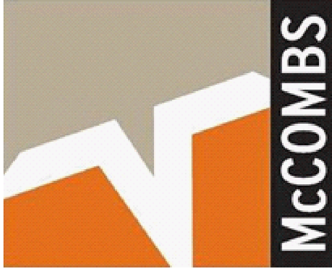

Finance 395

Asset Pricing Theory

Spring 2017

Tuesday 2:00 - 5:00pm GSB 5.154

Instructor

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Overview

This course is meant to be an introduction to the theory of asset pricing, and is intended for first-year PhD students in finance. We will discuss a wide range of topics ranging from no arbitrage, state prices, consumption-based asset pricing, and factor models to more special topics including heterogeneous agent models, asymmetric information, behavioral finance, and macrofinance. Though the course will emphasize static and discrete-time frameworks, we will also cover some of the basics of continuous-time.

Textbooks

Textbooks are recommneded as supplementary material but are not required. Toward the topics portion of the course, more emphasis will be placed on certain papers from the reading list.

- Campbell, John Y. and Luis M. Viceira, Strategic Asset Allocation: Portfolio Choice for Long-Term Investors, Oxford University Press, 2002
- Cochrane, John H., Asset Pricing, Princeton University Press, revised ed., 2005
- Duffie, Darrel, Dynamic Asset Pricing Theory, Third Edition, Princeton University Press, 2001
- Skiadas, Costis Asset Pricing Theory, Princeton University Press, 2009

Course Requirements and Grades

The overall grade is calculated based on the following weighting scheme:

Midterm (25%), Final Exam (25%), Homework (20%), Research Assignment (15%), Participation (15%)

Midterm

There will be a midterm in class on Tuesday March 7. No textbooks, formula sheets, or calculators will be allowed for the exam.

Homework

There will be weekly homework assignments of up to 5 problems. These can be found at the end of each set of lecture notes. You are responsible for completing at least 3 problems to receive credit for the assignment. Completing more than three will increase likelihood of receiving a ✓+ instead of a ✓. Homeworks are due at the beginning of the following class.

Research Assignment

At the final day of class, there will be a three page (double-spaced, size 12 font) paper due that describes a research project that could be undertaken in asset pricing theory. The goal is

to motivate a research idea, based on a topic we saw in the course, conduct a short literature review, and write down a preliminary theoretical model and its asset pricing implications. You are encouraged to talk with the teaching assistant about potential topics once we reach the topics section of the course. It is difficult to construct a novel mechanism, especially given the short length of the paper, so ideally one would find an application of one of the models we discuss in explaining some empirical phenomenon.

Appeal Policy

Since the teaching assistant will grade all weekly assignments and exams, all appeals of grades should first be addressed to the teaching assistant in writing within one week. Appeals of research assignments should be addressed to the instructor. Verbal appeals will not be accepted, and you must provide a written statement about where and why there is a problem. Please note that we reserve the right to regrade the entire exam or assignment as part of the regrade process. Exams or assignments written in pencil cannot be regraded.

Tentative Syllabus

1. Mathematical Preliminaries
a. Notation
b. Linear Algebra and Projection Theory
c. Information and Random Variables
d. Static and Dynamic Optimization
f. Continuous-time Basics
g. Campbell-Viceira approximation

2. Utility Theory and Choice Under Uncertainty
a. utility theory and risk aversion
b. standard preferences in finance
c. Rabin critique

3. Fundamentals of Asset Pricing and Present Value Analysis
a. Lucas Tree model
b. Euler Equations, risk premia, and compensation for systematic risk
c. Gordon Growth Dividend Discount Model

d. Campbell-Shiller Decomposition

4. State Prices and the Stochastic Discount Factor

a. No arbitrage and state prices

b. Complete markets and risk-neutral measure

c. Incomplete Markets

d. Hansen-Jagannathan Bound

e. Change of numeraire

f. Recovering probabilities from prices

5. Portfolio Choice

a. Static portfolio choice

b. Mean-variance frontier, Market portfolio, Global Minimum Variance portfolio, two-fund separation theorem

c. CAPM

d. Extensions to Lack of a riskfree asset, labor income, and conditional CAPM

e. APT and Factor Models

f. Intertemporal portfolio choice

g. Discrete-Time Martingale Method and Dynamic Programming

6. Consumption-Based Asset Pricing

a. Revisting the Lucas Tree Model

b. Equity Premium Puzzle

c. Habit Formation

d. Long-Run Risk, Epstein-Zin preferences, and Stochastic Volatility

e. Rare Disasters

f. Ambiguity Aversion and Hansen and Sargent Robust Control

7. Heterogeneous Agent Models

8. Production-based Asset Pricing

9. Behavioral Finance and Bubbles

10. Macro Finance

11. Asymmetric Information and Market Microstructure

12. Limits to Arbitrage

13. Miscellaneous

Potential topics include Bonds, Commodities, Bubbles, Options, Indices, and Networks

Readings

1. Mathematical Preliminaries

Campbell and Viceira Section 2.1.3.

Duffie Chapters 3-4

Genotte, Gerard (1986), Optimal Portfolio Choice Under Incomplete Information, Journal of Finance, 41, 733-746.

2. Utility Theory and Choice Under Uncertainty

Arrow, Kenneth (1971), The Theory of Risk Aversion, in Essays in the Theory of Risk Bearing, Markham.

Pratt, John W. (1964), Risk Aversion in the Small and in the Large, Econometrica, 32, 122-136.

Rabin, Matthew (2000), Risk Aversion and Expected Utility Theory: A Calibration Theorem, Econometrica, 68, 1281-1292.

Rothschild, Michael and Joseph E. Stiglitz (1970), Increasing Risk I: A Definition, Journal of Economic Theory, 2, 225-243.

3. Fundamentals of Asset Pricing

Duffie Chapters 3 & 4

Lucas, Robert E. (1978), Asset Prices in an Exchange Economy, Econometrica 46, 1429-1445.

Breeden, Douglas (1979), An Intertemporal Asset Pricing Model with Stochastic Consumption and Investment Opportunities, Journal of Financial Economics 7, 265-296.

Campbell, John Y. and Robert J. Shiller (1988), The Dividend-Price Ratio and Expectations of Future Dividends and Discount Rates, Review of Financial Studies 1, 195-228.

4. State Prices, the Stochastic Discount Factor, and Present Value Relations

Cochrane Chapters 3-4, 6-8, and Section 20.2

Cochrane chapters 5 & 9

Hansen, Lars Peter and Ravi Jagannathan (1991), Implications for Security Market Data for Models of Dynamic Economies, Journal of Political Economy 99, 225-262.

Roll, Richard (1976), A Critique of Asset Pricing Theory's Tests: Part 1, Journal of Financial Economics 4, 129-176.

Ross, Stephen A. (1976), The Arbitrage Theory of Capital Asset Pricing, Journal of Economic Theory 13, 341-360.

Ross, Stephen A. (2015), The Recovery Theorem, Journal of Finance 70, 615-648.

5. Portfolio Choice

Cambell and Viceira Chapters 2-4, Section 6.1.1

Cochrane chapters 5 & 9

Black, Fisher (1972), Capital Market Equilibrium with Restricted Borrowing, Journal of Business 45, 444-454.

Cox, John C. and Chi-fu Huang (1989), Optimal Consumption and Portfolio Policies when Assets Follow a Diffusion Process, Journal of Economic Theory 49, 33-83.

Fama, Eugene F. and Kenneth R. French (1993), Common Risk Factors in the Returns on Stocks and Bonds, Journal of Financial Economics 33, 3-56.

Fama, Eugene F. and Kenneth R. French (1996), Multifactor Explanations of Asset Pricing Anomalies, Journal of Finance 51, 55-84.

Lintner, John (1965), The Valuation of Risky Asset and the Selection of Risky Investments in Stock Portfolios and Capital Budgets, Review of Economics and Statistics 47, 13-37.

Lewellen, Jonathan and Stefan Nagel (2006), The Conditional CAPM Does Not Explain Asset-Pricing Anomalies, Journal of Financial Economics 82, 289-314.

Markowitz, Harry (1952), Portfolio Selection, Journal of Finance 7, 77-91.

Merton, Robert (1973), An Intertemporal Capital Asset Pricing Model, Econometrica 41, 867-887.

Sharpe, William (1964), Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk, Journal of Finance 19, 425-442.

6. Consumption-Based Asset Pricing

Abel, Andrew B. (1990), Asset Prices Under Habit Formation and Catching Up with the Joneses, American Economic Review 2, 38-42.

Barro, Robert J. (2006), Rare Disasters and Asset Markets in the Twentieth Century, Quarterly Journal of Economics 121, 823-866.

Bansal, Ravi and Amir Yaron (2004), Risk for the Long Run: a Potential Resolution of Asset Pricing Puzzles, Journal fo Finance 59, 1481-1509.

Campbell, John Y. and John C. Cochrane (1999), By Force of Habit: A Consumption-Based Explanation of Aggregate Stock Market Behavior, Journal of Political Economy 107, 205-251.

Constantinides, George (1990), Habit Formation: A Resolution of the Equity Premium Puzzle, Journal of Political Economy 98, 519-543.

Epstein, Larry G. and Martin Schneider (2008), Ambiguity, Information Quality, and Asset Pricing, Journal of Finance, 63, 197-228.

Epstein, Larry G. and Stanley E. Zin (1989), Substitution, Risk Aversion, and the Temporal Behavior of Consumption and Asset Returns, a Theoretical Framework, Econometrica 57, 937-969.

Hansen, Lars Peter and Thomas J. Sargent (2008), Risk Sensitivity, Model Uncertainty, and Asset Pricing, Chapter 14 in Robustness, Princeton University Press.

Jagganathan, Ravi and Zhenyu Wang (1996), The Conditional CAPM and the Cross-Section of Expected Returns, Journal of Finance 51, 3-53.

Kocherlakota, Narayana R. (1996), The Equity Premium: It's Still a Puzzle, Journal of Economic Literature, 34, 42-71.

Lettau, Martin and Sydney Ludvigson (2001), Consumption, Aggregate Wealth, and Expected Stock Returns, Journal of Finance 56, 815-849.

Mehra, Rajnish and Edward C. Prescott (1985), The Equity Premium: A Puzzle?, Journal of Monetary Economics 15, 145-161.

Mehra, Rajnish and Edward C. Prescott (1988), The Equity Premium: A Solution?, Journal of Monetary Economics 22, 133-136.

Wachter, Jessica (2011), Can Time-Varying Risk of Rare Disasters Explain Aggregate Stock Market Volatility, Journal of Finance, 2013, 987-1035.

Weil, Philippe (1989), The Equity Premium Puzzle and the Risk-free Rate Puzzle, Journal of Monetary Economics 24, 401-421.

7. Heterogeneous Agent Models

8. Production-based Asset Pricing

9. Behavioral Finance and Bubbles

Alpert, Marc, and Howard Raiffa. "A progress report on the training of probability assessors." (1982).

Ang, Andrew, et al. "The cross?section of volatility and expected returns." The Journal of Finance 61.1 (2006): 259-299. APA

Asness, Clifford S., Tobias J. Moskowitz, and Lasse Heje Pedersen. "Value and momentum everywhere." The Journal of Finance 68.3 (2013): 929-985.

Barber, Brad M., and Terrance Odean. "Trading is hazardous to your wealth: The common stock investment performance of individual investors." The journal of Finance 55.2 (2000): 773-806.

Barberis, Nicholas, and Ming Huang. "Mental accounting, loss aversion, and individual stock returns." The Journal of Finance 56.4 (2001): 1247-1292.

Barberis, Nicholas, and Wei Xiong. "Realization utility." Journal of Financial Economics 104.2 (2012): 251-271.

Barberis, Nicholas, and Wei Xiong. "What Drives the Disposition Effect? An Analysis of a Long?Standing Preference?Based Explanation." the Journal of Finance 64.2 (2009): 751-784.

Barberis, Nicholas, Andrei Shleifer, and Jeffrey Wurgler. "Comovement." Journal of Financial Economics 75.2 (2005): 283-317.

Barberis, Nicholas, Andrei Shleifer, and Robert Vishny. "A model of investor sentiment." Journal of financial economics 49.3 (1998): 307-343.

Barberis, Nicholas, et al. "X-CAPM: An extrapolative capital asset pricing model." Journal of Financial Economics 115.1 (2015): 1-24.

Barberis, Nicholas, et al. Extrapolation and bubbles. No. w21944. National Bureau of Economic Research, 2016.

Benartzi, Shlomo. "Excessive extrapolation and the allocation of 401 (k) accounts to company stock." The Journal of Finance 56.5 (2001): 1747-1764.

Benartzi, Shlomo, and Richard H. Thaler (1995), Myopic loss aversion and the equity premium puzzle. Quarterly Journal of Economics 110(1), (1995): 73-92.

Berk, Jonathan B., Richard C. Green, and Vasant Naik. "Optimal investment, growth options, and security returns." The Journal of Finance 54.5 (1999): 1553-1607.

Bernard, Victor L., and Jacob K. Thomas. "Post-earnings-announcement drift: delayed price response or risk premium?." Journal of Accounting research (1989): 1-36.

Bondt, Werner FM, and Richard Thaler. "Does the stock market overreact?." The Journal of finance 40.3 (1985): 793-805.

Campbell, John Y., and John H. Cochrane. By force of habit: A consumption-based explanation of aggregate stock market behavior. The Journal of political Economy 107.2 (1999): 205-251

Campbell, John Y., Jens Hilscher, and Jan Szilagyi. "In search of distress risk." The Journal of Finance 63.6 (2008): 2899-2939.

Chan, Louis KC, Jason Karceski, and Josef Lakonishok. "The level and persistence of growth rates." The Journal of Finance 58.2 (2003): 643-684.

Chen, Joseph, Harrison Hong, and Jeremy C. Stein. "Breadth of ownership and stock returns." Journal of financial Economics 66.2 (2002): 171-205.

Cochrane, John H. A cross-sectional test of a production-based asset pricing model. No. w4025. National bureau of economic research, 1992.

Cooper, Michael J., Roberto C. Gutierrez, and Allaudeen Hameed. "Market states and momentum." The Journal of Finance 59.3 (2004): 1345-1365.

Cox, John C., and Chi-fu Huang. "Optimal consumption and portfolio policies when asset prices follow a diffusion process." Journal of economic theory 49.1 (1989): 33-83.

Curcuru, Stephanie, et al. "Heterogeneity and portfolio choice: Theory and evidence." Handbook of financial econometrics 1 (2004): 337-382.

Daniel, Kent, David Hirshleifer, and Avanidhar Subrahmanyam. "Investor psychology and security market under?and overreactions." the Journal of Finance 53.6 (1998): 1839-1885.

Datar, Vinay T., Narayan Y. Naik, and Robert Radcliffe. "Liquidity and stock returns: An alternative test." Journal of Financial Markets 1.2 (1998): 203-219.

Dhar, Ravi, and Ning Zhu. "Up close and personal: Investor sophistication and the disposition effect." Management Science 52.5 (2006): 726-740.

Diether, Karl B., Christopher J. Malloy, and Anna Scherbina. "Differences of opinion and the cross section of stock returns." The Journal of Finance 57.5 (2002): 2113-2141.

Dimson, Elroy, Paul Marsh, and Mike Staunton. Triumph of the optimists: 101 years of global investment returns. Princeton University Press, 2009.

Fama, Eugene F., and James D. MacBeth. "Risk, return, and equilibrium: Empirical tests." The journal of political economy (1973): 607-636.

Fama, Eugene F., and Kenneth R. French. "Multifactor explanations of asset pricing anomalies." The journal of finance 51.1 (1996): 55-84.

Fama, Eugene F., and Kenneth R. French. "The cross-section of expected stock returns." the Journal of Finance 47.2 (1992): 427-465.

Frazzini, Andrea, and Lasse Heje Pedersen. "Betting against beta." Journal of Financial Economics 111.1 (2014): 1-25.

French, Kenneth R., and James M. Poterba. Investor diversification and international equity markets. No. w3609. National Bureau of Economic Research, 1991.

Froot, Kenneth A., and Emil M. Dabora. "How are stock prices affected by the location of trade?." Journal of Financial economics 53.2 (1999): 189-216.

Gervais, Simon, Ron Kaniel, and Dan H. Mingelgrin. "The high?volume return premium." The Journal of Finance 56.3 (2001): 877-919.

Glaeser, Edward L., and Charles G. Nathanson. An extrapolative model of house price dynamics. No. w21037. National Bureau of Economic Research, 2015.

Glaeser, Edward L., Joseph Gyourko, and Albert Saiz. "Housing supply and housing bubbles." Journal of urban Economics 64.2 (2008): 198-217.

Greenwood, Robin, and Andrei Shleifer. "Expectations of returns and expected returns." Review of Financial Studies 27.3 (2014): 714-746.

Gul, Faruk. "A theory of disappointment aversion." Econometrica: Journal of the Econometric Society (1991): 667-686.

Harrison, J. Michael, and David M. Kreps. "Speculative investor behavior in a stock market with heterogeneous expectations." The Quarterly Journal of Economics (1978): 323-336.

Hong, Harrison, and David A. Sraer. "Speculative betas." The Journal of Finance (2016).

Hong, Harrison, and Jeremy C. Stein. "A unified theory of underreaction, momentum trading, and overreaction in asset markets." The Journal of Finance 54.6 (1999): 2143-2184.

Hong, Harrison, Jose Scheinkman, and Wei Xiong. "Asset float and speculative bubbles." The journal of finance 61.3 (2006): 1073-1117.

Hong, Harrison, Terence Lim, and Jeremy C. Stein. "Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies." The Journal of Finance 55.1 (2000): 265-295.

Jegadeesh, Narasimhan, and Sheridan Titman. "Returns to buying winners and selling losers: Implications for stock market efficiency." The Journal of finance 48.1 (1993): 65-91.

Kahneman, Daniel, and Amos Tversky. "On the psychology of prediction." Psychological review 80.4 (1973): 237.

Kahneman, Daniel, and Amos Tversky. "Subjective probability: A judgment of representativeness." Cognitive psychology 3.3 (1972): 430-454.

Koijen, Ralph, Mark Schmeling, and Evert B. Vrugt (2014), Survey Expectations of Returns and Asset Pricing Puzzles, Working Paper NYU Stern, Cass Business School, and University of Amsterdam.

Laibson, David. "Golden eggs and hyperbolic discounting." The Quarterly Journal of Economics (1997): 443-477.

Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny. "Contrarian investment, extrapolation, and risk." The Journal of Finance 49.5 (1994): 1541-1578.

Lamont, Owen A., and Richard H. Thaler. "Anomalies: The law of one price in financial markets." The Journal of Economic Perspectives 17.4 (2003): 191-202.

Lee, Charles, and Bhaskaran Swaminathan. "Price momentum and trading volume." the Journal of Finance 55.5 (2000): 2017-2069.

LeRoy, Stephen F., and Charles J. LaCivita. "Risk aversion and the dispersion of asset prices." Journal of Business (1981): 535-547.

Mankiw, N. Gregory, and Stephen P. Zeldes. "The consumption of stockholders and non-stockholders." Journal of financial Economics 29.1 (1991): 97-112.

Mehra, Rajnish, and Edward C. Prescott. "The equity premium: A puzzle." Journal of monetary Economics 15.2 (1985): 145-161.

Mei, Jianping, Jose Scheinkman, and Wei Xiong. Speculative trading and stock prices: Evidence from Chinese AB share premia. No. w11362. National Bureau of Economic Research, 2005.

Miller, Edward M. "Risk, uncertainty, and divergence of opinion." The Journal of finance 32.4 (1977): 1151-1168.

Odean, Terrance. "Are investors reluctant to realize their losses?." The Journal of finance 53.5 (1998): 1775-1798.

Pindyck, Robert S., and Julio J. Rotemberg. "The comovement of stock prices." The Quarterly Journal of Economics (1993): 1073-1104.

Pindyck, Robert S., and Julio J. Rotemberg. "The excess co-movement of commodity prices." The Economic Journal, Vol. 100, No. 403. (Dec., 1990), pp. 1173-1189.

Scheinkman, Jose A., and Wei Xiong. "Overconfidence and speculative bubbles." Journal of political Economy 111.6 (2003): 1183-1220.

Segal, Uzi, and Avia Spivak. "First order versus second order risk aversion." Journal of Economic Theory 51.1 (1990): 111-125.

Shiller, Robert J. "Do stock prices move too much to be justified by subsequent changes in dividends?." (1980).

Thaler, Richard H., and Eric J. Johnson. "Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice." Management science 36.6 (1990): 643-660.

Thaler, Richard. "Toward a positive theory of consumer choice." Journal of Economic Behavior & Organization 1.1 (1980): 39-60.

The Econometrics of Financial Markets. Campbell, John Y., Andrew W. Lo and A. Craig MacKinlay. Princeton, NJ: Princeton University Press, 1996.

Tversky, Amos, and Daniel Kahneman. "Advances in prospect theory: Cumulative representation of uncertainty." Journal of Risk and uncertainty 5.4 (1992): 297-323.

Tversky, Amos, and Daniel Kahneman. "Judgment under uncertainty: Heuristics and biases." Utility, probability, and human decision making. Springer Netherlands, 1975. 141-162.

Weil, Philippe. "The equity premium puzzle and the risk-free rate puzzle." Journal of Monetary Economics 24.3 (1989): 401-421.

Zhang, Lu. "The value premium." The Journal of Finance 60.1 (2005): 67-103.

10. Macro Finace

Acemoglu, Daron, Asuman Ozdaglar, and Alireza Tahbaz-Salehi. Systemic Risk and Stability in Financial Networks. AER 105(2), 564-608.

Acharya, Viral V., Lars A. Lochstoer, and Tarun Ramadorai. "Limits to arbitrage and hedging: Evidence from commodity markets." Journal of Financial Economics 109.2 (2013): 441-465.

Adrian, Tobias and Hyun Song Shin (2010), Liquidity and Leverage, Journal of Financial Intermediation 19(3), 418-437.

Adrian, Tobias and Nina Boyarchenko (2015), Intermediary Leverage Cycles and Financial Stability, FRBNY Staff Report No. 567.

Adrian, Tobias, Emanuel Moench, and Hyun Song Shin. "Dynamic leverage asset pricing." New York Staff Reports 625 (2013).

Adrian, Tobias, Emmanuel Moench, and Hyun Song Shin (2010), Financial Intermediation, Asset Prices, and Macroeconomic Dynamics Federal Reserve Bank of New York Staff Report 422.

Adrian, Tobias, Erkko Etula, and Tyler Muir. "Financial Intermediaries and the Cross?Section of Asset Returns." The Journal of Finance 69.6 (2014): 2557-2596.

Aiyagari, S Rao. 1994. "Uninsured Idiosyncratic Risk and Aggregate Saving." The Quarterly Journal of Economics, 109(3): 659–84.

Allen, Franklin and Douglas Gale (1998) "Optimal Financial Crises," Journal of Finance, 53, 1245-1284.

Allen, Franklin and Douglas Gale (2000), Financial Contagion,Journal of Political Economy 108,1-33.

Allen, Franklin, and Douglas Gale. "Financial intermediaries and markets." Econometrica 72.4 (2004): 1023-1061.

Alvarez, Fernando, and Urban J. Jermann. "Quantitative asset pricing implications of endogenous solvency constraints." Review of Financial Studies 14.4 (2001): 1117-1151.

Babus, Ana. "The formation of financial networks." The RAND Journal of Economics 47.2 (2016): 239-272.

Baker, Scott R., Nicholas Bloom, and Steven J. Davis. Measuring economic policy uncertainty. No. w21633. National Bureau of Economic Research, 2015.

Beaudry, Paul, and Franck Portier. "Stock prices, news, and economic fluctuations." The American economic review 96.4 (2006): 1293-1307.

Bengt Holmström and Jean Tirole. Private and public supply of liquidity. Journal of Political Economy, 106(1):1–40, February 1998.

Bernanke, Ben S., Mark Gertler, and Simon Gilchrist. "The financial accelerator in a quantitative business cycle framework." Handbook of macroeconomics 1 (1999): 1341-1393.

Bernanke, Ben, and Mark Gertler. "Agency costs, net worth, and business fluctuations." The American Economic Review (1989): 14-31.

Bewley, Truman. 1986. "Stationary Monetary Equilibrium with a Continuum of Independently Fluctuating Consumers." In Contributions to Mathematical Economics in Honor of Gerard Debreu, ed. Werner Hildenbrand and Andreu Mas-Collel. Amsterdam:North Holland.

Blanchard, Olivier J. "Debt, deficits and finite horizons." Journal of Political Economy 93(2) (1984), 223-247.

Bloom, Nicholas. "The impact of uncertainty shocks." Econometrica 77.3 (2009): 623-685.

Boyarchenko, Nina (2014), Information Acquisition and Financial Intermediation, FRBNY Staff Report No. 571.

Brunnermeier, Markus K, and Yuliy Sannikov. "A Macroeconomic Model with a Financial Sector". American Economic Review 104.2 (2014)

Brunnermeier, Markus, Thomas Eisenbach, and Yuliy Sannikov. "Macroeconomics with Financial Frictions: A Survey, Advances in Economics and Econometrics." Tenth World Congress of the Econometric Society, New York. 2013.

Buffa, Andrea M., Dimitri Vayanos, and Paul Woolley. Asset management contracts and equilibrium prices. No. w20480. National Bureau of Economic Research, 2014.

Caballero, R. and A. Simsek (2013), "Fire Sales in a Model of Complexity,"Journal of Finance, Volume 68-6, p.2549-2587

Cao, Dan (2013) Speculation and Financial Wealth Distribution under Belief Heterogeneity, working paper Georgetown University.

Carlstrom, C. T., and T. S. Fuerst (1997): “Agency Costs, Net Worth, and Business Fluctuations: A Computable General Equilibrium Analysis,” American Economic Review, 87(5), 893–910.

Cheng, Haw, Andrei Kirilenko, and Wei Xiong. "Convective risk flows in commodity futures markets." Review of Finance (2014): rfu043.

Croce, Maximiliano M., et al. "Fiscal policies and asset prices." Review of Financial Studies 25.9 (2012): 2635-2672.

Croce, Maximiliano M., Howard Kung, Thien T. Nguyen, and Lukas Scmid (2012), Fiscal Policies and Asset Prices, Review of Financial Studies, 25, 2635-2672.

Croce, Maximiliano M., Thien T. Nguyen, and Lukas Scmid (2012), The Market Price of Fiscal Uncertainty, Journal of Monetary Economics 59, 401-416.

De Meza, David, and David C. Webb. "Too much investment: a problem of asymmetric information." The quarterly journal of economics (1987): 281-292.

Detemple, Jerome, and Shashidhar Murthy. "Intertemporal asset pricing with heterogeneous beliefs." Journal of Economic Theory 62.2 (1994): 294-320.

Diamond, Douglas W., and Philip H. Dybvig. "Bank runs, deposit insurance, and liquidity." The journal of political economy (1983): 401-419.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl (2016), A model of monetary policy and risk premia, working paper, NYU Stern.

Dumas, Bernard, 1989. “Two-Person Dynamic Equilibrium in the Capital Market.” The Review of Financial Studies. 2 (2): 157–188.

Egan, Mark, Ali Hortaçsu, and Gregor Matvos. "Deposit competition and financial fragility: Evidence from the us banking sector." Fama-Miller Working Paper (2015): 15-33.

Egan, Mark, Stefan Lewellen, and Adi Sunderam (2016), The Cross Section of Bank Value, working paper University of Minnesota, LBS, and HBS.

Eggertsson, Gauti and Paul Krugman (2012), Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach, Quarterly Journal of Economics, 127(3), 1469-1513.

Etula (2013), Broker-Dealer Risk Appetite and Commodity Returns Journal of Financial Econometrics 11 (3): 486-521

Farboodi, Maryam. "Intermediation and voluntary exposure to counterparty risk." Available at SSRN 2535900 (2014).

Favilukis, Jack, Sydney C. Ludvigson, and Stijn Van Nieuwerburgh. Foreign ownership of US safe assets: good or bad?. No. w19917. National Bureau of Economic Research, 2014.

Fisher, Irving. "The debt-deflation theory of great depressions." Econometrica: Journal of the Econometric Society (1933): 337-357.

Fostel, Ana, and John Geanakoplos. "Collateral restrictions and liquidity under-supply: a simple model." Economic Theory 35.3 (2008): 441-467.

Geanakoplos, John. "The Leverage Cycle." In D. Acemoglu, K. Rogoff and M. Woodford, eds., NBER Macroeconomic Annual 2009, vol. 24: 1-65, University of Chicago Press, 2010

Gennaioli, Nicola, Andrei Shleifer, and Robert W. Vishny. "A model of shadow banking." The Journal of Finance 68.4 (2013): 1331-1363.

Gertler, Mark and Nobuhiro Kiyotaki (2010), Financial Intermediation and Credit Policy in Business Cycle Analysis, Handbook of Monetary Economics Volume 3, Pages 3-1520, I1-I77 (2010), Edited by Benjamin M. Friedman and Michael Woodford.

Gertler, Mark, Nobuhiro Kiyotaki, and Andrea Prestipino. Wholesale Banking and Bank Runs in Macroeconomic Modelling of Financial Crises. No. w21892. National Bureau of Economic Research, 2016.

Gilchrist, Simon, and Egon Zakrajšek. "Credit spreads and business cycle fluctuations." The American Economic Review 102.4 (2012): 1692-1720.

Gilchrist, Simon, Jae W. Sim, and Egon Zakrajšek. Uncertainty, financial frictions, and investment dynamics. No. w20038. National Bureau of Economic Research, 2014.

Gilchrist, Simon, Vladimir Yankov, and Egon Zakrajsek. "Credit market shocks and economic fluctuations: Evidence from corporate bond and stock markets." Journal of monetary Economics 56.4 (2009): 471-493.

Gorton, Gary, and Guillermo Ordoñez. "Collateral crises." The American Economic Review 104.2 (2014): 343-378.

He, Zhiguo and Arvind Krishnamurthy (2014), A Macroeconomic Framework for Quantifying Systemic Risk, working paper Chicago Booth and Stanford University.

He, Zhiguo and Wei Xiong (2012), Dynamic Debt Runs, Review of Financial Studies 25, 1799-1843.

He, Zhiguo, and Arvind Krishnamurthy. "Intermediary asset pricing." The American Economic Review 103.2 (2013): 732-770.

He, Zhiguo, Arvind Krishnamurthy, and Konstantin Milbradt. A model of the reserve asset. No. 3279. 2015.

Hermes, Niels, and Robert Lensink. "Capital flight and the uncertainty of government policies." Economics letters 71.3 (2001): 377-381.

Holmstrom, Bengt, and Jean Tirole. "Financial intermediation, loanable funds, and the real sector." the Quarterly Journal of economics (1997): 663-691.

Huggett, M. (1993): "The Risk-Free Rate in Heterogeneous-Agent Incomplete Insurance Economies," Journal of Economic Dynamics and Control, 17(5–6), 953–969

Jesus Fernandez-Villaverde, Pablo Guerron-Quintana, Keith Kuester, and Juan Rubio-Ramirez, Fiscal Volatility Shocks and Economic Activity, American Economic Review 2015, 105(11): 3352–3384.

Jorda, Oscar, Moritz Schularick, and Alan M. Taylor. "Leveraged bubbles." Journal of Monetary Economics 76 (2015): S1-S20.

Jurado, Kyle, Sydney C. Ludvigson, and Serena Ng. "Measuring uncertainty." The American Economic Review 105.3 (2015): 1177-1216.

Kehoe, Timothy J. and David K. Levine (1993), Debt-Constrained Asset Markets, Review of Economic Studies 60, 865-888.

Kelly, Bryan, Lubos Pastor, and Pietro Veronesi. "The price of political uncertainty: Theory and evidence from the option market." The Journal of Finance (2016).

Keynes, John Maynard. "The general theory of interest, employment and money." (1936).

Kiyotaki, N., and John Moore. "Liquidity, monetary policy and business cycles." Princeton University and LSE (2012).

Kiyotaki, Nobuhiro, and John Moore. "Credit Cycles." Journal of Political Economy 105.21 (1997): 211-248.

Koijen, Ralph SJ, and Motohiro Yogo. An equilibrium model of institutional demand and asset prices. No. w21749. National Bureau of Economic Research, 2015.

Kurlat, Pablo. "Lemons markets and the transmission of aggregate shocks." The American Economic Review 103.4 (2013): 1463-1489.

Lorenzoni, Guido, and Veronica Guerrieri. "Credit Crises, Precautionary Savings and the Liquidity Trap." 2015, working paper, University of Chicago and Northwestern and NBER

Lustig, Hanno N., and Stijn G. Van Nieuwerburgh. "Housing collateral, consumption insurance, and risk premia: An empirical perspective." The Journal of Finance 60.3 (2005): 1167-1219.

Maggiori, Matteo, and Xavier Gabaix. "International liquidity and exchange rate dynamics." Quarterly Journal of Economics 130.3 (2015).

Maggiori, Matteo. "Financial Intermediation, International Risk Sharing, and Reserve Currencies," 2013, working paper Harvard University.

Minsky, H. P. (1957): "Central Banking and Money Market Changes," Quarterly Journal of Economics, 71(2), 171–187.

Modigliani, Franco, and Merton H. Miller. "The cost of capital, corporation finance and the theory of investment." The American Economic review 48.3 (1958): 261-297.

Moreira, Alan, and Alexi Savov (2015). The macroeconomics of shadow banking, working paper Yale SOM and NYU Stern.

Muir, Tyler (2014), Financial Crises and Risk Premia, working paper UCLA.

Pastor, Lubos, and Pietro Veronesi. "Political uncertainty and risk premia." Journal of Financial Economics 110.3 (2013): 520-545.

Pastor, Lubos, and Pietro Veronesi. "Uncertainty about government policy and stock prices." The Journal of Finance 67.4 (2012): 1219-1264.

Pozsar, Zoltan, et al. "Shadow banking." Available at SSRN 1640545 (2010).

Scheinkman, J. A., and L. Weiss (1986): "Borrowing Constraints and Aggregate Economic Activity," Econometrica, 54(1), 23–45.

Sialm, Clemens (2006), "Stochastic Taxation and Asset Pricing in Dynamic General Equilibrium," Journal of Economic Dynamics and Control (30), 511-540.

Stiglitz, J. E., and A. Weiss (1981): "Credit Rationing in Markets with Imperfect Information," American Economic Review, 71(3), pp. 393–410.

Ulrich, Maxim (2013), How Does the Bond Market Perceive Government Interventions?, Working paper, Columbia University.

Woodford, M. (1990): "Public Debt as Private Liquidity," American Economic Review, 80(2), 382–388.

Xiong, Wei, and Hongjun Yan. "Heterogeneous expectations and bond markets." Review of Financial Studies 23.4 (2010): 1433-1466.

11. Asymmetric Information

Abreu, Dilip, and Markus K. Brunnermeier. "Bubbles and crashes." Econometrica 71.1 (2003): 173-204.

Abreu, Dilip, and Markus K. Brunnermeier. "Synchronization risk and delayed arbitrage." Journal of Financial Economics 66.2 (2002): 341-360.

Admati, Anat R., and Paul Pfleiderer. "Does it all add up? Benchmarks and the compensation of active portfolio managers*." The Journal of Business 70.3 (1997): 323-350.

Albagi, Elias, Christian Hellwig, and Aleh Tsyvinski. Dynamic Dispersed Information and the Credit Spread Puzzle, December 2013

Albagi, Elias, Christian Hellwig, and Aleh Tsyvinski. "A Theory of Asset Prices Based on Heterogeneous Information , July 2015, revise and resubmit to Review of Economic Studies.

Albagli, Elias. "Amplification of uncertainty in illiquid markets." AFA 2012 Chicago Meetings Paper. 2011.

Allen, Franklin, Stephen Morris, and Hyun Song Shin. "Beauty contests and iterated expectations in asset markets." Review of financial Studies 19.3 (2006): 719-752.

Angeletos, George-Marios, Guido Lorenzoni, and Alessandro Pavan. Wall street and silicon valley: A delicate interaction. No. w13475. National Bureau of Economic Research, 2013.

Aumann, Robert J. "Agreeing to disagree." The annals of statistics (1976): 1236-1239.

Bacchetta, Philippe, and Eric van Wincoop (2003), "Can Information Heterogeneity Explain the Exchange Rate Determination Puzzle?" NBER Working Paper No. 9498.

Bacchetta, Philippe, and Eric Van Wincoop. "Higher order expectations in asset pricing." Journal of Money, Credit and Banking 40.5 (2008): 837-866.

Banerjee, Snehal (2011), Learning from prices and the dispersion in beliefs, Review of Financial Studies 24, 3025-3068.

Banerjee, Snehal, and Ilan Kremer. "Disagreement and learning: Dynamic patterns of trade." The Journal of Finance 65.4 (2010): 1269-1302.

Biais, Bruno, Peter Bossaerts, and Chester Spatt. "Equilibrium asset pricing and portfolio choice under asymmetric information." Review of Financial Studies 23.4 (2010): 1503-1543.

Black, Fischer (1986), Noise, Journal of Finance, 41, 529-543.

Bond, P., A. Edmans, and I. Goldstein. "Financial Markets and Real Economy." NBER Working Paper 17719 (2012).

Breon-Drish, Bradyn. "On existence and uniqueness of equilibrium in a class of noisy rational expectations models." The Review of Economic Studies (2015): rdv012.

Dasgupta, Amil. "Coordination and delay in global games." Journal of Economic Theory 134.1 (2007): 195-225.

David, Alexander (1977), Fluctuating Confidence in Stock Markets: Implications for Returns and Volatilities, Journal of Financial and Quantitative Analysis.

DeMarzo, Peter, and Costis Skiadas. "Aggregation, determinacy, and informational efficiency for a class of economies with asymmetric information." journal of economic theory 80.1 (1998): 123-152.

DeMarzo, Peter, and Darrell Duffie. "A liquidity?based model of security design." Econometrica 67.1 (1999): 65-99.

Diamond, Douglas W., and Robert E. Verrecchia. "Information aggregation in a noisy rational expectations economy." Journal of Financial Economics 9.3 (1981): 221-235.

Diamond, Douglas W., and Robert E. Verrecchia. "Optimal managerial contracts and equilibrium security prices." The Journal of Finance 37.2 (1982): 275-287.

Duffie, Darrell, and Chi-fu Huang. "Multiperiod security markets with differential information: martingales and resolution times." Journal of Mathematical Economics 15.3 (1986): 283-303.

Easley, David and Maureen O'Hara, "Price, Trade Size, and Information in Securities Markets," Journal of Financial Economics, 19.1 (1987): 69-90..

Easley, David and Maureen O'Hara, "Adverse Selection and Large Trade Volume: The Implications for Market Efficiency," Journal of Financial and Quantitative Analysis, 27(2), (1992): 185-208.

Easley, David, and Maureen O'Hara. "Information and the cost of capital." The journal of finance 59.4 (2004): 1553-1583.

Fama, Eugene F. "The behavior of stock-market prices." The journal of Business 38.1 (1965): 34-105.

Foster, F. Douglas, and S. Viswanathan. "Strategic trading when agents forecast the forecasts of others." The Journal of Finance 51.4 (1996): 1437-1478.

Friedman, Milton. "The methodology of positive economics." (1953): 259.

Froot, Kenneth A., David S. Scharfstein, and Jeremy C. Stein. "Herd on the street: Informational inefficiencies in a market with short?term speculation." The Journal of Finance 47.4 (1992): 1461-1484.

Garcia, Diego and Joel M. Vanden, "Information acquisition and mutual funds," Journal of Economic Theory, 2009, 144 (5), 1965-1995.

Gârleanu, Nicolae, and Lasse Heje Pedersen. "Dynamic portfolio choice with frictions." Preprint (2013).

Gennotte, Gerard, and Hayne Leland. "Market liquidity, hedging, and crashes." The American Economic Review (1990): 999-1021.

Gennotte, Gerard. "Optimal portfolio choice under incomplete information." The Journal of Finance 41.3 (1986): 733-746.

Glosten, Lawrence R. "Insider trading, liquidity, and the role of the monopolist specialist." Journal of Business (1989): 211-235.

Glosten, Lawrence R. "Is the electronic open limit order book inevitable?." The Journal of Finance 49.4 (1994): 1127-1161.

Glosten, Lawrence R., and Paul R. Milgrom. "Bid, ask and transaction prices in a specialist market with heterogeneously informed traders." Journal of financial economics 14.1 (1985): 71-100.

Goldstein, Itay, Emre Ozdenoren, and Kathy Yuan. "Trading frenzies and their impact on real investment." Journal of Financial Economics 109.2 (2013): 566-582.

Gorton, Gary, and George Pennacchi. "Financial intermediaries and liquidity creation." The Journal of Finance 45.1 (1990): 49-71.

Grossman, Sanford J., and Joseph E. Stiglitz. "On the impossibility of informationally efficient markets." The American economic review 70.3 (1980): 393-408.

Grossman, Sanford. "On the efficiency of competitive stock markets where trades have diverse information." The Journal of finance 31.2 (1976): 573-585.

Grundy, Bruce D., and Maureen McNichols. "Trade and the revelation of information through prices and direct disclosure." Review of financial Studies 2.4 (1989): 495-526.

He, Hua, and Jiang Wang. "Differential information and dynamic behavior of stock trading volume." Review of Financial Studies 8.4 (1995): 919-972.

Hellwig, Martin F. "On the aggregation of information in competitive markets." Journal of economic theory 22.3 (1980): 477-498.

Holmström, Bengt, and Roger B. Myerson. "Efficient and durable decision rules with incomplete information." Econometrica: Journal of the Econometric Society (1983): 1799-1819.

Kreps, David M. "A note on "fulfilled expectations" equilibria." Journal of Economic Theory 14.1 (1977): 32-43.

Kurlat, Pablo, and Laura Veldkamp. "Should we regulate financial information?." Journal of Economic Theory 158 (2015): 697-720.

Kyle, Albert S. "Continuous auctions and insider trading." Econometrica: Journal of the Econometric Society (1985): 1315-1335.

Milgrom, Paul, and Nancy Stokey. "Information, trade and common knowledge." Journal of Economic Theory 26.1 (1982): 17-27.

Morris, Stephen. "The common prior assumption in economic theory." Economics and philosophy 11.02 (1995): 227-253.

Morris, Stephen. "Trade with heterogeneous prior beliefs and asymmetric information." Econometrica: Journal of the Econometric Society (1994): 1327-1347.

Myers, Stewart C., and Nicholas S. Majluf. "Corporate financing and investment decisions when firms have information that investors do not have." Journal of financial economics 13.2 (1984): 187-221.

Nimark, Kristoffer, Dynamic Higher Order Expectation. (2011), working paper Cornell University.

Radner, Roy. "Rational expectations equilibrium: Generic existence and the information revealed by prices." Econometrica: Journal of the Econometric Society (1979): 655-678.

Roell, Ailsa. Liquidity in limit order book markets and single price auctions with imperfect competition. 1998.

Singleton, Kenneth (1987), Asset Prices in a Time Series Model with Disparately Informed, Competitive Traders, In New Approaches to Monetary Economics, Proceedings of the Second International Symposium in Economic Theory and Econometrics, eds. W. Barnet and K. Singleton, Chapter 12, Cambridge: Cambridge University Press, 1987.

Straub, Ludwig, and Robert Ulbricht. "Endogenous Uncertainty and Credit Crunches." Available at SSRN 2668078 (2015).

Subrahmanyam, Avanidhar, and Sheridan Titman. "Feedback from stock prices to cash flows." The Journal of Finance 56.6 (2001): 2389-2413.

Tirole, Jean. "On the possibility of speculation under rational expectations." Econometrica: Journal of the Econometric Society (1982): 1163-1181.

Townsend, Robert (1983), Forecasting the Forecasts of Others, Journal of Political Economy, 91(4), 546-588.

Varian, Hal R. "Differences of opinion in financial markets." financial Risk: Theory, Evidence and implications. Springer Netherlands, 1989. 3-37.

Veronesi, Pietro. Stock Market Overreaction to Bad News in Good Times: A Rational Expectations Equilibrium Model. Review of Financial Studies 12, 975-1007.

Verrecchia, Robert E. "Information acquisition in a noisy rational expectations economy." Econometrica: Journal of the Econometric Society (1982): 1415-1430.

Wang, Jiang. A Model of Intertemporal Asset Prices Under Asymmetric Information, Review of Economic Studies 60, (1993): 249-282.

Wang, Jiang. "A model of competitive stock trading volume." Journal of Political Economy (1994): 127-168.

Yuan, Kathy, Asymmetric Price Movements and Borrowing Constraints: A REE Model of Crisis, Contagion, and Confusion, The Journal of Finance 60 (1): 379-411, 2005.

12. Limits to Arbitrage

De Long, J. Bradford, Andrei Shleifer, Lawrence H. Summers, and Robert J. Waldmann (1990), Noise Trader Risk in Financial Markets, *Journal of Political Economy,* 98, 703-738.

Duffie, Darrell (2010), Presidential Address: Asset Price Dynamics with Slow-Moving Capital, Journal of Finance, 65, 1237-1267.

Lamont, Owen A. and Richard Thaler (2003), Anomalies: The Law of One Price in Financial Markets, Journal of Economics Perspectives, 17, 191-202.

Shleifer, Andrei and Robert Vishny (1997), The Limits of Arbitrage, Journal of Finance 52, 35-55.