Dr. Ruyi LIU

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Homepage

Lecturer @ Department of Statistics, School of Mathematics and Statistics
University of New South Wales, Sydney, Australia

EMPLOYMENT

- Lecturer in Financial Mathematics — Jul. 2025 - present
  University of New South Wales, Sydney, Australia
  School of Mathematics and Statistics

- Research Fellow in Financial Mathematics — Aug. 2024 - Jul. 2025
  The Hong Kong Polytechnic University, Hong Kong
  - Research fields: *Robust Optimization under model uncertainty, Stochastic Control*
  - Supervisor: Prof. Zuoquan Xu
- Postdoctoral Fellow (Level A), — Oct. 2021 - Aug.2024
  The University of Sydney, Australia
  - Research fields: *Pricing of Options and Superannuation Products with Market and Credit Risk*
  - Supervisor: Prof. Marek Rutkowski

EDUCATION

- *Ph.D. degree in Probability and Numerical Statistics* — 2020
  Shandong University, China
  - Dissertation title: Optimal pairs-trading strategy and the well-posedness of linear forward-backward stochastic differential equations.
  - Advisor: Prof. Zhen Wu.
- *Visiting Scholar* — 2019
  University of Georgia, USA
  - Collaborative research in Markov-chain modeling and pairs trading strategy with Prof. Qing Zhang.
- *B.S. degree in Statistics* — 2014
  Shandong University, China

PUBLICATIONS

- Libo Li, Ruyi Liu and Marek Rutkowski, Vulnerable European and American options in a hazard process model, *Accepted, Finance & Stochastics*, 2025. doi.org/10.48550/arXiv.2212.12860
- Ruyi Liu, Jingzhi Tie, Zhen Wu and Qing Zhang, Pairs Trading: An Optimal Selling Rule with Constraints, *Communications in Mathematical Sciences*, 23(7): 1837-1858, 2025.
- Ruyi Liu, Zhen Wu and Qing Zhang, Pairs-Trading under Geometric Brownian Motions: An Optimal Strategy with Cutting Losses. *Automatica*, 115: 108912, 2020.
- Huansang Xu, Ruyi Liu, and Marek Rutkowski. Equity protection swaps: investment insurance for superannuation accounts. *Quantitative Finance*, 12: 1-25, 2024.

- Ying Ma, Zhen Li, Ruyi Liu, Bin Liu and et al. Data-Driven Interval Robust Optimization Method of Vpp Bidding Strategy in Spot Market Under Multiple Uncertainties, *Applied Energy*, 384: 125366, 2025.
- Ruyi Liu, Detao Zhang and Zhen Wu, Two Equivalent Families of Linear Fully Coupled Forward Backward Stochastic Differential Equations, *ESAIM: Control, Optimisation and Calculus of Variations* 28: 82-101, 2022.
- Ruyi Liu, Jingzhi Tie, Zhen Wu and Qing Zhang, An Optimal Pricing Policy Under a Markov Chain Model, *Science China-Mathematics* 65: 1065-1080, 2022.
- Libo Li, Ruyi Liu and Marek Rutkowski, Penalization schemes for BSDEs and reflected BSDEs with generalized driver, *Probability, Uncertainty and Quantitative Risk*, 9(3): 301-338, 2024.
- Tian Chen, Ruyi Liu and Zhen Wu, Continuous-time mean-variance portfolio selection under non-Markovian regime-switching model with random horizon, *Journal of Systems Science and Complexity*, 36: 457-479, 2023.
- Ruyi Liu, and Zhen Wu, *Journal of Systems Science and Complexity*, Well-Posedness of Fully Coupled Linear Forward-Backward Stochastic Differential Equations. 32 (3): 789-802, 2019.
- Ruyi Liu and Zhen Wu, *Advances in Difference Equations*, Well-Posedness of a Class of Two Point Boundary Value Problems associated with Ordinary Differential Equations. 2018: 54, 2018.

PREPRINTS & WORKING PAPER

- Yining Ding, Ruyi Liu and Marek Rutkowski, Cross-Currency Basis Swaps and Swaptions Referencing Backward-Looking Rates, *Submitted to SIAM Journal on Financial Mathematics (2nd-round review)*, arXiv:2410.08477 (2024).
- Ruyi Liu and Zhou Zhou, Optimal Information Disclosure In A Stackelberg Game, *Submitted to Mathematics of Operations Research (1st-round review)*, SSRN: 5340055 (2025).

TEACHING EXPERIENCE

@ The University of Sydney

2022- 2023 — *MATH5551*: “Finance and Stochastics”, Lecturer, *Honors and Master level*

2021- 2022 — *MATH3075/3975*: “Financial Derivatives”, Substitute Lecturer, *Undergraduate level (130-student class)*

2022- 2023 — *FMAT3888*: “Projects in Mathematics”, Substitute Lecturer, *Postgraduate level (60-student class)*

@ Shandong University

2018 - 2020 — “Options, Futures and Derivatives”, 2nd Lecturer, *Postgraduate level (200-student class)*

2019-2020 — “Stochastic Control”, Sole Lecturer, *Undergraduate level (60-student class)*

PEER REVIEWS

Finance and Stochastics, Automatica, IEEE Transactions on Automatic Control, IEEE System Control Letters, Fundamental Research, Mathematical Control and Related Fields, Applied Mathematics and Optimization

SUPERVISION

SINCE NOV. 2021 — • Co-supervision of the Ph.D. candidate Huansang Xu with thesis titled "Equity Protection Swaps: A New Type of Risk Management Products for Superannuation Funds".

FEB.-NOV. 2022 — • Co-supervision of Yining Ding with the Honour thesis titled "Pricing and Hedging of Cross-Currency Interest Rate Derivatives" (**Awarded the University Medal**).

FEB.-NOV. 2023 — • Co-supervision of Thomas Papasavvas with the Honour thesis titled "The Discrete and Continuous Time Principal-Agent Problems and Their Multi-Agent Extensions". (**Awarded the University Medal**)

SINCE NOV. 2023 — • Co-supervision of the Ph.D. candidate Yining Ding with thesis titled "Cross-Currency SOFR Derivatives", on-going.

SELECTED PRESENTATIONS

DEC. 2024 — AustMs 2024 Conference-Session "Stochastic Differential Equations"
University of Auckland, New Zealan

JUN. 2024 — Stochastic control and Optimization Conference
School of Mathematics, Shandong University, China

MAR. 2024 — Probability and Stochastic Analysis
Hong Kong Polytechnic University, Hong Kong ,China

DEC. 2023 — AustMs 2023 Conference-Session "Stochastic Differential Equations"
University of Queensland, Australia

MAY. 2023 — Stochastics and Finance Seminar
School of Mathematics and Statistics, The University of Sydney, Australia

DEC. 2021 — NUS-USYD Joint Workshop on Quantitative Finance
Department of Mathematics, National University of Singapore (online)

PROGRAMMING CAPACITY

Python, Matlab, R, Mathematica