

ROBERT F. ALMGREN

Quantitative Brokers

- 2008- Co-founder, President, and Head of Research
Algorithmic agency brokerage for futures and interest rates.
- 2017- Princeton University, Operations Research and Financial Engineering
Twelve-week undergraduate/master's course on "High-frequency trading"
- 2015- Carnegie Mellon University, Tepper School of Business
Seven-week master's course on "Market microstructure and algorithmic trading"
- 2006-09 New York University, Courant Institute of Mathematical Sciences
Half-semester master's course on "Financial econometrics and time series analysis"

Bank of America

- 2005-08 Managing Director (from 2007) and Head of Quantitative Strategies (from 2006)
Electronic Trading Services in Equities division of Banc of America Securities
Client-focused quantitative research on equity execution costs and trading algorithms.
Development of "Instinct" algorithm that adapts execution to dynamic liquidity.

University of Toronto

- 2000-05 Associate Professor of Mathematics and Computer Science (with tenure)
Director, Master of Mathematical Finance Program (2002-05)
Research in financial mathematics and in free boundaries supported by NSERC.

University of Chicago

- 1998-2000 Senior Lecturer in Mathematics
Associate Director, Program on Financial Mathematics
- 1992-98 Assistant Professor of Mathematics
Research on free boundaries in materials science and fluid dynamics, supported by Alfred P. Sloan Foundation and NSF CAREER program. Undergraduate and graduate teaching in applied mathematics, and summer program on interactive geometry for elementary school teachers.

University of Paris VII

- 1992 Visiting Postdoctoral Researcher

Courant Institute of Mathematical Sciences, New York University

- 1989-91 Visiting Member
NSF Mathematical Sciences Postdoctoral Research Fellowship

EDUCATION

- 1989 Ph.D. in Applied and Computational Mathematics, Princeton University
- 1984 M.S. in Applied Mathematics, Harvard University
- 1983 B.S. in Physics and B.S. in Mathematics, Massachusetts Institute of Technology

RECENT INVITED CONFERENCE PRESENTATIONS

- Dec 2016 *Market Microstructure: Confronting Many Viewpoints*, Paris, France
Panel discussion on “Foreseeing new fixed income markets”
- Nov 2016 *7th Annual High Frequency Finance and Data Analytics*, Stevens Inst. Tech., NJ
Plenary talk on “Event modeling for high frequency trading”
- Jul 2016 *9th World Congress of the Bachelier Finance Society*, New York City
Plenary talk on “Large trades and price reaction in futures markets”
- Jul 2016 *PIMS Summer School 2016 in Mathematical Finance*, Edmonton, Alberta, Canada
4-lecture mini-course on “Market microstructure and algorithmic trading”
- Mar 2016 *Princeton Quant Trading Conference 2016*, Princeton, NJ, “Overlapping events”
- Feb 2016 *MMF Symposium*, Blue Mountain, Ontario, Canada
“U.S. and Canadian events impact the Canadian markets”
- Oct 2015 *Copenhagen Business School Symposium on High-Frequency Trading*
“High frequency trading in fixed income and futures markets”

PUBLICATIONS**Finance and optimization**

1. T. M. Li and RFA, “Option hedging with smooth market impact”, *Market Microstructure and Liquidity*, 2 (June 2016), 1650002-1 to -26.
2. RFA and A. Tourin, “Optimal soaring via Hamilton-Jacobi-Bellman equations”, *Optim. Control Appl. Meth.*, 36 (2015) 475-495.
3. “Execution strategies in fixed-income markets”, in Maureen O’Hara, Marcos López de Prado and David Easley, editors, *High Frequency Trading*, Risk Books 2013.
4. “Optimal trading with stochastic liquidity and volatility”, *SIAM J. Financial Math.*, 3 (2012) 163-181.
5. J. Lorenz and RFA, “Mean-variance optimal adaptive execution”, *Appl. Math. Fin.*, 18 (2011) 395-422.
6. “Execution Costs”, in Rama Cont, editor-in-chief, *Encyclopedia of Quantitative Finance*, Wiley 2009.
7. RFA and J. Lorenz, “Adaptive arrival price”, in *Algorithmic Trading III: Precision, Control, Execution*, Brian R. Bruce, editor, Institutional Investor Journals 2007.
8. RFA and J. Lorenz, “Bayesian adaptive trading with a daily cycle”, *J. Trading* Fall 2006.
9. RFA and N. Chriss, “Optimal portfolios from ordering information”, *J. Risk* Fall 2006.
10. RFA, C. Thum, E. Hauptmann, and H. Li, “Equity market impact”, *Risk*, July 2005.
11. RFA and N. Chriss, “Bidding principles”, *Risk*, June 2003.
12. “Optimal execution with nonlinear impact functions and trading-enhanced risk”, *Appl. Math. Fin.*, 10 (2003) 1-18.
13. “Financial derivatives and partial differential equations”, *Amer. Math. Mon.*, Jan. 2002.
14. RFA and N. Chriss, “Optimal execution of portfolio transactions”, *J. Risk* 3 (2000) 5-39.
15. RFA and N. Chriss, “Value under liquidation”, *Risk*, Dec. 1999.

Free boundary problems

16. K. Glasner and RFA, "Dual fronts in a phase field model," *Physica D* 146 (2000) 328-340.
17. B. Johnson, R. Sekerka, and RFA, "Thermodynamic basis for a variational model for crystal growth," *Phys. Rev. E* 60 (1999) 705-714.
18. "Second order phase field asymptotics with unequal conductivities," *SIAM J. Appl. Math.* 59 (1999) 2086-2107
19. N. Provatas, N. Goldenfeld, J. Dantzig, J. LaCombe, A. Lupulescu, M. Koss, M. Glicksman, and RFA, "Crossover scaling in dendritic evolution at low undercooling", *Phys. Rev. Lett.* 82 (1999) 4496-4499.
20. A. S. Almgren and RFA, "Phase field instabilities and adaptive mesh refinement," in *Modern Methods for Modeling Microstructure in Materials*, TMS/SIAM 1996.
21. RFA, A. Bertozzi and M. P. Brenner, "Stable and unstable singularities in the unforced Hele-Shaw cell," *Phys. Fluids* 8 (1996) 1356-1370.
22. "Singularity formation in Hele-Shaw bubbles," *Phys. Fluids* 8 (1996) 344-352.
23. "Crystalline Saffman-Taylor fingers," *SIAM J. Appl. Math.* 55 (1995) 1511-1535.
24. "Computing Laplacian dendrites," in J. I. Diaz *et al*, editors, *Free boundary problems: theory and applications*, pages 1-12. Longman Scientific and Technical, 1995.
25. RFA, W. Dai, and V. Hakim, "Scaling behavior in anisotropic Hele-Shaw flow," *Phys. Rev. Lett.* 71 (1993) 3461-3464.
26. "Variational algorithms and pattern formation in dendritic solidification," *J. Comp. Phys.* 106 (1993) 337-354.

Geometry teaching, compressible combustion, and elasticity

27. "Geometric Biology for the Chicago Public Schools," in proceedings of *Inquiry-Based Geometry Throughout the Secondary Curriculum*, St. Olaf College, June 1997.
28. "High-frequency acoustic waves in a reacting gas," *SIAM J. Appl. Math.* 51 (1991) 351-373.
29. RFA, A. Majda, and R. R. Rosales, "Asymptotic analysis of reacting materials with saturated explosion, I. Low-frequency waves," *Stud. Appl. Math.* 84 (1991) 275-313.
30. RFA, A. Majda, and R. R. Rosales, "Asymptotic analysis of reacting materials with saturated explosion, II. High-frequency waves," *Stud. Appl. Math.* 84 (1991) 315-360.
31. "Modulated high-frequency waves," *Stud. Appl. Math.* 83 (1990) 159-181.
32. RFA, A. Majda, and R. R. Rosales, "Rapid initiation in condensed phases through resonant nonlinear acoustics," *Phys. Fluids A* 2 (1990) 1014-1029.
33. "An isotropic three-dimensional structure with Poisson's ratio = -1," *J. Elasticity* 15 (1985) 427-430.

PATENT

RFA and N. Chriss, "Method and system for portfolio optimization from ordering information", United States Patent 7630930, Dec. 2009.