Financial Econometrics

1. Introduction

Instructor: Bo Hu

Fall 2017

Financial Econometrics

Financial Econometrics

- Study of finance using statistical tools
- Strong empirical nature of finance
- Non-experimental environment
- Model-based statistical inference

Can be used to

- Test finance theories
- Predict asset returns
- Study short-term and long-term relationships between different financial markets
- Study short-term and long-term relationships between financial markets and the macro economy
- Help making financial decisions

# Examples of Capabilities of Financial Econometrics

Brooks (2014)

1. Testing whether financial markets are weak-form informationally efficient.
2. Testing whether the Capital Asset Pricing Model (CAPM) or Arbitrage Pricing Theory (APT) represent superior models for the determination of returns on risky assets.
3. Measuring and forecasting the volatility of bond returns.
4. Explaining the determinants of bond credit ratings used by the ratings agencies.
5. Modeling the long-term relationships between prices and exchange rates.

# Examples of Capabilities of Financial Econometrics

Brooks (2014)

6. Determining the optimal hedge ratio for a spot position in oil.

7. Testing technical trading rules to determine which makes the most money.

8. Testing the hypothesis that earnings or dividend announcements have no effect on stock prices.

9. Testing whether spot or futures markets react more rapidly to news.

10. Forecasting the correlation between the stock indices of two countries.
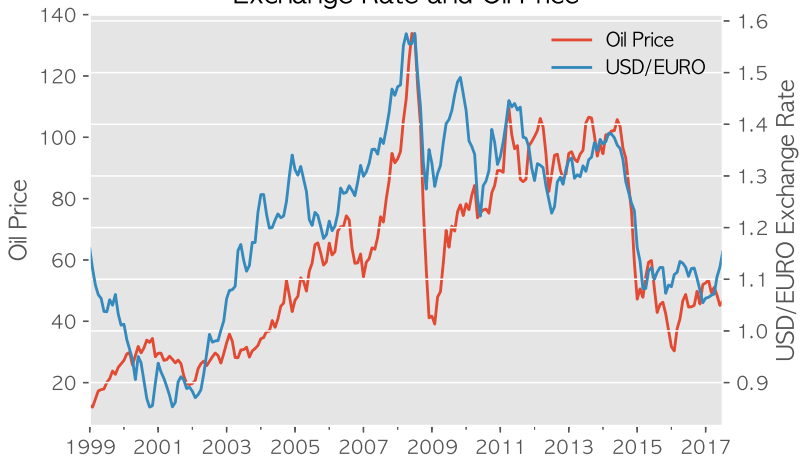
3-Month Treasury Bill Minus Federal Funds Rate
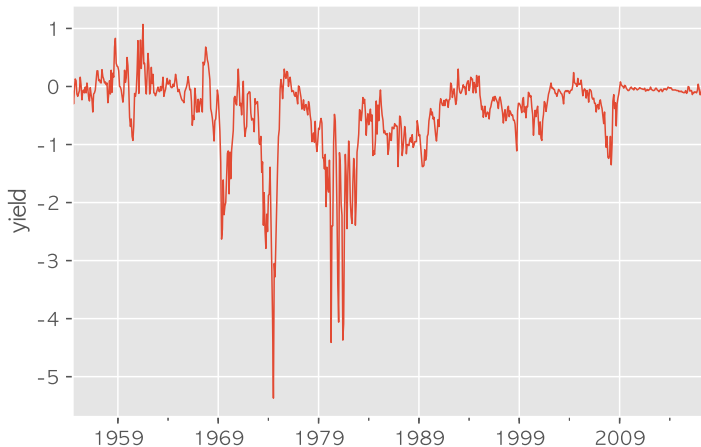
Notes: 3-Month Treasury Bill Second Market Rate minus Effective Federal Funds Rate. Data source: Federal Reserve Bank of St. Louis. Data frequency: Monthly.

S&P500 Daily Returns
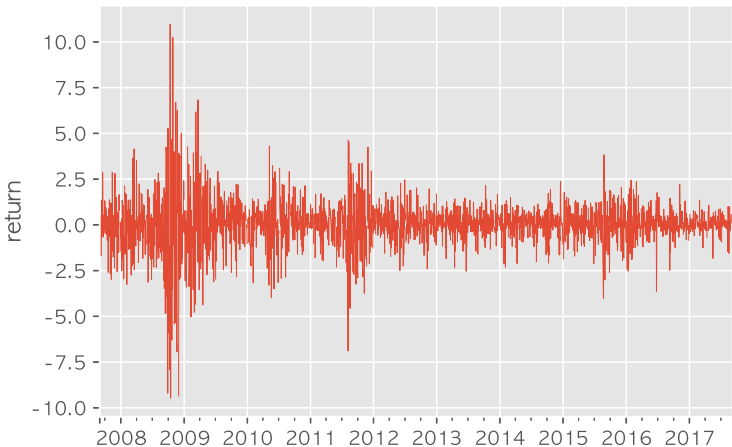
Notes: Standard & Poors 500 Index Daily Returns. Data source: Federal Reserve Bank of St. Louis.

Exchange Rate and Oil Price

Notes: USD/Euro Foreign Exchange Rate and West Texas Intermediate (WTI) Crude Oil Prices. Data source: Federal Reserve Bank of St. Louis. Data frequency: Monthly.

This Course

- Introduce essential tools that can be used to analyze financial data and to test market models
- Focus on empirical techniques, while theories will be reviewed
- Main topics: asset return predictability, market microstructure, event-study, the Capital Asset Pricing Model, factor models, consumption-based asset pricing models, volatility, the term structure, high frequency data analysis ...

Course Information

- Meet once or twice a week
    - Wednesdays 13:00-14:50, **every other** week
    - Thursdays 15:10-17:00, **every** week
- Instructor: Bo Hu
- Email: bohu@nsd.pku.edu.cn
- Course Website:
  http://www.econbohu.com/teaching/finmetrics/
- Office Hours and Location: TBA
- Teaching Assistant: TBA

- Students are supposed to have taken a course in probability
  and mathematical statistics, a course in econometrics and a
  course in finance

Reference Books

There is no required textbook for this course. I will post my lecture notes and slides on the course website. The following books are for reference.

Financial Econometrics

- Chris Brooks (2014). Introductory Econometrics in Finance. Cambridge University Press, 3rd edition.
- John Y. Campbell, Andrew W. Lo & A. Craig MacKinlay (1997). The Econometrics of Financial Markets. Princeton University Press.
- Christian Gourieroux & Joann Jasiak (2001). Financial Econometrics: Problems, Models, and Methods. Princeton University Press.
- Ruey S. Tsay (2010). Analysis of Financial Time Series. Wiley, 3rd edition.

Reference Books

Probability Foundation

- Patrick Billingsley (1995). Probability and Measure. Wiley, 3rd edition.
- A. N. Shiryaev (1989). Probability. Springer, 2nd edition.

Statistics

- George Casella & Roger L. Berger (2001). Statistical Inference. Duxbury Press, 2nd edition.

Econometrics

- Jefferey M. Wooldridge (2016). Introductory Econometrics: A Modern Approach. South-Western College Pub, 6th edition.
- Jefferey M. Wooldridge (2010). Econometric Analysis of Cross-Section and Panel Data. The MIT Press, 2nd edition.

Reference Books

Finance

- Frederic S. Mishkin (2015). The Economics of Money, Banking and Financial Markets. Pearson, 11th edition.

- Stephen F. LeRoy & Jan Werner (2000). Principles of Financial Economics. Cambridge University Press.

- Stephen Ross, Randolph Westerfield, Jeffrey Jaffe & Bradford Jordan (2016). Corporate Finance. McGraw-Hill Education, 11th edition.

- Zvi Bodie, Alex Kane & Alan J. Marcus (2013). Investments. McGraw-Hill Education, 10th edition.

- John C. Hull (2011). Options, Futures, and other Derivatives. Prentice Hall, 8th edition.

- John H. Cochrane (2005). Asset Pricing. Princeton University Press, revised edition.

- Darrell Duffie (2001). Dynamic Asset Pricing Theory. Princeton University Press, 3rd edition.

Computer Usage

- Requires programming

- May use any software package

- Python, R, Matlab recommended

- I will be using and teaching Python in class

- If you choose to use Python, the first homework will ask you to install Python on your computer.
    - Python 2 v.s. Python 3
    - Anaconda Python
    - https://www.anaconda.com/download/

Grading

- Homework (20%, 5-8 assignments in total)
    - Discussions encouraged
    - Complete independently
    - Late submissions will **NOT** be accepted
- Midterm Exam (30%)
- Final Exam (50%)
    - There will **NOT** be make-up exams

	Date	Time	Location
Midterm	**11/8/2017**	**13:00-14:50**	In Class
Final	**1/3/2018**	**14:00-16:00**	TBA

Academic Misconduct will lead to a score of zero on the particular paper and probably a grade of **Fail** for the course. The Dean's Office will be notified for further actions.

Financial Data

Data Types

- Cross-sectional data
- Time series data
- Panel Data (longitudinal data)
- Repeated cross-sectional data
- Pooled data
- Balanced data v.s. unbalanced data

Data in Finance

- Mostly deal with time series or panel data
- Both cross-sectional and time dimensions could be large
- Data availability is less of a problem
- Measurement error is usually small
- High frequency data
- Noisy