

**Economics 514**  
**Financial Economics**  
**Fall 2016**

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Office: 303b NJ Hall  
Hours: 2-3 MTh  
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**Learning Goals:**

Students will analyze the relationship between the real and financial sectors of the economy.

They will also develop statistical skills for understanding financial time series data, with an appreciation of the market structure behind the data generating mechanism.

**Course Motivation:**

The class will be run like a seminar with required student participation and presentations.

Articles with a – are older references or other papers not eligible for presentation. Articles marked with · may be presented in class.

**Optional Useful Texts:**

Cochrane, John H., (2005), *Asset Pricing*, 2nd ed. Princeton: Princeton U. Press.

de Jong, Frank and Barbara Rindi (2009), *The Microstructure of Financial Markets*, New York: Cambridge.

Lewis, Alan (2016), *Option Valuation Under Stochastic Volatility II*, New York: Finance Press.

**Requirements:**

(a) Class presentation (10%); (b) a final exam (30%); (c) Five data exercises (20%). (d) 10-15 page paper graded on content and presentation (40%).

**Skills:**

(a) Econometric software: You must be able to perform data exercises in R.

(b) Beamer: All class presentations must be done in Beamer, a LaTeX package for slide preparation.

**Data:**

I have created a class account on the Wharton Research Data Services (WRDS).

The login is: ec514 and password: FinaEc16.

(a) Center for Research in Security Prices (WRDS)

(b) New York Stock Exchange Trade and Quote (TAQ) Data (WRDS)

(c) Nasdaq Totalview Historical ITCH Datafeed. Will be provided by me.

## Agenda

| <b>5 classes</b> | <b>Unit 1</b> | <b>Topic</b>                  |
|------------------|---------------|-------------------------------|
| September 8      | 1(a)          | Macro Finance                 |
| September 12     | 1(a)          | Pricing Kernel                |
| September 15     | 1(a)          | Equity Premium                |
| September 19     |               | <b>Data Exercise #1</b>       |
| September 19     | 1(b)          | CAPM                          |
| September 22     | 1(b)          | Factor Models                 |
| September 26     |               | <b>Data Exercise #2</b>       |
|                  |               |                               |
| <b>5 classes</b> | <b>Unit 2</b> | <b>Topic</b>                  |
| September 26     | 2(b)          | Inventory                     |
| September 29     | 2(b)          | Asymmetric Information        |
| September 29     | 2(c)          | Spread Models                 |
| October 3        | 2(c)          | Level II                      |
| October 6        | 2(c)          | Order Book Models             |
| October 10       |               | <b>Data Exercise #3</b>       |
|                  |               |                               |
| <b>9 classes</b> | <b>Unit 3</b> | <b>Topic</b>                  |
| October 10       | 3(a)          | Market breakdowns             |
| October 13       | 3(a)          | HFT                           |
| October 17       | 3(a)          | Hidden liquidity              |
| October 21       | 3(a)          | Reg. NMS                      |
| October 24       |               | <b>Data Exercise #4</b>       |
| October 24       | 3(b)          | Treasury market               |
| October 27       | 3(b)          | Treasury market               |
| October 31       | 3(c)          | Commodities                   |
| November 3       | 3(c)          | Petroleum market              |
| November 7       | 3(c)          | Carbon market                 |
|                  |               |                               |
| <b>9 classes</b> | <b>Unit 4</b> | <b>Topic</b>                  |
| November 10      | 4(a)          | GARCH                         |
| November 10      | 4(a)          | Stochastic volatility         |
| November 14      | 4(a)          | Realized volatility and jumps |
| November 14      | 4(b)          | Binomial trees                |
| November 17      |               | <b>Data Exercise #5</b>       |
| November 17      | 4(b)          | Black Scholes/American puts   |
| November 21      | 4(b)          | OTC and microstructure        |
| November 22      | 4(c)          | Stochastic vol. and skew      |
| November 28      | 4(c)          | Implied PDFs                  |
| December 1       | 4(d)          | Credit default swaps          |
| December 5       | 4(d)          | CDOs                          |
| December 8       | 4(e)          | Financial crisis              |
| December 12      |               | Student presentations         |

## 1. The Standard Models

### (a) Consumption based models

- Bansal, Ravi and Amir Yaron (2004), "Risks for the long run: A potential resolution of asset pricing puzzles," *Journal of Finance* 59, 481-509.
- Constantinides, George and Anisha Ghosh (2011), "Asset pricing tests with long run risks in consumption growth," *Review of Asset Pricing Studies* 1, 96-136.
- Bansal, Ravi, Dana Kiku and Amir Yaron (2012), "An empirical evaluation of the long-run risks model for asset prices," *Critical Finance Review* 1, 183-221.
- Beeler, Jason and John Campbell (2012), "The long-run risks model and aggregate asset prices: an empirical assessment," *Critical Finance Review* 1, 141-182.
- Avramov, Doron and Scott Cederburg (2012), "Implications of Long-Run Risk for Asset Allocation Decisions," Netspar Discussion Paper 2012-011.
- Campbell, John Y., Stefano W. Giglio, Christopher Polk and Robert Turley (2015), "An intertemporal CAPM with stochastic volatility," CEPR Working Paper 10681.
- Cochrane, John H. (2016), "Macro finance," NBER Working Paper 22485.
- Li, Jun and Harold H. Zhang (2016), "Short-run and long-run consumption risks, dividend processes, and asset returns," *Review of Financial Studies*, forthcoming.

### (b) Factor models

- Fama, Eugene and Ken French (1996), "Multifactor explanations of asset pricing anomalies," *Journal of Finance* 51, 55-84.
- Pástor, Lubos and Robert Stambaugh (2003), "Liquidity risk and expected stock returns," *Journal of Political Economy* 111, 642-85.
- Acharya, Viral and Lasse Pedersen (2005), "Asset pricing with liquidity risk," *Journal of Financial Economics* 77, 375-410.
- Lewellen, Jonathan (2015), "The cross section of expected stock returns," *Critical Finance Review* 4, 1-44.
- Fama, Eugene and Ken French (2015), "A five-factor asset pricing model," *Journal of Financial Economics* 116, 1-22.
- Stambaugh, Robert F. and Yu Yuan (2015), "Mispricing factors," NBER Working Paper 21533.
- Harvey, Campbell R., Yan Liu and Heqing Zhu (2015), ". . . and the cross-section of expected returns," Duke University Working Paper, [ssrn.com/abstract=2249314](http://ssrn.com/abstract=2249314).

## 2. Market Microstructure

### (a) Surveys

- Madhavan, Ananth (2000), "Market microstructure: a survey," *Journal of Financial Markets* 3, 205-258.
- Biais, Bruno, Larry Glosten and Chester Spatt (2005), "Market microstructure: a survey of microfoundations, empirical results, and policy implications," *Journal of Financial Markets* 8, 217-264.
- Parlour, Christine and Duane Seppi (2008), "Limit order markets: a survey," *Handbook of Financial Intermediation & Banking*, Arnoud Boot and Anjan Thakor (eds), New York: Elsevier.

### (b) Theory

#### (i) Inventory models

- Stoll, Hans (1978), "The supply of dealer services in securities markets," *Journal of Finance*

33, 1133-51.

(ii) Asymmetric information

- Glosten, Larry and Paul Milgrom (1985), "Bid, ask and transaction prices in a specialist market with heterogeneously informed traders," *Journal of Financial Economics* 14, 71-100.
- Kyle, Albert S. (1985), "Continuous Auctions and Insider Trading," *Econometrica* 53, 1315-35.

(iii) Limit order books

- Biais, Bruno, David Martimort, and Jean-Charles Rochet (2000), "Competing mechanisms in a common value environment," *Econometrica* 68, 799-837
- Goettler, Ronald, Christine Parlour, and Uday Rajan (2005), "Equilibrium in a dynamic limit order market," *Journal of Finance* 60, 2149-92.
- Rosu, Ioanid (2009), "A dynamic model of the limit order book," *Review of Financial Studies* 22, 4601-4641.
- Cont, Rama and Arseniy Kukanov (2016), "Optimal order placement in limit order markets," *Quantitative Finance*, forthcoming, <https://arxiv.org/abs/1210.1625>.
- Shmuel Baruch and Lawrence R. Glosten (2016) "Strategic foundation for the tail expectation in limit order book markets," [ssrn.com/abstract=2770179](https://ssrn.com/abstract=2770179)

(c) Empirical Models

(i) Models of the spread

- Roll, Richard (1984), "A simple implicit measure of the effective bid-ask spread in an efficient market," *Journal of Finance* 39, 1127-1139.
- Glosten, Lawrence and Lawrence Harris (1988), "Estimating the components of the bid/ask spread," *Journal of Financial Economics* 21, 123-42.
- Madhavan, Ananth, Matthew Richardson, and Mark Roomans (1997), "Why do security prices change? A transaction-level analysis of NYSE stocks," *Review of Financial Studies* 10, 1035-1064.

(ii) Informed trading

- Easley, David, Nicholas Kiefer, Maureen O'Hara and Joseph Paperman (1996), "Liquidity, information, and infrequently traded stocks," *The Journal of Finance* 51, 1405-1436.

(iii) Limit order books

- Biais, Bruno, Pierre Hillion and Chester Spatt (1995), "An empirical analysis of the limit order book and the order flow in the Paris bourse," *Journal of Finance* 50, 1655-1689.
- Sandas, Patrick (2001), "Adverse selection and competitive market making: empirical evidence from a limit order market," *Review of Financial Studies* 14, 705-34.

(iv) Level II

- Engle, Robert and Andrew Patton (2004), "Impacts of trades in an error-correction model of quote prices," *Journal of Financial Markets* 7, 1-25.
- Mizrahi, Bruce, "The next tick on Nasdaq," *Quantitative Finance* 8, 2008, 19-40.

(v) Information Shares

- Hasbrouck, Joel (1995), "One security, many markets: determining the contribution to price discovery," *Journal of Finance* 50, 1175-99.
- Baillie, Richard, Geoffrey Booth, Yiuman Tse, and Tatyana Zobotina (2002), "Price discovery and common factor models," *Journal of Financial Markets* 5, 309-21.
- Frederic Harris, Thomas McInish, and Robert Wood (2002), "Security price adjustment across exchanges: an investigation of common factor components for Dow stocks," *Journal of Financial Markets* 5, 277-308.

- Yan, Bingcheng and Eric Zivot (2010), “A structural analysis of price discovery measures,” *Journal of Financial Markets* 13, 1-19.
- Grammig, Joachim and Franziska J. Peter (2013), “Telltale tails: A new approach to estimating unique market information shares,” *Journal of Financial and Quantitative Analysis* 48, 459-88.
- Lien, Donal and Zijun Wang (2016), “Estimation of market information shares: A comparison,” *The Journal of Futures Markets*, 1–17.

### 3. Market Structures

#### (a) Equities

##### (i) Market breakdowns

- U.S. Securities and Exchange Commission Report on the Flash Crash
- Easley, David, Marcos Lopez de Prado, and Maureen O’Hara (2011), “The microstructure of the ‘Flash crash’: flow toxicity, liquidity crashes and the probability of informed trading,” *The Journal of Portfolio Management* 37, 118-128.
- Andersen, Torben and Oleg Bondarenko (2014), “VPIN and the Flash Crash,” *Journal of Financial Markets* 17, 1–46.
- Gao, Cheng and Bruce Mizraich (2015), “Market quality breakdowns in equities,” *Journal of Financial Markets* 28, 2016, 1-23.

##### (ii) HFT

- U.S. Securities and Exchange Commission (2014), “Equity market structure literature review part II: high frequency trading.”

##### (ii.a) Theory

- Baruch, Shmuel and Lawrence Glosten (2013), “Fleeting orders,” [ssrn.com/abstract=2278457](https://ssrn.com/abstract=2278457).
- Biais, Bruno, Thierry Foucault, and Sophie Moinas (2013), “Equilibrium fast trading,” [ssrn.com/abstract=2024360](https://ssrn.com/abstract=2024360).

##### (ii.b) Empirical

- Menkveld, Albert (2013), “High frequency trading and the new-market makers,” *Journal of Financial Markets* 16, 712-40.
- Brogaard, Jonathan, Terence Hendershott, and Ryan Riordan (2014), “High frequency trading and price discovery,” *Review of Financial Studies* 27, 2267-2306
- Gao, Cheng and Bruce Mizraich (2016), “Quote stuffing and market quality,” Rutgers University Working Paper.

##### (iii) Hidden liquidity

- Cebiroğlu, Gökhan, Nikolaus Hautsch, and Ulrich Horst (2014), “Does hidden liquidity harm price efficiency? equilibrium exposure under latent demand,” [ssrn.com/abstract=2305171](https://ssrn.com/abstract=2305171).
- Zhu, Haoxiang (2014), “Do dark pools harm price discovery,” *Review of Financial Studies* 27, 747-789.
- Ready, Mark (2014), “Determininants of dark pool volume,” U. Wisconsin Working Paper.

##### (iv) Current Issues in Market Structure

- White, Mary Jo (2014), “Enhancing Our equity market structure,” Remarks at Sandler O’Neill & Partners, L.P. Global Exchange and Brokerage Conference, June 5, 2014
- U.S. Securities and Exchange Commission (2014), “Equity market structure literature review part I: fragmentation.”

#### (b) Treasury market

- Brandt, Michael and Kenneth Kavajecz (2004), “Price discovery in the U.S. Treasury market: the impact of Order Flow and Liquidity on the Yield Curve,” *Journal of Finance* 59, 2623-54.

- Caporale, Guglielmo Maria and Alessandro Girardi (2013), “Price discovery and trade fragmentation in a multi-market environment: evidence from the MTS System,” *Journal of Banking and Finance* 37, 227-240.
- Duffie, Darrell and Haoxiang Zhu (2015), “Size discovery,” NBER Working Paper #21696.
- Joint Staff Report (2015), “The U.S. treasury market on October 15, 2014,” Dept. of Treasury.
- Fleming, Michael, Bruce Mizrach and Giang Nguyen (2016), “The microstructure of a Treasury ECN: the BrokerTec platform,” Federal Reserve Bank of New York Working Paper.
- (c) Commodities
  - (i) Metals
    - Chinn, Menzie and Olivier Coibon (2014), “The predictive content of commodity futures,” *Journal of Futures Markets* 34, 607–636.
    - Ing-Haw Cheng and Wei Xiong (2014), “Financialization of Commodity Markets,” *Annu. Rev. Financ. Econ* 6, 419–41.
  - (ii) Petroleum
    - Ederington, Louis, Chitru Fernando, Kateryna Holland, Thomas Lee (2012), “Financial trading, spot oil prices, and inventory: evidence from the U.S. crude oil market,” U. of Oklahoma Working Paper.
    - Li, Yang, Bruce Mizrach and Yoichi Otsubo, (2014), “Location basis differentials in oil prices,” Rutgers University Working Paper.
  - (iii) Greenhouse gases
    - Mizrach, Bruce and Yoichi Otsubo (2014), “ The market microstructure of the European Climate Exchange,” *Journal of Banking and Finance* 39, 107-16.
- (d) Foreign exchange
  - Karnaukhm, Nina, Angelo Ranaldo and Paul Söderlind (2015), “Understanding FX liquidity,” *Review of Financial Studies*, forthcoming.

#### 4. Volatility Models and Derivatives

- (a) Volatility models
  - (i) GARCH
    - Bollerslev, Tim (1986). “Generalized autoregressive conditional heteroskedasticity,” *Journal of Econometrics* 31, 307–327.
    - Baillie, Richard, Tim Bollerslev and Hans Ole Mikkelsen (1996), “Fractionally integrated generalized autoregressive conditional heteroskedasticity,” *Journal of Econometrics* 74, 3-30.
  - (ii) Realized volatility and jumps
    - Barndorff-Nielsen, Ole, Peter Hansen, Asger Lunde and Neil Shephard (2009) “Realised kernels in practice: trades and quotes,” *Econometrics Journal* 12, C1-C32.
    - Ait-Sahalia, Yacine, Per Mykland and Lan Zhang (2011), “Ultra high frequency volatility estimation with dependent microstructure noise,” *Journal of Econometrics* 160, 190-203.
    - Kapetanios, George, Michael Neumann, and George Skiadopoulos (2014), “Jumps in option prices and their determinants: Real time evidence from the E-mini S&P 500 option market,” Queen Mary University Working Paper.
    - Bollerslev, Tim, Andrew J. Patton and Rogier Quaadvlieg (2015), “Exploiting the errors: A simple approach for improved volatility forecasting,” *Journal of Econometrics*, forthcoming.
- (b) Options
  - (i) Binomial trees
    - Cox, John, Stephen Ross, and Mark Rubenstein, “Option pricing: a simplified approach,”

*Journal of Financial Economics* 7, 229-63.

(ii) Black-Scholes

- Black, Fisher and Myron Scholes (1973) "The pricing of options and corporate liabilities," *Journal of Political Economy* 81, 637-54.

(c) Beyond Black-Scholes

(i) Volatility smile and skew

- Heston, Steven (1993) "A closed-form solution for options with stochastic volatility with applications to bond and currency options," *Review of Financial Studies* 6, 327-43.
- Carr, Peter and Liuren Wu (2001) "Time-changed Levy processes and option pricing," *Journal of Financial Economics* 71, 113-141.

· Huang, Darien and Ivan Shaliastovich (2014), "Volatility-of-volatility risk," <http://papers.ssrn.com/sol3/pap>

(ii) Implied probability densities

- Mizraeh, B. (2010), "Recovering probabilistic information from options prices and the underlying," in Cheng-few Lee and Alice C. Lee (eds.), *Handbook of Quantitative Finance and Risk Management*, New York: Springer-Verlag, 2010, 515-29.
- Kitsul, Yuriy and Jonathan Wright (2012), "The economics of options-implied inflation probability density functions," NBER Working Paper No. 18195.

(d) Credit derivatives

(i) Credit default swaps

- Carr, Peter and Liuren Wu (2010), "Stock options and credit default swaps: a joint framework for Valuation and Estimation," *Journal of Financial Econometrics* 8, 409-49.

(ii) CDOs and structured finance

- Li, David (2000), "On default correlation: a copula function approach," *Journal of Fixed Income* 9, 43-54.
- Gordy, Michael (2003), "A risk-factor model foundation for ratings-based bank capital rules," *Journal of Financial Intermediation* 12, 199-232.
- Krekel, Martin and Jan Partenheimer (2013), "The implied loss surface of CDOs," *Wilmott Magazine*, 94-103.