Patrick Chang

Postdoctoral Researcher · University of Oxford

Oxford-Man Institute, Oxford, United Kingdom

patrick.chang@omi.ox.ac.uk | CHNPAT005 | patrick-chang-976120170

Academic Posts

2025-2028 **Postdoctoral Researcher,** Oxford-Man Institute, University of Oxford

Education

2021-2025 **University of Oxford,** DPhil in Mathematics
2020 **University of Cape Town,** MSc by dissertation in Mathematical Statistics (Distinction)
2019 **University of Cape Town,** BSc (Honours) in Statistical Sciences (First Class, 91/100)
2016-2018 **University of Cape Town,** BCom in Actuarial Science (Distinction, 83/100)

Research

Revise and Resubmit

Cartea, Á., Chang, P., & García-Arenas, G. (2023). Spoofing and Manipulating Order Books with Learning Algorithms. R&R at **Operations Research**.

Cartea, Á., Chang, P., & Penalva, J. (2022). Algorithmic Collusion in Electronic Markets: The Impact of Tick Size. R&R at **Management Science**.

Published

Cartea, Á., Chang, P., Penalva, J., & Waldon, H. (2026). Algorithmic Collusion and a Folk Theorem from Learning with Bounded Rationality. **Games and Economic Behavior** 157: 1-21.

Cartea, Á., Chang, P., Mroczka, M., & Oomen, R. (2022). AI Driven Liquidity Provision in OTC Financial Markets. **Quantitative Finance** 22(12): 2171-2204.

Working Papers

Cartea, Á., Chang, P., Chen, N., & Zhong, M. (2026). AI Bubbles with Large Language Models.

Brogaard, J., Cartea, Á., Chang, P., & Graumans, R. (2025). The Lasting Impact of Flickering Quotes.

Cartea, Á., Chang, P., & Graumans, R. (2025). Anonymity, Signaling, and Collusion in Limit Order Books. Submitted to Management Science.

Cartea, Á., Chang, P., Penalva, J., & Waldon, H. (2022). The Algorithmic Learning Equations: Evolving Strategies in Dynamic Games.
Submitted to European Journal of Operations Research.

Work in Progress

Cartea, Á., Chang, P., & Penalva, J. Entry Deterrence by Algorithmic Pricing.

Brogaard, J., Cartea, Á., Chang, P., & Graumans, R. The Lifetime of Trading Algorithms.

Other Publications (Pre-DPhil)

Chang, P., Pienaar, E., & Gebbie, T. (2025). Detecting discrete processes with the Epps effect. Frontiers of Mathematical Finance 4(0): 140-167.

Chang, P., Pienaar, E., & Gebbie, T. (2021). The Epps effect under alternative sampling schemes. Physica A: Statistical Mechanics and its Applications 583: 126329.

Chang, P., Pienaar, E., & Gebbie, T. (2020). Malliavin–Mancino Estimators Implemented with Nonuniform Fast Fourier Transforms. SIAM Journal on Scientific Computing 42(6): B1378–B1403.

Chang, P. (2020). Fourier instantaneous estimators and the Epps effect. PLOS ONE 15(9): e0239415.

Teaching and Supervision

Lecturer

2021 **Introduction to Bayes (BSc Honours in Statistical Sciences)**, University of Cape Town

PhD Co-supervision

2026 **Mingyue Zhong**, University of Oxford, Visitor Program (with Prof. Álvaro Cartea)
2025 **Rob Graumans**, University of Oxford (with Prof. Álvaro Cartea)

Tutor

2024 **Mathematical Models of Financial Derivatives** , University of Oxford
2020 **Statistical Computing**, University of Cape Town
2019 **Decision Theory & GLMs, Advanced Stochastic Processes, Actuarial Science II Models, Actuarial Science II Contingencies**, University of Cape Town
2018 **Decision Theory & GLMs, Advanced Stochastic Processes, Statistical Theory & Inference, Financial Mathematics**, University of Cape Town

Conferences

Invited

2026. Oxford-Man Institute Machine Learning and Quantitative Finance Conference; Oxford-Man Institute Microstructure and Financial Economics Workshop.

2025. Cartels Seminar, European Commission; Algorithmic Collusion and Signaling, European Securities and Markets Authority.

2024. Oxford-Man Institute Financial Economics and Microstructure Workshop; Financial Conduct Authority and Autoriteit Financiële Markten Workshop.

2023. Oxford-Man Institute Algorithmic Collusion and Learning in Games Workshop; University of Cape Town ShockLab Seminar.

2022. Oxford-Man Institute Machine Learning and Quantitative Finance Conference; President's seminar, Wolfson College.

Contributed

2026. Oxford-PKU Joint Conference on Quantitative Finance and Data Science; SIAM Annual Meeting.

2025. The Microstructure Exchange; SAET Conference; INFORMS Annual Meeting; SIAM Financial Mathematics.

2024. Workshop on Mathematical Insights of Markets, Control, and Learning; European Financial Management Association; Oxford-Princeton Workshop.

2023. Learning, Evolution, and Games; Oxford-ETH Workshop on Mathematical & Computational Finance; SIAM Financial Mathematics; 67th EWGCFM Meeting.

2022. Student Workshop in Microeconomic Theory; London–Oxford–Warwick Mathematical Finance Workshop; 11th World Congress of the Bachelier Finance Society.

Organised

2024-Present. OMI Finance Seminar.

2021-Present. OMI Student Seminar.

2021-Present. OMI Crossroads Seminar.

2026. Oxford-Man Institute Microstructure and Financial Economics Workshop.

2024. Oxford-Man Institute Financial Economics and Microstructure Workshop.

2023. Oxford-Man Institute Algorithmic Collusion and Learning in Games Workshop.

Scholarships

2022-2024	**Oxford-Man Institute**, University of Oxford	*£ 28,000 p.a.*
2020	**South African Statistical Association Scholarship**, University of Cape Town	*R 100,000*
2019	**Manuel & Luby Washkansky Scholarship**, University of Cape Town	*R 12,500*
2019	**National Research Foundation Scarce Skills Scholarship**, University of Cape Town	*R 65,000*

Awards

2018-2020	**Class Medals**, Advanced Stochastic Processes (95%), Statistical Sciences Honours (91%), and High-Frequency Trading (97%)
2018	**Boston Consulting Group (BCG) Award**, Boston Consulting Group
2018	**Discovery Award**, Discovery Ltd.
2016-2018	**Dean's merit list**, University of Cape Town

Skills

Programming Languages:, Julia, R, Python
Other Technologies:, LaTeX, GitHub
Languages:, English, Mandarin

Media Coverage

Crossed signals: row over collusion pits scholars against traders, by Luke Clancy and Mauro Cesa (Risk.net)

Collusion claims cast a cloud over vital role of ETF market makers, by Chris Flood (ETF Stream)

Debunking Collusion Claims in ETF Market Making: An Insider's Perspective, by Nicholas Phillips

Market maker 'collusion' in ETF trades on Euronext Amsterdam exchange, by Chris Flood (ETF Stream)

The curious case of the revealing orders, by Mauro Cesa and Luke Clancy (Risk.net)

Can algos collude? Quants are finding out, by Faye Kilburn (Risk.net)