



## MKT 7v12.001: Research Applications in Marketing Spring 2026

(This version: December 2025)

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Office: JSOM 13.219

Class: Wednesday, 10:00am - 12:45pm, JSOM 13.501

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### Course Description:

This course focuses on recent developments in quantitative marketing and empirical industrial organization, with an emphasis on dynamic structural models. We will study techniques for developing and estimating models of demand and competition in both static and dynamic settings. In these types of models, a decision maker's choice today can have an impact on how he and other players make their decisions in the future. In many situations, economic agents recognize this relationship and make strategic choices. Examples of dynamic demand models include consumer learning models, inventory and stockpiling problems, durable goods adoption and replacement decisions, multi-armed bandit decision process. Examples of dynamic competition models include dynamic price competition, entry-exit, store location and product positioning. Examples of multi-agents' models include network externalities, platform economics, matching models and online sponsored search advertising. We will emphasize the importance of combining theory, institutional details and econometric techniques to answer these types of questions in marketing, industrial organization and other applied microeconomics areas. By discussing several empirical applications in detail, we will illustrate how to apply basic modeling techniques to problems at hand. In the later lectures, we will explore areas on the research frontier, such as modeling approaches that relax the standard rational expectations assumptions, and approaches that incorporate machine learning and large-scale datasets. The course will be a mixture of lecture notes and discussion of specific papers.<sup>1</sup> The ultimate goal of this course is each student should come up with an interesting research question to be modeled and estimated structurally. We want to work *very hard together* to help each student to end up with a high-quality research project for her/his future career. We have a tough road but

***“Don't give up. The beginning is always the hardest. Life rewards those who work hard at it.”***

### Meetings:

In the beginning weeks of the course, I will try to cover some basic methods and concepts. Later, in each class, students will be assigning one or more papers to read and present, typically oriented around a particular topic, estimation or modeling approach. My preference is that each student choose a topic regarding to her/his research interest. I will give shorter lectures in some of the

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<sup>1</sup> I thank Professors Andrew T. Ching, Matthew Osborne, and Xiaolin Li, for generously providing their prior materials.

class, and the rest will be devoted to class discussion of the assigned reading. If you are assigned to present a paper carefully, you will be responsible for making a comprehensive presentation to the class about it and leading a discussion of the paper's strengths, weaknesses, and opportunities for future research. All students are required to read the paper that is being presented. I require all non-presenters to submit review report. That must include strengths and weakness, insights and managerial/policy implementations. **The most important part of each review report should be a proposal about what can be possible next paper to overcome the caveats of the current paper.** *Please note that attendance at all class sessions is a course requirement.*

Each student presentation of an assigned paper should provide:

- An analysis of what the research has accomplished its contribution, and a clear explanation of any potentially confusing aspects. At this time the key modeling elements and empirical results of the paper should be reviewed and evaluated.
- A careful critique of the research, including a discussion of the paper's major strengths and weaknesses.
- An agenda for future research in the problem area.

So, you essentially need to prepare a detailed referee report when you are assigned to read a paper carefully. Students who audit the course will also be assigned readings and be responsible for presenting.

## Term Project

Students who take this class for credits are required to complete a term project. It should develop a clear research question(s), and at least an empirical modeling framework that can be used to answer the research question(s). Ideally, it should also include data analysis. The empirical framework needs to be at the advanced level, either the ones that we covered in the class, or those at the similar level of sophistication. *I highly recommend to develop your research questions around your current research ideas. Try to think an interesting problem in the context of your current expertise that a structural approach can help you to provide deeper answer.* A research topic needs to be determined by the 9<sup>th</sup> week of the classes. You can come and talk with me about your ideas. Ideally, preliminary data analysis should be conducted by the 9<sup>th</sup> week of the class as you explore the feasibility of research questions. I will give chances to give a presentation in class on your progress to receive feedback. By the 12<sup>th</sup> week of the classes, we will devote a class to the first presentation of your project. You should develop the basic empirical framework for your paper. For the rest of the course, you should fine tune your model, and implement it to the data. The deadline of submitting the term project is May 10, 2026 (if students have many final exams to prepare, I might extend the deadline).

## Basis for Grading

- 30% Paper presentation
- 20% Participation in Class Discussions
- 50% Term Project

## Weekly Class Schedule (tentative)

I am glad to have two amazing guest speakers in this course. Our guest speakers will present some recent working papers in Structural modeling. The tentative schedule is as follows:

- 1- Professor Behnam Mohammadi, March 25, 2026
- 2- Professor Ivan Li, April 8, 2026

Session 1: Introduction and Organization, Review of Discrete Choice Modeling and Bayesian Estimation

- Train, Kenneth (2009), [Discrete Choice Methods with Simulation](#), Ch.2, 3, 4 (sections 4.1, 4.2 and 4.3), 6.
- Train, Kenneth (2009), [Chapter 8, 11, 12](#).
- Rossi, Allenby and McCulloch (2005), Bayesian Statistics and Marketing, Ch 3, 5
- Hanemann, W. M. (1984), “Discrete/Continuous Models of Consumer Demand,” *Econometrica*, V. 52(3), pp. 541-561.
- Walsh’s lecture notes (2004) “Markov Chain Monte Carlo and Gibbs Sampling”, available at <http://nitro.biosci.arizona.edu/courses/EEB581-2004/handouts/Gibbs.pdf>

Session 2: Bayesian and Classical Estimation of Dynamic Programming Models

- Matt Shum’s notes on “Single-agent dynamic optimization models.”
- Imai, Susumu, Neelam Jain and Andrew Ching (2009), “Bayesian Estimation of Dynamic Discrete Choice Models,” *Econometrica*, vol.77(6), pp.1865-1899.
- Ching, Andrew T., S. Imai, M. Ishihara, and N. Jain (2012), “[A Practitioner’s Guide to Bayesian Estimation of Discrete Choice Dynamic Programming Models](#),” *Quantitative Marketing and Economics*, vol.10(2), pp.151-196.
- Judd, Kenneth (1998), “Numerical Methods in Economics”, ch 12.
- Rust, John (1987), “[Optimal Replacement of GMC Bus Engines: A Empirical Model of Harold Zurcher](#)”, *Econometrica*, Vol 55(5), pp 999-1033.
- Rust, John (1994), “Structural Estimation of Markov Decision Processes”, *Handbook of Econometrics*, 4, 3081-3143.
- Rust, John (2000), “Nested Fixed-Point Algorithm Documentation Manual”, available at <https://editorialexpress.com/jrust/nfxp.pdf>.

Session 3: Consumer Learning: A survey

- **Ching, Andrew T., Tulin Erdem and Michael Keane (2013), “[Learning Models: An Assessment of Progress, Challenges and New Developments](#),” *Marketing Science*, 32(6): pp.913-938.**
- **Ching, Andrew T., Tulin Erdem and Michael Keane (2017), “[Empirical Models of Learning Dynamics: A Survey of Recent Developments](#),” *Handbook of Marketing Decision Models* (New Edition), Berend Wierenga and Ralf van der Lans (eds.), Springer.**
- Ackerberg, D. (2003) “Advertising, Learning and Consumer Choice in Experience Good Markets: An Empirical Examination,” *International Economic Review*, vol.44(3), pp.1007-1040.
- Ching, Andrew and Masakazu Ishihara (2010), “The Effects of Detailing on Prescribing Decisions under Quality Uncertainty,” *Quantitative Marketing and Economics*, vol.8(2), pp.123-165.
- Keane and Wolpin (1994), “[The Solution and Estimation of Discrete Choice Dynamic Programming Models by Simulation and Interpolation: Monte Carlo Evidence](#),” *Review of Economics and Statistics*, vol.76, pp.648-672.
- Osborne, Matthew (2011), “Consumer Learning, switching costs, and heterogeneity: A structural examination,” *Quantitative Marketing and Economics*, 9(1): 25-46.
- Crawford, G. and M. Shum (2004), “Uncertainty and learning in pharmaceutical demand,” *Econometrica*, vol.73(4), pp.1137-1173.
- Roos, J., Mela, C. and Shachar, R (2018), “The Effect of Links and Excerpts on Internet News Consumption”, working paper available at [http://www.jasonmtroos.com/papers/Links\\_Excerpts\\_News.pdf](http://www.jasonmtroos.com/papers/Links_Excerpts_News.pdf).
- Yewon Kim (2019), “Customer retention under imperfect information”, [Job Market Paper](#)
- Reza Roshangarzadeh and Shervin Shahrokhi Tehrani (2026), “Navigating Content Strategy in the Face of Platform Moderation: The Case of YouTube's Borderline Policy,” [Working Paper](#)

Session 4: Finite horizon single agent dynamic problem, Students present

- **Diermeier, Daniel, Michael Keane and Antonio Merlo (2005) “A Political Economy Model of Congressional Careers,” *American Economic Review*, vol.95(1), pp.347-373.**
- Keane, Michael P., Petra Todd and Kenneth Wolpin (2011), “The Structural Estimation of Behavioral Models: Discrete Choice Dynamic Programming Methods and Applications,” *Handbook of Labor Economics*, vol.2.
- [http://athena.sas.upenn.edu/~petra/papers/handbook\\_labor.pdf](http://athena.sas.upenn.edu/~petra/papers/handbook_labor.pdf)

- Yang, Botao and Andrew Ching, “Dynamics of Consumer Adoption of Financial Innovation: The Case of ATM Cards,” working paper. Available at SSRN: <http://ssrn.com/abstract=1434722>
- Houser, D., Keane, M. and McCabe, K., 2004. “Behavior in a dynamic decision problem: An analysis of experimental evidence using a Bayesian type classification algorithm.” *Econometrica*, 72(3), pp.781-822.
- Ishihara, M. and A.T. Ching (2012), “Dynamic demand for new and used durable goods without physical depreciation: The case of Japanese video games,” working paper, Available at SSRN: <http://ssrn.com/abstract=2189871>

#### Session 5: Dynamic stockpiling

- Hendel, Igal and Aviv Nevo (2006), “Measuring the Implications of Sales and Consumer Inventory Behavior,” *Econometrica*, 74(6): 1637-73.
- Erdem, Tulin, Susumu Imai, and Michael P. Keane (2003), “Brand and Quantity Choice Dynamics Under Price Uncertainty,” *Quantitative Marketing and Economics*, 1 (1), 5-64.
- Seiler, Stephan (2013), “The Impact of Search Costs on Consumer Behavior: A Dynamic Approach,” *Quantitative Marketing and Economics*, vol.11(2), pp.155-203.
- Hendel, Igal and Aviv Nevo (2013), “Intertemporal Price Discrimination in Storable Goods Markets,” *American Economic Review*, vol.103(7), pp.2722-2751.
- Osborne, Matthew (2018), “Approximating the Cost-of-Living Index for a Storable Good,” *American Economic Journal: Microeconomics*, Vol. 10(2), May 2018, pp. 286-314)
- Osborne, Matthew (2018), “Frequency versus Depth: How Changing the Temporal Process of Promotions Impacts Demand for a Storable Good,” *Japanese Economic Review, Special Issue: Bridging Marketing and Economics*, Vol 69(3), 2018, pp. 258-283

#### Session 6: Identification of Dynamic Discrete Choice Models (class discussion on identification of hyperbolic discounting and naivete)

- Fang, Hanming and Yang Wang (2014) “Estimating Dynamic Discrete Choice Models with Hyperbolic Discounting, with an application to Mammography Decisions,” *International Economic Review*, vol.56(2), pp.565-596.
- Magnac, Thierry and David Thesmar (2002), “Identifying dynamic discrete choice models,” *Econometrica*, vol.70(2), pp.801-816.
- Dube, J-P, G.J. Hitsch and P. Jindal (2014), “The Joint Identification of Utility and Discount Functions from Stated Choice Data: An application to durable goods adoption,” *Quantitative Marketing and Economics*, vol.12, pp.331-377.
- Abbring, J, and Daljord, O (2018), “Identifying the Discount Factor in Dynamic Discrete Choice Models,” Working Paper. Available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3051326](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3051326)
- Fang and Wang Counterexample (Provided in shared folder).

- Ching, A., and Osborne, M. (2018) “Identification and Estimation of Forward-Looking Behavior: The Case of Consumer Stockpiling,” Working Paper.
- Yao, S., C. Mela, J. Chiang, and Y. Chen (2012). “Determining consumers’ discount rates with field studies.” *Journal of Marketing Research*, 49(6), 822-841.
- Chung, D., Steenburgh T., Sudhir, K (2013) “Do bonuses enhance sales productivity? A dynamic structural analysis of bonus-based compensation plans.” *Marketing Science* 33(2), pp 165-187.

Session 7: Student’s presentation on research progress

Session 8: New Approaches: Incorporating Behavioral Assumptions into Structural Models

- **Tehrani, S. S. and Ching, A. T. (2019). A heuristic approach to explore: value of perfect information, *Management Science* 70(5):3200-3224.**
- **Ata Jameei Osgouei, Andrew T. Ching, Brian T. Ratchford, Shervin Shahrokhi Tehrani (2025) Estimating Position and Social Influence Effects in Online Search. *Marketing Science***
- **Reza Roshangarzadeh, TI Tongil Kim, Shervin Shahrokhi Tehrani (2025) Expert’s Recommendations in Product Choices: Information Provision, Conflicts of Interest, and Consumer Protection among U.S. Kidney Disease Patients. *Marketing Science* 44(5):1017-1037.**
- **Grubb, Michael and Matthew Osborne (2015), “Cellular Service Demand: Biased Beliefs, Learning, and Bill Shock,” *American Economic Review*, vol.105(1), pp.234-271.**
- **Ching, Andrew, Tulin Erdem and Michael Keane (2009), “The Price Consideration Model of Brand Choice,” *Journal of Applied Econometrics*, vol. 24, pp. 393-420.**  
<http://onlinelibrary.wiley.com/doi/10.1002/jae.1053/pdf>
- Goldfarb, A and Xiao, M (2011) “Who Thinks about the Competition? Managerial Ability and Strategic Entry in US Local Telephone Markets”, *American Economic Review*, Vol 101(7), pp. 3130-61.
- Liu, X., Montgomery, A. and Srinivasan, K. “Analyzing Bank Overdraft Fees with Big Data”, *Marketing Science*, Forthcoming.
- Handel, B. and Kolstad, J (2015) “Health Insurance for “Humans”: Information Frictions, Plan Choice, and Consumer Welfare”, *American Economic Review*, Vol 105(3), p. 2449 – 2500.
- Uetake, K, and Yang, N, (2018), “Harnessing the Small Victories: Goal Design Strategies for a Mobile Calorie and Weight Loss Tracking Application”, working paper, available at [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2928441](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2928441).

Session 9: Student’s presentation on research progress

Some Possible Sessions:

#### Session 10: Multi-Armed Bandit Type Models

- **Scott, S.L., 2010. “A modern Bayesian look at the multi - armed bandit.” *Applied Stochastic Models in Business and Industry*, 26(6), pp.639-658.**
- **Modeling Serialized Content Consumption: Adversarial IRL for Dynamic Discrete Choice. Peter S. Lee, K. Sudhir and Tong Wang ([Job Market Paper](#))**
- **Urban, G.L., Liberali, G., MacDonald, E., Bordley, R. and Hauser, J.R., 2013. “Morphing banner advertising.” *Marketing Science*, 33(1), pp.27-46.**
- **Schwartz, E. M., Bradlow, E. T., and Fader, P. S. (2017). Customer acquisition via display advertising using multi-armed bandit experiments. *Marketing Science*, 36(4), 500-522.**
- **Shchetkina, Anya. Blind targeting: Personalization under third-party privacy constraints (2025). arXiv preprint [arXiv:2507.05175 \(2025\)](#).**
- **Miller, R. A. (1984): “Job matching and occupational choice,” *The Journal of Political Economy*, 1086-1120.**
- **Gong, Q. (2017): “Physician Learning and Treatment Choices: Evidence from Brain Aneurysms,” Tech. rep., working paper, University of Pennsylvania.**
- **Meyer, R. J. and Y. Shi (1995): “Sequential choice under ambiguity: Intuitive solutions to the armed-bandit problem,” *Management Science*, 41, 817-834.**
- **Gans, N., G. Knox, and R. Croson (2007): “Simple models of discrete choice and their performance in bandit experiments,” *Manufacturing & Service Operations Management*, 9, 383-408.**
- **Farias, V.F. and Van Roy, B., 2010. “Dynamic pricing with a prior on market response.” *Operations Research*, 58(1), pp.16-29.**

#### Session 11: Dynamic oligopoly models

- **Pakes, Ariel; McGuire, Paul (2002), “Stochastic Algorithms for Dynamic Models: Markov Perfect Equilibrium, and the 'Curse' of Dimensionality,” *Econometrica*, vol.69(5), pp.1261-1281.**
- **Borkovsky, Ron, Avi Goldfarb, Avery Haviv, and Sridhar Moorthy. (2017). “Measuring and understanding brand value in a dynamic model of brand management.” *Marketing Science* 36(4), 471-499**
- **Ericson, Richard; Pakes, Ariel (1995), “Markov-Perfect Industry Dynamics: A Framework for Empirical Work,” *Review of Economic Studies*, vol.62(1), pp.53-82.**
- **Pakes, Ariel; McGuire, Paul, “Computing Markov-Perfect Nash Equilibria: Numerical Implications of a Dynamic Differentiated Product Model,” *RAND Journal of Economics*, vol.25(4): pp.555-89, Winter 1994.**
- **Bajari, P., Benkard, L., and Levin, J (2007) “Estimating Dynamic Models of Imperfect Competition”, *Econometrica*,**
- **Weintraub, G.Y., C.L. Benkard, B. Van Roy (2008), “Markov Perfect Industry Dynamics With Many Firms,” *Econometrica*, vol.76(6), pp.1375-1411.**

- Ching, Andrew (2010), “A dynamic oligopoly structural model for the prescription drug market after patent expiration,” *International Economic Review*, vol.51(4), pp.1175-1207.
- Hollenbeck, B. “The Economic Advantages of Chain Organization”, *RAND Journal of Economics*, Vol. 48(2), pp. 1103-1135.

#### Session 12: Matching Models:

- **Fox, Jeremy T. (2016). Estimating Matching Games with Transfers. *Quantitative Economics* 9.1 (2018): 1-38**
- **Sørensen, M., 2007. How smart is smart money? A two - sided matching model of venture capital. *The Journal of Finance*, 62(6), pp.2725-2762.**
- Hsieh, Yu-Wei, Shum, Matthew, & Yang Sha (2014). To Score or Not to Score? Structural Estimation of Sponsored Search Auctions, Working Paper
- Mindruta, Denisa, Moeen, Mahka, & Agarwal, Rajshree (2015). A Two-sided Matching Approach for Partner Selection and Assessing Complementarities in Partners’ Attributes in Interfirm Alliances. *Strategic Management Journal*, 27(1), 206-231
- Ni, Jian, & Srinivasan, K. (2015). Matching in the Sourcing Market: A Structural Analysis of the Upstream Channel. *Marketing Science*, 34(5), 722-738
- Yang, Yupin, Shi, Mengze, & Goldfarb, Avi (2009). Estimating the Value of Brand Alliances in Professional Team Sports. *Marketing Science*, 28(6), 1095-1111
- Wu, Chunhua (2015). Matching Value and Market Design in Online Advertising Networks: An Empirical Analysis. *Marketing Science*, 34(6), 906-921

#### Session 13: New Approaches: Machine Learning and Structural Modeling

- Victor Chernozhukov, Juan Carlos Escanciano, Hidehiko Ichimura, Whitney K. Newey, James M. Robins, (2018) “Locally Robust Semiparametric Estimation”, Working paper (<https://arxiv.org/abs/1608.00033>)
- Igami, M (2018) “Artificial Intelligence as Structural Estimation: Economic Interpretations of Deep Blue, Bonanza, AlphaGo”, Working paper (<https://arxiv.org/pdf/1710.10967.pdf>)
- Ruiz, F., Athey, S., and Blei, D. (2018) “SHOPPER: A Probabilistic Model of Consumer Choice with Substitutes and Complements”, working paper (<https://arxiv.org/abs/1711.03560>)
- Bajari, P., Nekipelov, D., Ryan, S., and Yang, M. (2015) “Demand Estimation with Machine Learning and Model Combination,” working paper.
- Compiani, Giovanni, Ilya Morozov, and Stephan Seiler (2025). “Demand estimation with text and image data,” [Working Paper](#).
- Zhang, Weiqing, and Masakazu Ishihara. “The Impacts of Content Inclusiveness and Content Moderation Practices: Evidence From a Social Media Platform.” [Available at SSRN 5109139](#) (2025).

#### Session 14: Habit Formation

- **Gordon, B. R., & Sun, B. (2015). A dynamic model of rational addiction: Evaluating cigarette taxes. *Marketing Science*, 34(3), 452-470.**
- **Shuo Zhang, Tat Chan, Xueming Luo (2019). Addictive Digital Content Consumption and Strategic Self-Control: An Empirical Study. [Job Market Paper](#)**
- Luo, L., Ratchford, B. T., & Yang, B. (2013). Why we do what we do: A model of activity consumption. *Journal of Marketing Research*, 50(1), 24-43.
- Nevskaya, Y., & Albuquerque, P. (2012). A continuous time model of product usage: Measuring the effect of product design and rewards in online games. Available at SSRN 2098915.

***The Final Session: Students' presentations: May 6<sup>th</sup> (We can adjust if there will be any exam around this date)***