



## SYLLABUS

**TIME AND LOCATION:** TTh 11:00am-12:15pm, VAN VLECK B215.

### **COURSE DESCRIPTION:**

This is a graduate course in microeconomic theory. The course content will have two modules:

**Decentralized markets:** Classical equilibrium theory is based on two assumptions: (1) markets are competitive, i.e., all traders are negligible in the market; and (2) markets are centralized, i.e., a single market clearing applies to all traders' demands and supplies for all assets. Modern financial and goods markets are neither competitive nor centralized. There is a growing literature on imperfectly competitive and decentralized markets, which has been increasingly active in the past decade.

In a sequence of lectures, we will learn how to model centralized and decentralized markets -- competitive and imperfectly competitive, static and dynamic -- in a systematic and fairly flexible way. We will discuss how market noncompetitiveness and decentralization affect agents' behavior, equilibrium and welfare. What are decentralized market phenomena that have no centralized market counterparts? We will look into the new possibilities that market design offers when trading is decentralized and ask whether decentralized markets can be more efficient than centralized markets. We will discuss the insights from the literature as well as what we have yet to understand. We will introduce the relevant modeling techniques in the context of applications in microeconomics, industrial organization, macroeconomics, and finance.

**Games among groups of agents:** Game theory has implicitly focused on interactions in which either all players interact directly or all interactions are bilateral, as is the case in networks and matching models. In many economic applications, the relevant unit of analysis is a group. Examples include financial markets (traders participate in multiple exchanges), international trade (countries sign multilateral agreements), and political economy. How do interactions among groups differ from games played by individuals? How does the fact that a player interacts with others as a member of a group rather than an individual affect his behavior? We will learn techniques for modeling market and nonmarket interactions among groups.

The course will focus on theory and on market-design, broadly understood. The main emphasis will be on the classic contributions and recent developments. This course will provide you with an overview of the theories and the relevant techniques used in the analysis in these areas of research.

Some specific topics we'll cover: Modern equilibrium theory; Games in demand functions -- challenges and applications; Liquidity; Static and dynamic inference in markets; Information aggregation; Games on networks; Decentralized market design; Social interactions.

**COURSE MATERIAL:** Course material (e.g., slides, handouts, articles not available on Jstor, ScienceDirect, Wiley) will be posted on Canvas (<https://canvas.wisc.edu/courses/78400>).

**CONTACT INFORMATION:** My office hours are on Tuesdays, 2:50pm-3:50pm in 7440 SOC SCI or by appointment. You can reach me by e-mail at [mrostek@atjssc.wisc.edu](mailto:mrostek@atjssc.wisc.edu) or by phone at 608.262.6723.

**EVALUATION:**

- (1) A take-home exam (choice of problems, 50%); distributed on May 7 (Tu), due on May 15 (W);
- (2) Presentation of a paper related to the topics/methods of the course (50%), evaluated based on how much you've learned from the paper, how much we've learned from you, the quality of presentation itself; a handout with details about the rules of the presentation and some advice will be available on Canvas.

**READING MATERIALS:**

**Imperfectly Competitive Markets, Divisible Good Markets and Auctions: Classic Contributions, General Modeling**

Bergemann, D., T. Heumann, and S. Morris (2016): "Information and Market Power," Cowles Foundation Discussion Paper No. 2017.

Du, S. and H. Zhu (2017): "Bilateral Trading in Divisible Double Auctions," *Journal of Economic Theory*, 167, 285-311.

Glebkin, S. (2016): "Strategic Trading Without Normality," Working Paper.

Grossman, S. J. (1981): "Nash Equilibrium and the Industrial Organization of Markets with Large Fixed Costs," *Econometrica*, 49, 5, 1149-72.

Klemperer, P. and M. Meyer (1989): "Supply Function Equilibria in Oligopoly under Uncertainty," *Econometrica*, 57, 1243-77.

Klemperer, P. (2002): "What Really Matters in Auction Design," *Journal of Economic Perspectives*.

Kyle, A. S. (1989): "Informed speculation with imperfect competition," *Review of Economic Studies*, 56, 317-56.

Veldkamp, L. (2011): *Information Choice in Macroeconomics and Finance*, Princeton: Princeton University Press.

Vives, X. (2008): *Information and Learning in Markets: The Impact of Market Microstructure*, Princeton: Princeton University Press.

Vives, X. (2011): "Strategic Supply Function Competition with Private Information," *Econometrica*, 79, 6, 1919-1966.

Wilson, R. (1979): "Auctions of Shares," *Quarterly Journal of Economics*, 94, 675-89.

**Static and Dynamic Inference in Markets, Information Aggregation**

De Castro, L. I. (2010): "Affiliation, Equilibrium Existence and the Revenue Ranking of Auctions," Working Paper.

Jordan, J. (1983): "On the Efficient Market Hypothesis," *Econometrica*, 51, 1352-43.

Malinova, K., and L. Smith (2006): "A Brownian Motion Foundation for Informational Diversity and Proximity, With Application to Rational Expectations Equilibrium," Working Paper.

Ostrovsky, M. (2012): "Information Aggregation in Dynamic Markets with Strategic Traders," *Econometrica*, 80, 6, 2595-648.

Ostrovsky, M. N. Lambert, and M. Panov (2017): "Strategic Trading in Informationally Complex

- Environments," *Econometrica*, forthcoming.
- Reny, P., and M. Perry (2006): "Toward a Strategic Foundation of Rational Expectations Equilibrium," *Econometrica*, 49, 655-78.
- Rostek, M. and M. Weretka (2012): "Price Inference in Small Markets," *Econometrica*, 80, 2, 687-711.
- Vives, X. (2011): "Strategic Supply Function Competition with Private Information," *Econometrica*, 79, 6, 1919-66.

### **Imperfectly Competitive Trading and Liquidity, Bilateral Oligopoly, Dynamic Trading**

- Amihud, Y., H. Mendelson, and L. H. Pedersen (2005): "Liquidity and Asset Prices," *Foundations and Trends in Finance* 1, 269-364.
- Bergemann, D., T. Heumann, and S. Morris (2019): "Information, Market Power and Price Volatility," Working Paper.
- Bonatti, A., G. Cisternas, and J. Toikka (2017): "Dynamic Oligopoly with Incomplete Information," *Review of Economic Studies*, 84, 2, 503-546.
- Budish, E., P. Cramton, and J. Shim (2015): "The High-Frequency Trading Arms Race: Frequent Batch Auctions as a Market Design Response," *Quarterly Journal of Economics*, 130, 4, 1547-1621.
- Du, S. and H. Zhu (2017): "What is the Optimal Trading Frequency in Financial Markets?," *Review of Economic Studies*, 84, 1606-1651.
- Duffie, D. (2010): "Asset Price Dynamics with Slow-Moving Capital," American Finance Association Presidential Address, *Journal of Finance*, 65, 1238-68.
- Hendricks, K. and R. P. McAfee (2010): "Theory of Bilateral Oligopoly," *Economic Inquiry*, 48, 2, 391-414.
- Kyle, A. S. and J. Lee (2017): "Information and Competition with Speculation and Hedging," Working Paper.
- Kyle, A. S., A. A. Obizhaeva, and Y. Wang (2017): "Smooth Trading with Overconfidence and Market Power," *Review of Economic Studies*, 85, 1, 611-662.
- Rostek, M. and M. Weretka (2015): "Dynamic Thin Markets," *Review of Financial Studies*, 28, 10, 2946-2992.
- Skrzypacz, A. and Y. Sannikov (2016): "Dynamic Trading: Price Inertia, Front-Running and Relationship Banking," Working Paper.
- Vayanos, D. (1999): "Strategic Trading and Welfare in a Dynamic Market," *Review of Economic Studies*, 66, 2, 219-54.

### **Divisible Good Auctions: Market Design**

- Antill, S. and D. Duffie (2017): "Augmenting Markets with Mechanisms," Working Paper.
- Ausubel, L., P. Cramton, M. Pycia, M. Rostek, and M. Weretka (2014): "Demand Reduction and Inefficiency in Multi-Unit Auctions," *Review of Economic Studies* 81, 4, 1366-400.
- Duffie, D. and P. Dworzak (2014): "Robust Benchmark Design," Working Paper.
- Einav, L., T. Kuchler, J. Levin and N. Sundaresan (2011): "Learning from Seller Experiments in Online Markets," Working Paper.
- Hortaçsu, A. and D. McAdams (2010): "Mechanism Choice and Strategic Bidding in Divisible Good Auctions: An Empirical Analysis of the Turkish Treasury Auction Market," *Journal of Political Economy*, 118, 5, 833-65.
- Zhang, A. L. (2018): "Auctions with Liquidity Subsidies," Working Paper.

## **Decentralized Markets, Networks and Hypergraphs, Decentralized Market Design**

- Babus, A. and P. Kondor (2017): "Trading and Information Diffusion in Over-the-Counter Markets," Working Paper.
- Babus, A. and C. Parlato (2018): "Strategic Fragmented Markets," Working Paper.
- Berge, C. (1989): *Hypergraphs*, Elsevier.
- Blume L., D. Easley, J. Kleinberg and E. Tardos (2009): "Trading Networks with Price Setting Agents," *Games and Economic Behavior*, 67, 1, 36-50.
- Bramoulle, Y. and R. Kranton (2016): "Games Played on Networks," In: *Oxford Handbook on Economics of Networks*, Y. Bramoulle, A. Galeotti, and B. Rogers (eds.), Oxford University Press.
- Choi, S., A. Galeotti, and S. Goyal (2017): "Trading in Networks: Theory and Experiment," *Journal of the European Economic Association*, 15, 4, 1, 784-817.
- Duffie, D. (2012): *Dark Markets*, Princeton Lectures in Finance, Y.A`it-Sahalia (ed.), Princeton University Press (Chapter 1 is available online).
- Duffie, D., N. Garleanu and L. H. Pedersen (2005): "Over-the-Counter Markets," *Econometrica*, 73, 1815-47.
- Duffie, D. and C. Wang (2017): "Efficient Contracting in Network Financial Markets," Working Paper.
- Glode, V. and C. Opp (2016): "Asymmetric Information and Intermediation Chains," *American Economic Review*, 106, 9, 2699-2721.
- Golub, B. and S. Morris (2017a): "Expectations, Networks, and Conventions," Working Paper.
- Golub, B. and S. Morris (2017b): "Higher-Order Expectations," Working Paper.
- Horn, R. A. and C. A. Johnson (2012): *Matrix Analysis*, 2nd edition, Cambridge.
- Jackson, M. and Y. Zenou (2012): "Games on Networks," forthcoming in: *Handbook of Game Theory Vol. 4*, P. Young and S. Zamir (eds.), Elsevier Science.
- Malamud, S. and M. Rostek (2017): "Decentralized Exchange," *American Economic Review*, 107, 11, 3320-3362.
- Nava, F. (2015): "Efficiency in Decentralized Oligopolistic Markets," *Journal of Economic Theory*, 157, 315-348.
- Peivandi, A. and R. Vohra (2017): "On Fragmentation of Markets," Working Paper.

## **Games Among Groups**

- Blume, L., W. Brock, S. Durlauf, and Y. Ioannides (2011): "Identification of Social Interactions," Ch. 18, 853-964, In: *Handbook of Social Economics*, J. Benhabib, A. Bisin, and M. O. Jackson (eds.), Elsevier.
- Blume, L., W. Brock, S. Durlauf, and Y. Ioannides (2015): "Linear Social Interactions Models," *Journal of Political Economy*, 123, 2, 444-496.
- Durlauf, S. and Y. Ioannides (2010): "Social Interactions," *Annual Review of Economics*, 2, 451-478.
- Dutta, R. D. Levine, S. Modica (2018): "Collusion Constrained Equilibrium," *Theoretical Economics*, 13, 1, 307-340.
- Dutta, R. D. Levine, S. Modica (2015): "Collusion, Randomization and Leadership in Groups," Working Paper.
- Olson, M. (1965): "The Logic of Collective Action: Public Goods and the Theory of Groups," Vol. 124 of *Harvard Economic Studies*, Harvard University Press.
- Saggi, K., W. F. Wong, and H. M. Yildiz (2017): "Preferential Trade Agreements and Rules of the Multilateral Trading System," Working Paper.
- Tirole, J. (1999): "Incomplete Contracts: Where do We Stand?" *Econometrica*, 67, 4, 741-781.

**Other Useful Resources:**

- Angel, J., L. Harris, and C. Spatt (2011): "Equity Trading in the 21st Century," *Quarterly Journal of Finance*, 1, 1-53.
- Biais, B. and R. Green (2007): "The Microstructure of the Bond Market in the 20th Century," IDEI Working Paper, 482.
- Bramoulle, Y., A. Galeotti, and B. Rogers (2016): *The Oxford Handbook of the Economics of Networks*, Oxford University Press.
- Commodity Futures Trading Commission (2007): "Keeping Pace with Change: Strategic Plan 2007-2012," <http://www.cftc.gov>.
- De Loecker, J. and J. Eeckhout (2017): "The Rise of Market Power and the Macroeconomic Implications," Working Paper.
- Duffie, D. (2010): "Asset Price Dynamics with Slow-Moving Capital," American Finance Association Presidential Address, *Journal of Finance*, 65, 1238-68.
- Kastl, J. (2017): "Recent Advances in Empirical Analysis of Financial Markets: Industrial Organization Meets Finance," In B. Honore, A. Pakes, M. Piazzesi, and L. Samuelson (Eds.), *Advances in Economics and Econometrics: Eleventh World Congress (Econometric Society Monographs*, pp. 231-270). Cambridge: Cambridge University Press.
- Knight Capital Group (2010): *Current Perspectives on Modern Equity Markets: A Collection of Essays by Financial Industry Experts*: Knight Capital Group, Inc.

**ACADEMIC INTEGRITY:** This is a PhD-level elective designed to teach cutting-edge research and help you prepare to successfully write a dissertation. If you are seriously considering cheating in this class, you are so fundamentally missing the point that I wouldn't even know where to begin a conversation about why you shouldn't do that. See <https://conduct.students.wisc.edu/academic-integrity> for more information on academic integrity.

**ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES:** McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." <http://mcburney.wisc.edu/facstaffother/faculty/syllabus>

**DIVERSITY AND INCLUSION:** Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." <https://diversity.wisc.edu>