

Ronnie Sircar

Eugene Higgins Professor of Operations Research & Financial Engineering
ORFE Department, Princeton University, Sherrerd Hall 208, Princeton, NJ 08544.

Academic Positions and Education

- 2000-present **Princeton University**
Assistant (2000-04), Associate (2004-08), and Full (2008-) Professor
- 2022-present Affiliate Faculty member, Princeton Institute for Computational Science & Engineering.
- 2015-present Affiliate Faculty member, Andlinger Center for Energy & the Environment.
- 2004-present Affiliate Faculty member, Program in Applied & Computational Mathematics.
- 2000-present Affiliate Faculty member, Bendheim Center for Finance.
- Spring 2024 **Oxford University**
Visiting Fellow, St. Catherine's College & Mathematical Institute.
- Fall 2016 **Stanford University**
Visiting Professor, Institute for Computational Mathematics & Engineering.
- Fall 2010 **Oxford-Man Institute of Quantitative Finance, Oxford University**
- 1997-2000 **University of Michigan**
Assistant Professor, Department of Mathematics.
- 1993-1997 **Stanford University**
Ph.D. in Scientific Computing and Computational Mathematics;
minor in Mathematics. Completed June 1997.
- 1992-1993 **Oxford University**
M.Sc. with Distinction in Mathematical Modelling and Numerical Analysis.
- 1989-1992 **Oxford University**
B.A. First Class Honours in Mathematics.

Awards

- March 2020 Fellow of Society for Industrial & Applied Mathematics (SIAM).
- Dec. 2006 Engineering Council Teaching Award, Princeton University.
- Dec. 2005 Engineering Council Teaching Award, Princeton University.
- June 2003 Howard B. Wentz, Jr. Junior Faculty Award, Princeton University.
- Nov. 2002 Engineering Council Teaching Award, Princeton University.
- 1996-1997 Lieberman Fellowship, Stanford University.

Recent Grants

- 2021-2023 First Republic Bank Lifelong Learning & Research Initiative, PI, ~ \$2.5 million.
- 2023-2025 Fund for Energy Research with Corporate Partners, Andlinger Center, co-PI, \$150K.
- 2020-2025 ARPA-E PERFORM grant, co-PI, \$4.25 million.
- 2020-2022 PIIRS Development Finance grant, co-PI.
- 2017-2020 NSF Algorithms for Modern Power Systems grant, co-PI, \$280K.

Administrative Roles (Princeton University)

- 2018-24 Chair, ORFE Department.
- 2015-18 Director of Graduate Studies, Bendheim Center for Finance.
- 2013-15 Director of Graduate Studies, ORFE Department.
- 2009-10 Acting Chair, ORFE Department.
- 2002-05 Director of Undergraduate Studies, ORFE Department.

Editorial

Associate Editor, *Communications in Mathematical Sciences*, 2015-25.

Editorial Board, *Risk and Decision Analysis*, 2014-.

Founding co-Editor-in-Chief, *SIAM Journal on Financial Mathematics*, 2008-14; Associate Editor 2015-.

Associate Editor, *Management Science*, 2010-12.

Co-Managing Editor, *International Journal on Theoretical & Applied Finance*, 2008-10.

Associate Editor, *Mathematical Finance*, 2006-19.

Editorial Board, *Applied Mathematical Finance*, 2003-present.

Associate Editor, *Operations Research Letters*, 2002-08.

Associate Editor, *Operations Research*, 2005-08.

Book Review Editor, *Quantitative Finance*, 2005-6.

Professional Societies

Society for Industrial and Applied Mathematics (SIAM); selected as Fellow in 2020.

SIAM Activity Group on Financial Mathematics: elected Chair for 2013-15; elected Vice Chair for 2011-13; Secretary (2007-09, elected term; re-elected 2009-11).

Bachelier Finance Society (member of Council, 2012-16).

Recent Invited Talks (past 5 years)

Meetings

June 2025 *Byrne Workshop on Stochastic Analysis in Finance and Insurance*, University of Michigan.

May 2025 *Probability, finance and signal conference*,
Centre International de Rencontres Mathematiques (CIRM), Marseille, France.

Feb 2025 *Economic Models in MFG workshop*, Durham University Institute of Advanced Study, UK.

Jan 2025 *Explorations in Statistics, Probability, Learning and Optimization Research*, plenary,
Ashoka University, India.

July 2024 *UMI-AMS joint international Meeting, Mean Field Games session*, Palermo, Italy.

June 2024 *New Trends and Challenges in Stochastic Differential Games workshop*, Kelowna, Canada.

June 2024 *Byrne Workshop on Stochastic Analysis in Finance and Insurance*, University of Michigan.

Oct 2022 *12th Oxford-Princeton Workshop*, Oxford.

Sept 2022 *CFMAR Workshop*, UC Santa Barbara.

Nov 2021 *Applications of Mean Field Games Workshop*, IMSI, Chicago (online).

July 2020 *SIAM Annual Meeting*, plenary (online).

Colloquia & Seminars

Feb 2024 *Mathematical Finance seminar*, Oxford University.

Nov 2022 *DeFi Seminar*, Oxford-Man Institute.

Apr 2021 *Risk Management & Insurance Seminar*, Robinson College of Business,
Georgia State University (online).

Feb 2021 *Mathematics Colloquium*, Humboldt University, Berlin (online).

Fall 2020 *Mathematics Colloquium*, University of Connecticut (online).

Publications

Books

- J.-P. Fouque, G. Papanicolaou, R. Sircar, K. Solna, *Multiscale Stochastic Volatility for Equity, Interest-Rate and Credit Derivatives*, Cambridge University Press, September 2011.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, *Derivatives in Financial Markets with Stochastic Volatility*, Cambridge University Press, September 2000.

Surveys

- M. Ludkovski, R. Sircar, *Game Theoretic Models for Energy Production*, in Fields Communications Volume: Commodities, Energy and Environmental Finance, Springer (2015).
- R. Carmona, R. Sircar, *Financial Mathematics*, in Princeton Companion to Applied Mathematics, (eds. N. Higham, F. Santosa), Princeton University Press (2015).
- M. Lorig, R. Sircar, *Stochastic Volatility: Modeling and Asymptotic Approaches to Option Pricing & Portfolio Selection*, in Fundamentals of Financial Signal Processing, (eds. A. Akansu, S. Kulkarni, D. Malioutov, I. Pollak), Wiley (2015).

Non-technical articles

- R. Aïd, M. Ludkovski, R. Sircar, *Renewables Reliability in an Era of Force Majeure*, SIAM News, May 2021.
- A.M. Reppen, R. Sircar, *Cryptocurrencies, Mining, and Mean Field Games*, SIAM News, Jan. 2021.
- R. Sircar, *FME 2010: Global Meltdown Broadens Agenda for Research in Financial Math*, SIAM News, Jan. 2011.
- R. Sircar, *Financial Mathematics '08: Modeling the Market for a Diminishing Resource*, SIAM News, Jan. 2009.
- R. Carmona, R. Sircar, *Financial Mathematics '08: Mathematics and the Financial Crisis*, SIAM News, Jan. 2009.
- M. Giles, R. Sircar, *Financial Mathematics at ICIAM*, SIAM News, Oct. 2007.
- R. Sircar, *Recent Books on the Mathematics of Finance*, Featured Book Review, SIAM Review, **47**(2), 2005, pages 369 – 372.

Submitted

- P. Chan, R. Sircar, I. Zimbidis, *Optimal Trading under Instantaneous and Persistent Price Impact, Predictable Returns and Multiscale Stochastic Volatility*, May 2025, submitted.
- B. Aydin, E. Parmaksiz, R. Sircar, *Fare Game: A Mean Field Model of Stochastic Intensity Control in Dynamic Ticket Pricing*, May 2025, submitted.
- N. Garcia, R. Sircar, M. Soner, *Mean Field Games of Control and Cryptocurrency Mining*, April 2025, submitted.
- R. Carmona, R. Sircar, X. Yang, *Attribution And Risk-Averse Unit Commitment In Power Grids Using Integrated Gradient*, August 2024, submitted.
- D. Rigobon, R. Sircar, *Formation of Optimal Interbank Lending Networks under Liquidity Shocks*, November 2022, submitted.

Published

- A. Shrivats R. Sircar, X. Yang, *Quantifying Renewables Reliability Risk in Modern and Future Electricity Grids*, August 2024. To appear in The Journal of Energy Markets.
- S. Howison, C. Reisinger, R. Sircar, Z. Wang, *Asymptotic expansions of evolution equations with fast volatility*, October 2023. To appear in SIAM J. Multiscale Modeling and Simulation.
- T. Sanger, E. Kapstein, R. Sircar, *Estimating the Collapse of Afghanistan’s Economy Using Nightlights Data*, in PLOS ONE, December 2024.
- Y. Ait-Sahalia, F. Matthys, E. Osambela, R. Sircar, *When Uncertainty and Volatility Are Disconnected: Implications for Asset Pricing and Portfolio Performance*, Journal of Econometrics, published online 2024.
- Z. Li, A.M. Reppen, R. Sircar, *A Mean Field Games Model for Cryptocurrency Mining*, Management Science, volume 70, 2024, pages 2188-2208.
- S. Geng, H. Nassif, Z. Kuang, A.M. Reppen, R. Sircar, *Factor Learning Portfolio Optimization Informed by Continuous-Time Finance Models*, in 2023 ICML Workshop on New Frontiers in Learning, Control, and Dynamical Systems (Frontiers4LCD).
- M. Alaluf, G. Crippa, S. Geng, Z. Jing, N. Krishnan, S. Kulkarni, W. Navarro, R. Sircar, J. Tang, *Reinforcement Learning Paycheck Optimization for Multivariate Financial Goals, Risk & Decision Analysis*, volume 9(1), 2023, pages 11-18.
- N. Krishnan, R. Sircar, *Accelerated Share Repurchases under Stochastic Volatility*, Applied Mathematical Finance, volume 22(5), 2023, pages 331-365.
- P. Graewe, U. Horst, R. Sircar, *A Maximum Principle approach to deterministic Mean Field Games of Control with Absorption*, SIAM J. Control & Optimization, volume 60(5), 2022, pages 3173-3190.
- L. Avanesyan, R. Sircar, *Power Mixture Forward Performance Processes*, SIAM J. Financial Math, volume 13(3), 2022, pages 1040-1062.
- P.J. Graber, R. Sircar, *Master Equation for Cournot Mean Field Games of Control with Absorption*, Journal of Differential Equations, volume 343, 2023, pages 816-909.
- J.-P. Fouque, R. Hu, R. Sircar, *Sub- and Super-solution Approach to Accuracy Analysis of Portfolio Optimization Asymptotics in Multiscale Stochastic Factor Markets*, SIAM J. Financial Math, volume 13(1), 2022, pages 109-128.
- S. Geng, H. Nassif, C. A. Manzanares, A. Max Reppen, R. Sircar, *Deep PQR: Solving Inverse Reinforcement Learning using Anchor Actions*, June 2020, in Proceedings of the 37th International Conference on Machine Learning (ICML), Vienna, Austria, PMLR 119.
- L. Avanesyan, M. Shkolnikov, R. Sircar, *Construction of Forward Performance Processes in Stochastic Factor Models and an Extension of Widder’s Theorem*, Finance & Stochastics, **24**(4), 2020, pages 981-1011.
- M. Bichuch, R. Sircar, *Optimal Investment with Transaction Costs and Stochastic Volatility, Part II*, SIAM J. Control & Optimization, **57**, 2019, pages 437-467.
- A. Agarwal, R. Sircar, *Portfolio Benchmarking under Drawdown Constraint and Stochastic Sharpe Ratio*, SIAM J. Financial Mathematics, **9**, 2018, pages 435-464.
- P. Chan, R. Sircar, *Fracking, Renewables & Mean Field Games*, SIAM Review, **59**(3), 2017, pages 588-615.

- J.-P. Fouque, A. Papanicolaou, R. Sircar, *Perturbation Analysis for Investment Portfolios Under Partial Information with Expert Opinions*, SIAM J. Control & Optimization, **55**(3), 2017, pages 1534-1566.
- M. Bichuch, R. Sircar, *Optimal Investment with Transaction Costs and Stochastic Volatility, Part I: Infinite Horizon*, SIAM J. Control & Optimization, **55**(6), 2017, pages 3799-3832.
- J.-P. Fouque, R. Sircar, T. Zariphopoulou, *Portfolio Optimization & Stochastic Volatility Asymptotics*, Mathematical Finance, **27**(3), 2017, pages 704-745. Published online 2015.
- M. Ludkovski, R. Sircar, *Technology Ladders and R&D in Dynamic Cournot Markets*, Journal of Economic Dynamics and Control, **69**, August 2016, pages 127-151.
- M. Lorig, R. Sircar, *Portfolio Optimization under Local-Stochastic Volatility: Coefficient Taylor Series Approximations & Implied Sharpe Ratio*, SIAM J. Financial Mathematics, **7**, 2016, pages 418-447.
- M. Shkolnikov, R. Sircar, T. Zariphopoulou, *Asymptotic Analysis of Forward performance processes in incomplete markets and their ill-posed HJB equations*, SIAM J. Financial Mathematics, **7**, 2016, pages 588-618.
- J.-P. Fouque, M. Lorig, R. Sircar, *Second Order Multiscale Stochastic Volatility Asymptotics: Stochastic Terminal Layer Analysis & Calibration*, Finance & Stochastics **20**(3), 2016, pages 543-588.
- A. Agarwal, S. Juneja, R. Sircar, *American Options under Stochastic Volatility: Control Variates, Maturity Randomization & Multiscale Asymptotics*, Quantitative Finance **16**(1), 2016, pages 17-30.
- P. Chan, M. Stein, R. Sircar, *A Feedback Model for the Financialization of Commodity Markets*, SIAM J. Financial Mathematics **6**, 2015, pages 870-899.
- P. Chan, R. Sircar, *Bertrand & Cournot Mean Field Games*, Applied Mathematics & Optimization **71**, 2015, pages 533-569.
- Y. Dong, R. Sircar, *Time-Inconsistent Portfolio Investment Problems*, April 2014, in Stochastic Analysis and Applications 2014, (eds. D. Crisan, B. Hambly and T. Zariphopoulou), Springer.
- A. Dasarathy, R. Sircar, *Variable Costs in Dynamic Cournot Energy Markets*, in Fields Communications Volume: Commodities, Energy and Environmental Finance, Springer (2015).
- T. Leung, R. Sircar, *Implied Volatility of Leveraged ETF Options*, Applied Mathematical Finance **22**(2), 2015, pages 162-188.
- J.-P. Fouque, A. Papanicolaou, R. Sircar, *Filtering and Portfolio Optimization with Stochastic Unobserved Drift in Asset Returns*, Communications in Mathematical Sciences **13**(4), 2015, pages 935-953.
- A. Papanicolaou, R. Sircar, *A Regime-Switching Heston Model for VIX and S&P 500 Implied Volatilities*, Quantitative Finance, **14**(10), 2014, pages 1811-1827.
- M. Coulon, W. Powell, R. Sircar, *A Model for Hedging Load and Price Risk in the Texas Electricity Market*, Energy Economics **40**, 2013, pages 976-988.
- R. Sircar, S. Sturm, *From Smile Asymptotics to Market Risk Measures*, Mathematical Finance **25**(2), 2015, pages 400-425 (published online since Nov. 2012).
- A. Ledvina, R. Sircar, *Oligopoly Games under Asymmetric Costs and an Application to Energy Production*, Mathematics and Financial Economics, **6**(4), 2012, pages 261-293.

- M. Ludkovski, R. Sircar, *Exploration and Exhaustibility in Dynamic Cournot Games*, European Journal on Applied Mathematics **23**(3), 2012, pages 343-372.
- A. Ledvina, R. Sircar, *Dynamic Bertrand and Cournot Competition: Asymptotic and Computational Analysis of Product Differentiation*, Risk and Decision Analysis, **3**(3), 2012, pages 149-165.
- T. Leung, R. Sircar, T. Zariphopoulou, *Forward Indifference Valuation of American Options*, Stochastics, **84**(5 – 6), 2012, pages 741-770.
- A. Ledvina, R. Sircar, *Dynamic Bertrand Oligopoly*, Applied Mathematics and Optimization **63**(1), 2011, pages 11-44.
- C. Harris, S. Howison, R. Sircar, *Games with Exhaustible Resources*, SIAM J. Applied Mathematics **70**(7), 2010, pages 2556-2581.
- A. Toussaint, R. Sircar, *A Framework for Dynamic Hedging under Convex Risk Measures*, Proceedings of 2008 Ascona Seminar on Stochastic Analysis, Random Fields and Applications, (eds. R. Dalang, M. Dozzi, F. Russo), Birkhauser.
- J.-P. Fouque, R. Sircar, K. Solna, *Multiname and Multiscale Default Modeling*, SIAM J. Multiscale Modeling and Simulation, **7**(4), 2009, pages 1956-1978.
- J. Perello, J. Masoliver, R. Sircar, *Option pricing under stochastic volatility: the exponential Ornstein-Uhlenbeck model*, Journal of Statistical Mechanics, 2008, P06010.
- A. Ilhan, M. Jonsson, R. Sircar, *Optimal Static-Dynamic Hedges for Exotic Options under Convex Risk Measures*, Stochastic Processes & Applications, **119**(10), 2009, pages 3608-3632.
- T. Leung, R. Sircar, *Exponential Hedging with Optimal Stopping and Application to ESO Valuation*, SIAM Journal on Control & Optimization, **48**(3), 2009, pages 1422-1451.
- T. Leung, R. Sircar, T. Zariphopoulou, *Credit Derivatives and Risk Aversion*, in Advances in Econometrics (eds. T. Fomby, J.-P. Fouque and K. Solna), 2008, Elsevier Science.
- R. Sircar, T. Zariphopoulou, *Utility Valuation of Credit Derivatives: Single and Two-Name Cases*, in Advances in Mathematical Finance (eds. M. Fu, R. Jarrow, J.-Y. Yen, R. Elliott), ANHA Series, Birkhauser, 2007, pages 279-301.
- E. Papageorgiou, R. Sircar, *Multiscale Intensity Models and Name Grouping for Valuation of Multi-name Credit Derivatives*, Applied Mathematical Finance, **16**(4), 2009, pages 353-383.
- T. Leung, R. Sircar, *Accounting for Risk Aversion, Vesting, Job Termination Risk and Multiple Exercises in Valuation of Employee Stock Options*, Mathematical Finance, **19**(1), 2009, pages 99-128.
- R. Sircar, T. Zariphopoulou, *Utility Valuation of Credit Derivatives and Application to CDOs*, Quantitative Finance, **10**(2), 2010, pages 195-208.
- E. Papageorgiou, R. Sircar, *Multiscale Intensity Models for Single Name Credit Derivatives*, Applied Mathematical Finance, **15**(1), 2008, pages 73-105.
- E. Bayraktar, U. Horst, R. Sircar, *Queueing Theoretic Approaches to Financial Price Fluctuations*, in Handbook of Financial Engineering (ed. J. Birge and V. Linetsky), Elsevier, Volume 15 of Handbooks in Operations Research and Management Science, North Holland, 2007, pages 637-677.
- R. Sircar, W. Xiong, *A General Framework for Evaluating Executive Stock Options*, Journal of Economic Dynamics and Control, **31**(7), 2007, pages 2317-2349.

- A. Ilhan, M. Jonsson, R. Sircar, *Portfolio Optimization with Derivatives and Indifference Pricing*, in *Indifference Pricing*, (ed. R. Carmona), Princeton University Press, 2008.
- J.-P. Fouque, R. Sircar, K. Solna, *Stochastic Volatility Effects on Defaultable Bonds*, Applied Mathematical Finance **13**(3), 2006, pages 215 – 244.
- A. Ilhan, M. Jonsson, R. Sircar, *Optimal Investment with Derivative Securities*, Finance & Stochastics **9**(4), 2005, pages 585 – 595.
- E. Bayraktar, U. Horst, R. Sircar, *A Limit Theorem for Financial Markets with Inert Investors*, Mathematics of Operations Research **31**(4), 2006, pages 789 – 810.
- A. Ilhan, R. Sircar, *Optimal Static-Dynamic Hedges for Barrier Options*, Mathematical Finance **16**(2), 2006, pages 359 – 385.
- R. Sircar, T. Zariphopoulou, *Bounds & Asymptotic Approximations for Utility Prices when Volatility is Random*, SIAM Journal on Control & Optimization **43**(4), 2005, pages 1328 – 1353.
- P. Cotton, J.-P. Fouque, G. Papanicolaou, R. Sircar, *Stochastic Volatility Corrections for Interest Rate Derivatives*, Mathematical Finance **14**(2), 2004, pages 173-200.
- A. Ilhan, M. Jonsson, R. Sircar, *Singular Perturbations for Boundary Value Problems Arising from Exotic Options*, SIAM Journal on Applied Mathematics **64**(4), 2004, pages 1268 – 1293.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, K. Solna, *Maturity Cycles in Implied Volatility*, Finance & Stochastics **8**(4), 2004, pages 451 – 477.
- E. Bayraktar, H.V. Poor, R. Sircar, *Estimating the Fractal Dimension of the S&P 500 Index using Wavelet Analysis*, International Journal of Theoretical & Applied Finance, **7**(5), 2004, pages 615 – 643.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, K. Solna, *Multiscale Stochastic Volatility Asymptotics*, SIAM Journal on Multiscale Modeling and Simulation, **2**(1), 2003, pages 22 – 42.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, K. Solna, *Singular Perturbations in Option Pricing*, SIAM Journal on Applied Mathematics **63**(5), 2003, pages 1648 – 65.
- M. Jonsson, R. Sircar, *Partial Hedging in a Stochastic Volatility Environment*, Mathematical Finance **12**(4), October 2002, pages 375 – 409.
- M. Jonsson, R. Sircar, *Optimal Investment Problems and Volatility Homogenization Approximations*, in Modern Methods of Scientific Computing, A. Bourlioux, M. Gander & G. Sabidussi eds., NATO Science Series II, vol. 75, Kluwer, August 2002, pages 255 – 281.
- D. Darius, A. Ilhan, J. Mulvey, K. Simsek, R. Sircar, *Trend-Following Hedge Funds and Multi-Period Asset Allocation*, Quantitative Finance **2**(5), October 2002, pages 354 – 61.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, *Stochastic Volatility and the Epsilon Martingale Decomposition*, in Trends in Mathematics, M. Kohlmann, S. Tang editors, pages 152 – 9, Birkhauser Verlag, October 2000.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, K. Solna, *Short Time-Scale in S&P 500 Volatility*, Journal of Computational Finance **6**(4), Summer 2003, pages 1 – 23.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, *From the Implied Volatility Skew to a Robust Correction to Black-Scholes American Option Prices*, International Journal of Theoretical & Applied Finance, **4**(4), 2001.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, *Stochastic Volatility Correction to Black-Scholes*, RISK **13**(2), February 2000, pages 89 – 92.

- R. Sircar, *Hedging under Stochastic Volatility*, in Quantitative Analysis in Financial Markets, Volume 2, M. Avellaneda, editor, World Scientific Publishing, February 2000.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, *Financial Modeling in a Fast Mean-Reverting Stochastic Volatility Environment*, Asia-Pacific Financial Markets **6**(1), 1999, pages 37 – 48.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, *Mean-Reverting Stochastic Volatility*, International Journal of Theoretical & Applied Finance **3**(1), pages 101 – 142, 2000.
- J.-P. Fouque, G. Papanicolaou, R. Sircar, *Asymptotics of a Two-Scale Stochastic Volatility Model*, in the Volume “Equations aux dérivées partielles et applications” in honour of Jacques-Louis Lions, pages 517 – 525, May 1998.
- R. Sircar, G. Papanicolaou, *Stochastic Volatility, Smile and Asymptotics*, Applied Mathematical Finance **6**(2), pages 107 – 145, June 1999.
- R. Sircar, G. Papanicolaou, *General Black-Scholes Models accounting for increased market volatility from hedging strategies*, Applied Mathematical Finance **5**(1), 1998, pages 45 – 82.