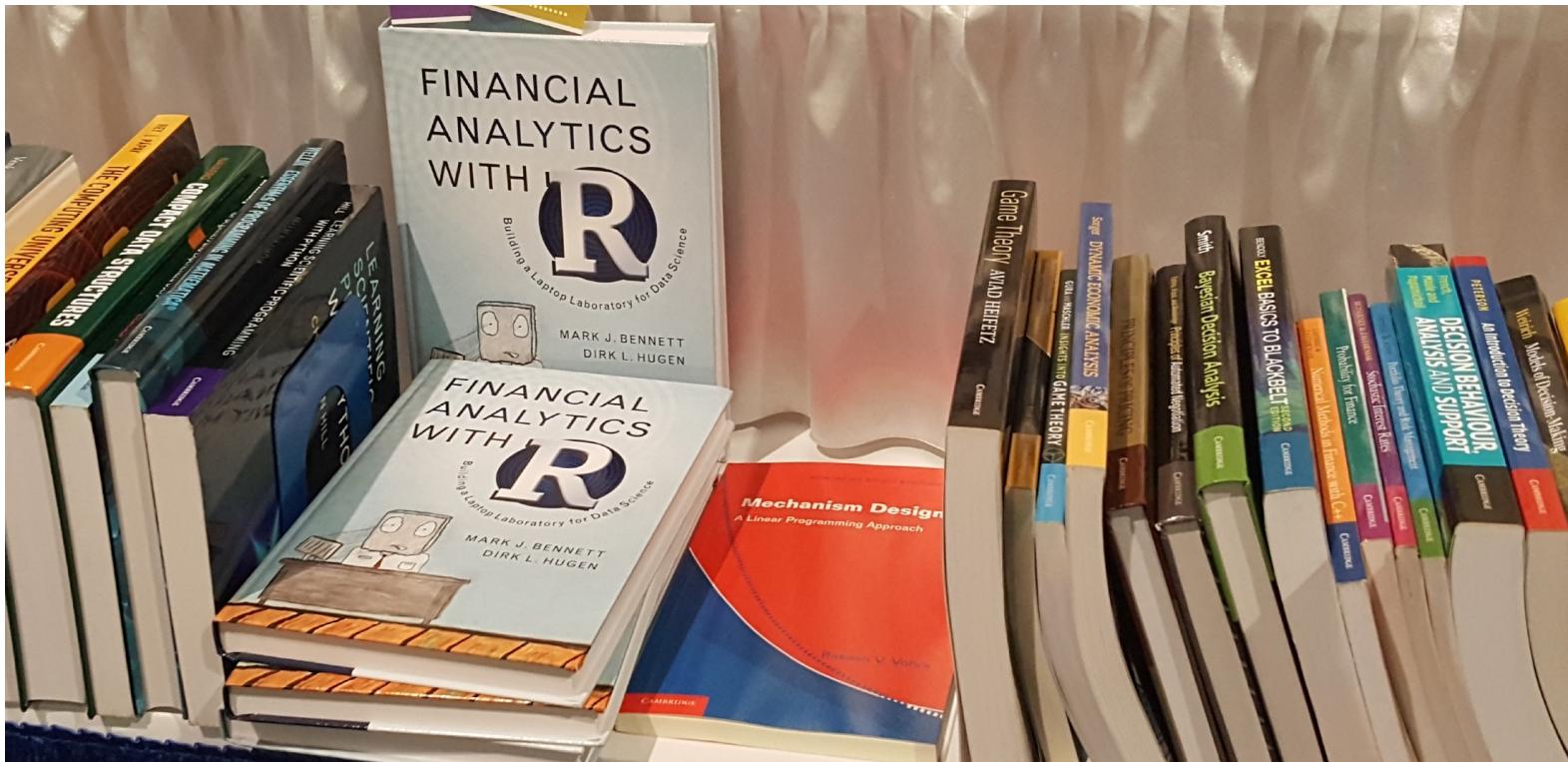
- Goal: Beating the Market “Bogie”
- S&P 500 Index
- Focus on stock whose mean return is higher than the Index
- Their adjusted mean return will be > 0



Encouraging Outcome! Model Accuracy is 61%



Financial Analytics with R: Building a Laptop Laboratory for Data Science,
D. L. Hugen, M. J. Bennett from Cambridge University Press, 2016
contains 4,000 lines of R code examples



www.cambridge.org/LaptopLab

Conclusion

- Foundational Course *Data Programming in R*
 Highlighted Broad Aspects of R
- R and RStudio Provided Access (**tseries**, **quandmod**)
 to the Datasets We Need to Validate Investor Strategies
- Retrieved Income Statements for 1621 NYSE &
 NASDAQ Stocks to Compare Price Appreciation,
 Volatility and Income Statement Growth
- Prediction was Accurate Using Recursive Partitioning
 (**party** for Decision Trees)
- Financial Analytics is Very Convenient with R