

Matthew Goldman

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DATE OF BIRTH: August 6, 1986 **GENDER:** Male **CITIZENSHIP:** USA

UNDERGRADUATE STUDIES:

Bachelor of Sciences, Mathematics & Economics, College of William and Mary (2008)

GRADUATE STUDIES:

Ph.D. Economics, University of California, San Diego (expected June 2015)

THESIS COMMITTEE AND REFERENCES:

James Andreoni (Chair)
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DESIRED TEACHING AND RESEARCH:

Primary Fields: Behavioral Economics, Digital Markets

Secondary Fields: Theoretical & Applied Econometrics

TEACHING EXPERIENCE:

2011-2012 Teaching Assistant – UCSD Department of Economics PhD Program
Mathematics for Economists (“Math Camp”)
2009-2014 Teaching Assistant – UCSD Department of Economics Undergraduate Program
Various courses in the Microeconomics and Econometrics core sequence

RELEVANT POSITIONS HELD:

2013 Research Intern at Microsoft Research in New York with Justin M Rao
2012-2014 Research Assistant for Professor James Andreoni
2010 Research Assistant for Professor Patrik Guggenberger

HONORS, SCHOLARSHIPS, AND FELLOWSHIPS:

2014 Clive Granger Research Fellowship
2013 Best Presentation in UCSD Graduate Student Research Seminar Series
2012 Fans' Choice Award for Best Paper at Sloan Sports Analytics Conference
2011 Teaching Assistant Excellence Award: Undergraduate Course
2010 Graduate Summer Research Fellowship

JOB MARKET PAPERS:

**Experiments as Instruments: Heterogeneous Position Effects in Sponsored Search Auctions
(Primary JMP) with Justin M Rao**

Google and Bing employ a generalized second price (GSP) auction to allocate billions of dollars of sponsored search advertising. Despite evolving from a naïve, first-price, rank-by-bid auction, the GSP has been shown to achieve an efficient allocation and favorable revenue properties via a tight theoretical link with the equilibrium of the truthful Vickrey-Clarke-Groves mechanism. This link hinges on a critical assumption about the causal impact of ad position on user click probabilities: moving up increases click-through-rate by the same scaling factor for all ads. Because an ad's position is the endogenous outcome of an auction, these assumptions have gone largely untested. We overcome this identification problem by developing a novel method to re-purpose internal business experimentation at a major search engine. Using a broad cross-section of advertisers we strongly reject the conventional multiplicatively-separable model, instead finding substantial heterogeneity of the causal impact of position on click-through-rates. For brand queries, off-brand competitors benefit much more from position than the advertiser matching the query. For generic queries, higher quality and less-well known websites benefit more from position. The impact of position differs by up to 100% across ad types. These findings raise serious concerns about the efficiency properties of the GSP as currently employed.

**Loss Aversion Around a Fixed Reference Point in Highly Experienced Agents
(Secondary JMP) with Justin M Rao**

We study how reference dependence and loss aversion motivate highly experienced agents, NBA basketball players. We find a very large "losing motivates" effect, an average team scores like a league leader when trailing by ten points and a bottom dweller up ten. With detailed data, we isolate that this effect comes through differential exertion of effort. Using betting spreads and lagged score margin, we test if expectations influence the reference point; they do not. The reference point appears remarkably stable around zero. It is far less malleable than previously found in experimental work studying less experienced agents.

OTHER RESEARCH IN PROGRESS:

Holier Than Thou? Testing Theories of Social Information in Charitable Giving using a Natural Field Experiment with James Andreoni and Marta Maras

We study a six-year fundraising campaign by a Catholic parish to build a new church. Every Sunday, the priest announced donations, names, and addresses of donors, with surprise changes in the presentation of this social information. This unique data allows tests of hypotheses on how social information affects giving. We examine "fitting in" (neighborhood effects, norm conformance), and "standing out" (social-image, information signaling, conspicuous giving). Early in the campaign, we observe significant fitting-in. Over six years, however, the dominant effect of social information is to encourage standing-out. Moreover, information affects how social comparisons are formed, sometimes with unintended consequences.

WORK UNDER REVIEW:

Misperception of Risk and Incentives by Experienced Agents

with Justin M Rao

We study an observable risk-return tradeoff for which risk "preferences" are normatively prescribed by the desire to win the game. The choice is whether to shoot a 2-pointer or a 3-pointer in professional (NBA) basketball. When trailing, teams should get more risk-loving as they fall further behind, matching prospect theory preferences. When leading, risk aversion should increase with the lead, running counter to typical risk preferences. We find strong evidence that players trade off risk and return correctly only in the trailing domain. In the leading domain, they incorrectly exhibit decreasing absolute risk aversion with the magnitude of their lead. Players thus exhibit preferences similar those widely found in the lab, but misapplied in this setting.

Tick Tock Shot Clock: Optimal Stopping in the NBA

with Justin M Rao

We study how highly experienced agents, professional basketball players, solve an optimal stopping problem. The decision to shoot is a complex problem that involves weighing the current shooting opportunity against the continuation value of the possession and the outside option of a teammate shooting. At each second of the "shot clock," dynamic efficiency requires that the reservation shot value equals the continuation value and allocative efficiency requires teammates have equal reservation values. Using a rich dataset of 1.3 million possessions, we empirically test these predictions with a structural stopping model. The estimated reservation threshold declines monotonically with time remaining on the shot clock nearly lockstep with the continuation value. Most line-ups show strong adherence to allocative efficiency. When time becomes intrinsically valuable, teams adjust threshold slope and level as implied by dynamic efficiency. Optimality violations we do observe are primarily due to thresholds that are too flat.

Fractional order statistic approximation for nonparametric conditional quantile inference

with David M Kaplan

Extending fractional order statistic theory, we characterize the $O(n^{-1})$ coverage probability error of previously proposed confidence intervals for population quantiles using L_1 -statistics as endpoints. We derive an analytic expression for the n^{-1} term, which may be used to calibrate the nominal coverage level to get $O(n^{-3/2}\log(n))$ coverage error. Asymptotic power is shown to be optimal. Using kernel smoothing, we propose a related method for nonparametric inference on conditional quantiles. This new method compares favorably with asymptotic normality and bootstrap methods in theory and in simulations. Code is provided for both unconditional and conditional inference.

Nonparametric inference on conditional quantile treatment effects and other objects using L_1 -statistics

with David M Kaplan

We provide novel methods for inference on quantile treatment effects in both unconditional and conditional (nonparametric) settings. These methods achieve high-order accuracy by using the probability integral transform and a Dirichlet (rather than Gaussian) reference distribution. We propose related methods for joint inference on multiple quantiles and inference on linear combinations of quantiles, again in both unconditional and conditional settings. Optimal bandwidth and coverage probability rates are derived for all methods, and code is provided.

Evenly Sensitive KS-type Tests on Distributions

with David M Kaplan

We implement practical methods of one-sample and two-sample nonparametric inference on continuous distributions based on the finite-sample joint Dirichlet distribution of uniform order statistic spacings. The commonly used Kolmogorov-Smirnov test is known to have low sensitivity to deviations in the tails. Weighting by the inverse pointwise asymptotic standard deviation is known to suffer the opposite problem: sensitivity in the middle of the distribution is much lower than in the tails. We provide a new computational approach to a test with equal finite-sample pointwise type I error rates across the entire distribution that maintains exact overall size. This method may alternatively be interpreted as a family of tests (one at each order statistic) that controls the familywise error rate, or as constructing a uniform confidence band for the

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unknown distribution function. We also introduce a new two-sample test for equality of distributions, which also evaluates first-order stochastic dominance. Our formulation of the two-sample problem removes the need for just-in-time simulation by allowing pre-computation of parameters. Simulations and empirical examples demonstrate our new one-sample and two-sample methods' performance and favorable properties. Fully operational code is provided.

CONFERENCE PRESENTATIONS AND SEMINARS:

- 2014 Stanford Institute for Theoretical Economics: session on *Psychology and Economics*
NBER Summer Workshop on the Economics of Information Technology and Digitization
Big Data Marketing Analytics Conference At Booth Business School
12th ZEW Conference on Information and Communication Technologies
Seminar at Microsoft Research, New York
Economic Science Association, North American Meeting

- 2013 Economic Science Association, North American Meeting
San Diego State University, Sports Business Management MBA Program

- 2011-2013 MIT Sloan Sports Analytics Conference

PROFESSIONAL ACTIVITIES:

Referee Service: Econometrica, Review of Economics and Statistics, Journal of Economic Behavior & Organization, Journal of Social Choice and Welfare, Journal of Quantitative Analysis of Sports
Affiliations: American Economics Association, Economic Science Association

PROGRAMMING LANGUAGES:

Fluent: MATLAB, Python, LaTeX, HTML
Competent: SQL, Stata
Learning: R, C#

WEEKENDS:

Basketball, Bridge, Indian food