Curriculum Vitae

ALEXANDER SHKOLNIK

Contact

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Education

PH.D. Computational & Mathematical Engineering, Stanford University, 2015.
ADVISOR: Kay Giesecke.
TITLE: *Computational Methods for Default Timing*.

M.S. Computational & Mathematical Engineering, Stanford University, 2010.

Positions

2018 – : *Assistant Professor*, Department of Statistics & Applied Probability, University of California, Santa Barbara.

2015 – : *Affiliated Researcher*, Consortium for Data Analytics in Risk (CDAR), University of California, Berkeley.

2015 – 2018: *Postdoctoral Scholar*, Department of Statistics & Center for Risk Management Research, University of California, Berkeley.

Research

Monte Carlo simulation of stochastic processes.
Importance sampling for complex stochastic systems.
Quantitative financial risk management.
High-dimensional covariance estimation.

Publications

Conference Publications

1. Unbiased Simulation Estimators for Path Integrals of Diffusions (with G. Chen and K. Giesecke), *Proceedings of the 2020 Winter Simulation Conference*, 277–288, 2020.

2. Unbiased Monte-Carlo Estimators for Jump-Diffusions (with G. Chen and K. Giesecke), *Proceedings of the 2019 Winter Simulation Conference*, 890–901, 2019.

3. Importance Sampling For Indicator Markov Chains (with K. Giesecke) *Proceedings of the 2010 Winter Simulation Conference*, 2742-–2750, 2010.

4. Ad-space exchange in a network using market equilibrium algorithms (with A. Saberi) *In* 5*th Workshop on Ad Auctions, 2009.*

Journal Articles

1. The Dispersion Bias (with L. Goldberg and A. Papanicolaou), *SIAM Journal on Financial Mathematics*, 2022.

2. James-Stein Estimators for Principal Component Analysis, *Stat (Special SDSS Issue)*, 2022.

3. James-Stein Estimation of the First Principal Component, *Stat*, 2021.

4. Conditional Importance Sampling for Event Counting Processes (with B. Kim). *INFORMS Journal on Computing*, 2021.

5. Numerical Solution of Jump-Diffusion SDEs (with K. Giesecke, G. Teng and Y. Wei), *Operations Research*, 2021.

6. Better betas (with L. Goldberg, A. Papanicolaou and S. Ulucam) *The Journal of Portfolio Management* 47(1), 119–136, 2020.

7. Reducing Bias in Event Time Simulation via Measure Changes (with K. Giesecke), *Mathematics of Operations Research*, 2020.

8. Identifying Financial Risk Factors with Convex Optimization (with C.Y. Li, J. Bohn and L. Goldberg), submitted to *Quantitative Finance*, 3rd round.

9. Optimal Importance Sampling of Default Losses (with K. Giesecke), submitted to *Stochastic Processes and their Applications*.

10. Large Deviations of Affine Processes, (with M. Varble), *in preparation* 2022.

Presentations

Conferences & Workshops

- James-Stein Estimators for Sample Eigenvectors, at 2021 Symposium on Data Science and Statistics, June 2-4, 2021.
- Compactness Methods for Rare Event Simulation Estimators, at *13th International Workshop on Rare-Event Simulation*, (Held Virtually), May 18-21, 2021.
- Unbiased Simulation Estimators for Path Integrals of Diffusions, at *Winter Simulation Conference*, (Held Virtually), December 14-18, 2020.
- Changes of Measure for Point Processes, at *2020 INFORMS Annual Meeting*, (Held Virtually), November 7–13, 2020.
- Conditional Importance Sampling for Event Timing, at *2019 INFORMS Annual Meeting*, Seattle, WA, October 20–23, 2019.
- Unbiased Sampling of Multivariate Jump-Diffusions, at *12th International Conference on Monte Carlo Methods & Applications*, Sydney, Australia. July 8–12, 2019.
- Unbiased Sampling of Multivariate Jump-Diffusions, at *20th INFORMS Applied Probability Society Conference*, Brisbane, Australia. July 3–5, 2019.
- Bias Corrections for Sample Eigenvectors, at *SIAM Conference on Financial Mathematics & Engineering*, Toronto, Canada. June 4–7, 2019.
- Exact Importance Sampling for Affine Processes, at *Southern California Applied Mathematics Symposium*, Pasadena, CA. April 27, 2019.
- Monte Carlo Estimation for Multivariate Jump-Diffusions, at *Southern California Probability Symposium*, Los Angeles, CA. December 8, 2018.
- The Dispersion Bias: correcting a large source of error in minimum variance portfolios, at 11*th Financial Risks International Forum*, Paris, France. March 26–27, 2018.
- The Dispersion Bias: correcting a large source of error in minimum variance portfolios, at 3*rd Annual CDAR Symposium*, Berkeley, CA. October 27, 2017.
- Compactness Methods for Importance Sampling, at *2017 INFORMS Annual Meeting*. Houston, TX. October 22-25, 2017.
- Reducing Bias in Event Time Simulation via Changes of Measure, at *2017 INFORMS Annual Meeting*, Houston, TX. October 22-25, 2017.

- Compactness Methods for Importance Sampling, at *11th International Conference on Monte Carlo Methods and Applications*, Montréal, Canada. July 3–7, 2017.
- Importance Sampling for Default Timing Models, at 12*th International Conference on Monte Carlo and Quasi-Monte Carlo Methods in Scientific Computing*, Stanford, CA. August 14–19, 2016.
- Identifying Broad and Narrow Financial Risk Factors with Convex Optimization, *MMDS 2016, Workshop on Algorithms for Modern Massive Data Sets, Berkeley, CA, June 2016*
- Reducing Bias in Default Timing Monte Carlo Simulation, at *Joint Mathematics Meeting*, Seattle, WA. January 6–9, 2016.
- Computational Complexity of Default Timing & Transform Methods, at *INFORMS Annual Meeting*, Philadelphia, PA. November 1–4, 2015.
- A Simulation Measure Perspective for Default Timing Simulation, at *INFORMS Annual Meeting*, Philadelphia, PA. November 1–4, 2015.
- A Simulation Measure Perspective for Default Timing Simulation, at *CORS/INFORMS International Conference*, Montréal, Canada. June 14–17, 2015.
- Systemic Risk in the Repo Market, at *IPAM Workshop on Systemic Risk and Financial Networks*, Los Angeles, CA. March 23–27, 2015.
- Systemic Risk in the Repo Market, at *The Consortium for Systemic Risk Analytics Meeting*, Boston, MA. December 15, 2014.
- Stability of the Repo Market, at *SIAM Conference on Financial Mathematics & Engineering*, Chicago, IL. November 13–15, 2014.
- Optimal Importance Sampling of Default Losses, at *INFORMS Annual Meeting*, San Francisco, CA. November 9–12, 2014.
- Systemic Risk in the Repo Market, at *INFORMS Annual Meeting*, San Francisco, CA. November 9–12, 2014.

Seminars & Lectures

- Analytical Solutions to Quadratic Programming on a Simplex, *IE & MS Seminar*, Northwestern University. April 20, 2021.
- Analytical Solutions to the Constrained Markowitz Problem, *Seminar, Department of Applid Mathematics*, Illinois Institute of Technology, Chicago, Il. April 13, 2021.

- Analytical Solutions to the Constrained Markowitz Problem, *Financial Mathematics Seminar, Department of Mathematics*, Florida State University, Tallahassee, FL. January 21, 2021.
- Monte Carlo Estimation for Multivariate Jump-Diffusions. *Financial Mathematics Seminar, Department of Mathematics*, Florida State University, Tallahassee, FL. March 28, 2019.
- Compactness Approaches for Importance Sampling. *Seminar, Department of Statistics & Applied Probability*, University of California, Santa Barbara, CA. January 9, 2018.
- Identifying Financial Risk Factors with Nonconvex Optimization. *CFRA Seminar, Center for Financial and Risk Analytics*, Stanford University, Stanford, CA. October 13, 2016.
- Convex Optimization Methods. *Invited Lecture, State Steet Global Exchange*, San Francisco, CA. June 9, 2016.
- Identifying Financial Risk Factors with Sparse Low-Rank Decompositions. *Risk Seminar, Center for Risk Management Research*, University of California, Berkeley, CA. April 12, 2016.
- Dynamic Importance Sampling, at *Center for Risk Management Research*. University of California, Berkeley, CA. April 5, 2016.
- Importance Sampling via Compactness Approaches. *Neyman Seminar, Department of Statistics*, University of California, Berkeley, CA. December 2, 2015.
- Urn Models: Applications in Finance and Economics. *Risk Seminar, Center for Risk Management Research*, University of California, Berkeley, CA. October 20, 2015.
- Transform Methods for Default Timing. *Risk Seminar, Center for Risk Management Research*, University of California, Berkeley, CA. May 5, 2015.
- Monte Carlo Methods for Default Timing. *Risk Seminar, Center for Risk Management Research*, University of California, Berkeley, CA. April 21, 2015.
- Systemic Risk in Repo Markets. *Risk Seminar, Center for Risk Management Research*, University of California, Berkeley, CA. November 4, 2014.
- Asymptotically Optimal Importance Sampling. *Risk Seminar, Center for Risk Management Research*, University of California, Berkeley, CA. April 1, 2014.

Teaching

Course Instructor (University of California, Santa Barbara)

- Monte Carlo Simulation (PSTAT262MC, 2021)
- Stochastic Calculus (PSTAT223A, 2019, 2020)
- Advanced Financial Modeling (PSTAT223C, 2019,2020)
- Advanced Probability Theory (PSTAT221B, 2019)
- Applied Stochastic Processes (PSTAT160B, 2018, 2019,2020)

Directed Research (University of California, Santa Barbara)

- Independent Study (PSTAT199)
  - Haoran Li (Spring, 2019)
    Empirical Testing of a Modified Keen's Model.
  - Zhehao Zhang (Spring, 2019)
    Dispersion Bias Corrections for Simple Linear Regression.
  - Sam O'Neal (Spring, 2019)
    Reconciling Diversification and Markowitz Optimization.
  - Yunkai Zhang (Spring, 2019)
    Self-Regularization of Neural Networks on Brownian & Poisson Paths.
- Directed Reading & Research (PSTAT596)
  - Alexander Bernstein (Spring, 2019)
    Explicit Solutions of Position Constrained Markowitz Portfolios.
  - Brennan Hall (Spring, 2019)
    Exact Importance Sampling of Affine Processes.

Teaching Assistant (Stanford University)

- Algorithms for Massive Data Set Analysis (CS369M, 2010)
- Discrete Mathematics & Algorithms (CME305, 2010–2012)
- Design and Analysis of Algorithms (CS161, 2012–2013)
- Software Development for Scientists & Engineers (CME211, 2012)
- Large-Scale Computing in Engineering (CME212, 2012–2013)

- Investment Science (MS&E242, 2013–2014)

Industry Experience

2016: Berkeley Associates, LLC. *Consultant for State Street Global Exchange.*

2012: The William & Flora Hewlett Foundation. *Portfolio Management Consultant for the Director of Public Investments.*

Summer 2012: Y Combinator & Highland Capital. *Accepted to Y Combinator & Highland summer programs as part of a* 3 *person co-founder team. Raised (combined)* $150,000 *from both VC funds & presented prototype on demo day.*

2007 – 2009: Adoptic Inc. *(1st hire) Designed and implemented an online advertising exchange platform based on Arrow-Debreu general equilibrium theory. Work was featured at Ad Auctions Workshop in Stanford, CA (July 2009).*

Professional Service

Affiliations

- INFORMS, SIAM.

Organizer

- *Co-organizer*, Workshop on Algorithms for Modern Massive Datasets (MMDS). Years: 2010, 2012, 2014 & 2016 (`http://mmds-data.org`).
- *Co-organizer*, ERP (S&P 500) Prediction Contest (2019,2020), at University of California, Santa Barbara (`http://erpcontest.pstat.ucsb.edu`). Sponsored by Hull Tactical Asset Allocation.

Referee

- Operations Research, Mathematical Finance, Quantitative Finance, Annals of Finance, SIAM Journal on Financial Mathematics.