Ruixun Zhang

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Research Interests

Sustainable Investing and ESG;
FinTech, Microstructure, and Liquidity;
Adaptive Markets and Evolutionary Foundations of Economic Behavior;
Machine Learning Applications in Finance.

Employment

Peking University — Beijing, China, 2021–Present
Assistant Professor and Boya Young Fellow, School of Mathematical Sciences (Financial Math)
Faculty Affiliate, Laboratory for Mathematical Economics and Quantitative Finance
Faculty Affiliate, Center for Statistical Science
Faculty Affiliate, National Engineering Laboratory for Big Data Analysis and Applications

Other Affiliations & Services

- Board Member, **Fellow of China Association of Actuaries (FCAA)** — 2022–Present
- Board Member, **China Society for Industrial and Applied Mathematics (CSIAM) Activity Group of Financial Technology and Algorithm** — 2022–Present
- Research Affiliate, **MIT Laboratory for Financial Engineering** — 2015–Present
- Academic Committee, **American Statistical Association (ASA)** section on statistical learning and data science (SLDS) student paper competition — 2019–2020

Education

Massachusetts Institute of Technology — Cambridge, MA, USA
Ph.D. in Applied Mathematics — 2011–2015

Peking University — Beijing, China
B.S. in Mathematics and Applied Mathematics — 2007–2011
B.A. in Economics (double degree) — 2008–2011

Honors & Awards

International Centre for Pension Management Research Award, Honourable Mention	2023
CFRI&CIRF-China Finance Review International Research Excellence Award	2023
S&P Global Academic ESG Research Award	2022
海外高层次人才计划青年项目	2021
Peking University Boya Young Fellow	2021
Tianjin Science and Technology Progress Award, Second Prize	2019, 2022
Google Spot Bonus, for "Exeptional Impact" to the company (5 times)	2018–2021
UC Berkeley Simons Institute for the Theory of Computing, Student Travel Grant	2013
MIT Presidential Fellowship	2011
Beijing Outstanding Graduate	2011
Peking University Undergraduate Academic Star of the Year	2010

WorldQuant Foundation Scholarship	2010
Finalist, Mathematical Contest in Modeling	2010
Meritorious, Mathematical Contest in Modeling	2009
University of Hong Kong Fung Scholarship	2008

Grants

National Key R&D Program of China: "Data-driven Financial Risk Forecasting", PI	2023-2027
National Natural Science Foundation of China: "Portfolio Analytics and Risk Management for Green Investing: Theory and Application", PI	2023-2026
Yinghua Foundation, "Applications of Statistics and Machine Learning in Finance", PI	2023-2025
Society of Actuaries (SOA) Grant: "ESG for the Insurance and Pension Industry in APAC"	2022
Peking University Startup Fund: "Big Data Methodologies for FinTech"	2021–2023

Publications

Book

1. *The Adaptive Markets Hypothesis: An Evolutionary Approach to Understanding Financial System Dynamics*
   Andrew W. Lo and Ruixun Zhang.
   Oxford University Press, (2023, in press).
2. *Biological Economics*, two volumes
   Andrew W. Lo and Ruixun Zhang (co-editor).
   Edward Elgar Publishing, (2018).

Sustainable Investing and ESG

3. Performance Attribution for Portfolio Constraints
   Andrew W. Lo and Ruixun Zhang.
   Working Paper, (2023).
   - Winner of the CFRI&CIRF-China Finance Review International Research Excellence Award (Asset Management).
4. Quantifying the Returns of ESG Investing: An Empirical Analysis with Six ESG Metrics
   Florian Berg, Andrew W. Lo, Roberto Rigobon, Manish Singh, and Ruixun Zhang*.
   Available at SSRN, (2023).
   - Reported by Institutional Investor and WealthProfessional. Blog on Duke's The FinReg Blog.
5. Optimal Impact Portfolios with General Dependence and Marginals
   Andrew W. Lo, Lan Wu, Ruixun Zhang*, and Chaoyi Zhao.
   Available at SSRN, (2022). Included in 2023 ICIAM, 2023 SIAM FM, 2023 Energy Finance Italia 8, 2022 INFORMS, 2022 CSIAM, 2022 Chinese Finance Annual Meeting, the 19th Chinese Finance Annual Meeting, UC Berkeley seminar, Suzhou University seminar, Sun Yat-sen University seminar.
   - Second place in the Best Paper Prize for Young Scholars, Annual Conference of the Operations Research Society of China (Financial Engineering and Risk Management Branch).

6. Quantifying the Impact of Impact Investing
   Andrew W. Lo and Ruixun Zhang.
   Management Science, (2023).
   - Winner of the ICPM Research Award (Honourable Mention).
   - Reported by Institutional Investor and MIT Sloan News.
7. Measuring and Optimizing the Risk and Reward of Green Portfolios
   Andrew W. Lo, Ruixun Zhang*, and Chaoyi Zhao.
   The Journal of Impact and ESG Investing, 3(2), 55-93, 2022, (2022).
   - Winner of the 2022 S&P Global Academic ESG Research Award.

FinTech, Microstructure, and Liquidity

8. Estimating Market Liquidity from Daily Data: Marrying Microstructure Models and Machine Learning
   Yuehao Dai and Ruixun Zhang.
   Available at SSRN, (2023).
9. Spectral Volume Models: High-Frequency Periodicities in Intraday Trading Activities
   Lintong Wu, Ruixun Zhang, and Yuehao Dai.
   Available at SSRN, (2022).
10. High-Frequency Liquidity in the Chinese Stock Market: Measurements, Patterns, and Determinants
    Ruixun Zhang, Chaoyi Zhao, Yufan Chen, Lintong Wu, Yuehao Dai, Ermo Chen, Zhiwei Yao, Yihao Zhou, and Lan Wu.
    Available at SSRN, (2022). Included in 2022 Bachelier World Congress and 2022 INFORMS.
11. Explainable Machine Learning Models of Consumer Credit Risk
    Randall Davis, Andrew W. Lo, Sudhanshu Mishra, Arash Nourian, Manish Singh, Nicholas Wu, and Ruixun Zhang.
    The Journal of Financial Data Science, (2023).
12. Interpretable Image-Based Deep Learning for Price Trend Prediction in ETF Markets
    Ruixun Zhang, Guanglian Lin, and Chaoyi Zhao.
    European Journal of Finance, (2023).
13. A Hawkes Process Analysis of High-Frequency Price Endogeneity and Market Efficiency
    Jingbin Zhuo, Yufan Chen, Bang Zhou, Baiming Lang, Lan Wu, and Ruixun Zhang.
    European Journal of Finance, (2023).

Adaptive Markets and Evolutionary Foundations of Economic Behavior

14. Social Contagion and the Evolutionary Survival of Diverse Investment Styles
    David Hirshleifer, Andrew W. Lo, and Ruixun Zhang.
    Journal of Economic Dynamics and Control, 2023.
    - Blog on Harvard Law School Forum on Corporate Governance.
15. The Wisdom of Crowds vs. the Madness of Mobs: An Evolutionary Model of Bias, Polarization, and Other Challenges to Collective Intelligence
    Andrew W. Lo and Ruixun Zhang.
    Collective Intelligence, 1(1), 2022.
    - Reported by AAAS, phys.org, SciTech, MIT Sloan News.

16. The Evolutionary Origin of Bayesian Heuristics and Finite Memory
    Andrew W. Lo and Ruixun Zhang.
    iScience, 24: 102853, (2021).
17. To Maximize or Randomize? An Experimental Study of Probability Matching in Financial Decision Making
    Andrew W. Lo, Katherine P. Marlowe, and Ruixun Zhang.
    PLoS ONE, 16(8): e0252540, (2021).
18. The Growth of Relative Wealth and the Kelly Criterion
    Andrew W. Lo, H. Allen Orr, and Ruixun Zhang.
    Journal of Bioeconomics, 20(1), 49-67, (2018).
19. The Origin of Risk Aversion
    Ruixun Zhang, Thomas J. Brennan, and Andrew W. Lo.
    Proceedings of the National Academy of Sciences, 111(50), 17777-17782, (2014).
    - Reported by MIT Sloan News.
20. Group Selection as Behavioral Adaptation to Systematic Risk
    Ruixun Zhang, Thomas J. Brennan, and Andrew W. Lo.
    PLoS ONE, 9(10), e110848, (2014).

Machine Learning and Its Applications

21. On Consistency of Signatures Using Lasso
    Xin Guo, Ruixun Zhang, and Chaoyi Zhao.
    arxiv, (2023).
22. Lighting Every Darkness in Two Pairs: A Calibration-Free Pipeline for RAW Denoising
    Xin Jin, Jia-Wen Xiao, Ling-Hao Han, Chunle Guo, Ruixun Zhang, Xialei Liu, Chongyi Li.
    International Conference on Computer Vision (ICCV), (2023).
23. Designing An Illumination-Aware Network for Deep Image Relighting
    Zuo-Liang Zhu, Zhen Li, Ruixun Zhang, Chun-Le Guo, and Ming-Ming Cheng.
    IEEE Transactions on Image Processing, 31, 5396-5411, (2022).
24. IBNet: Interactive branch network for salient object detection
    Xian Fang, Jinchao Zhu, Ruixun Zhang, Xiuli Shao, and Hongpeng Wang.
    Neurocomputing, 465, 574-583, (2021).
25. Learning Sparse Features with Lightweight ScatterNet for Small Sample Training
    Zihao Dong, Ruixun Zhang, Xiuli Shao, and Zengsheng Kuang.
    Knowledge Based Systems, 205, 106315, (2020).
26. Scale-Recursive Network with Point Supervision for Crowd Scene Analysis
    Zihao Dong, Ruixun Zhang, Xiuli Shao, and Yumeng Li.
    Neurocomputing, 384, 314-324, (2020).
27. Recurrent Collaborative Filtering for Unifying General and Sequential Recommender
    Disheng Dong, Xiaolin Zheng, Ruixun Zhang, and Yan Wang.
    The 27th International Joint Conference on Artificial Intelligence (IJCAI), 3350-3356, (2018).

Other Publications

28. Collaborative Learning in Bounding Box Regression for Object Detection
Xian Fang, Zengsheng Kuang, Ruixun Zhang, Xiuli Shao, and Hongpeng Wang.
Pattern Recognition Letters, 148, 121-127, (2021).
29. Subspace Clustering with Block Diagonal Sparse Representation
Xian Fang, Ruixun Zhang, Zhengxin Li, Xiuli Shao.
Neural Processing Letters, 53, 4293–4312, (2021).
30. A Plug and Play Fast Intersection Over Union Loss for Boundary Box Regression
Zengsheng Kuang, Xian Fang, Ruixun Zhang, Xiuli Shao, and Hongpeng Wang.
IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), 1705-1709, (2021).
31. Detection of Defect Proportion for Workpiece Surface Based on a Fusion Prediction Model
Tao, Sikai, Ruixun Zhang, and Yumeng Li.
IEEE 33rd International Conference on Tools with Artificial Intelligence (ICTAI), 1093-1098, (2021).
32. Multi-scale Discriminative Location-Aware Network for Few-Shot Semantic Segmentation
Zihao Dong, Ruixun Zhang, Xiuli Shao and Hongyu Zhou.
IEEE 43rd Annual Computer Software and Applications Conference (COMPSAC), 42-47, (2019).
33. Learning Deep Structured Multi-scale Features for Crisp and Object Occlusion Edge Detection
Zihao Dong, Ruixun Zhang, and Xiuli Shao.
International Conference on Artificial Neural Networks (ICANN), 253-266, (2019).
34. Surface Defect Segmentation with Multi-column Patch-Wise U-net
Zihao Dong, Xiuli Shao, and Ruixun Zhang.
IEEE 5th International Conference on Computer and Communications (ICCC), 1436-1441, (2019).
35. A CNN-RNN Hybrid Model with 2D Wavelet Transform Layer for Image Classification
Zihao Dong, Ruixun Zhang, and Xiuli Shao.
IEEE 31st International Conference on Tools with Artificial Intelligence (ICTAI), 1050-1056, (2019).
36. Variety is the Spice of Life: Irrational Behavior as Adaptation to Stochastic Environments
Thomas J. Brennan, Andrew W. Lo, and Ruixun Zhang.
Quarterly Journal of Finance, 8(3), 1850009, (2018).
37. A New Combined CNN-RNN Model for Sector Stock Price Analysis
Ruixun Zhang, Zhaozheng Yuan, and Xiuli Shao.
IEEE 42nd Annual Computer Software and Applications Conference (COMPSAC), 546-551, (2018).
38. Multi-scale Feature Decode and Fuse Model with CRF Layer for Boundary Detection
Zihao Dong, Ruixun Zhang, Xiuli Shao, Huichao Li, and Zihan Yang.
International Conference on Neural Information Processing (ICONIP), 28-40, (2018).
39. An Optimization Plan for the Arrangement of Hospital Bed Based on Q-process and Stochastic Analysis (In Chinese.)
Ruixun Zhang, Xin Sun, and Yue Yu.
Operations Research and Management Science, 20(2), 1-9, (2011).

Industry Reports

40. ESG for the Insurance and Pension Industry in Asia Pacific Markets
Jia ZHANG, Ji YAO, Zichao ZHAO, Jingling ZHANG, Cheng YU, Yue WANG, Lingyan WANG, Gexi ZHU, Liqun MAO, Mei TAN, Ruixun ZHANG, Danping LI.
SOA report, April 2023.

Talks & Conferences

INFORMS Annual Meetings, Phoenix, AZ, USA Oct-2023
10th International Congress on Industrial and Applied Mathematics (ICIAM), Tokyo, Japan Aug-2023
China Finance Review International & China International Risk Forum Joint Conference Jul-2023
Asian Meeting of the Econometric Society, Beijing Jun-2023
SIAM Conference on Financial Mathematics and Engineering (FM23), Philadephia Jun-2023
Seventh PKU-NUS Annual International Conference on Quantitative Finance and Economics May-2023
Beihang University Apr-2023
China Europe International Business School Apr-2023
Oxford Statistics and Machine Learning in Finance Seminar Apr-2023
University of Washington Seminar Course on Financial Math Apr-2023
PKU National Engineering Lab for Big Data Analysis and Applications, Beijing Mar-2023
Energy Finance Italia 8, Milan, Italy Feb-2023
China Society for Industrial and Applied Mathematics (CSIAM) Annual Meeting, Guangzhou, China Nov-2022
CSIAM Financial Math Annual Conference, Suzhou, China Nov-2022
HKUST-Guangzhou FinTech Thrust Nov-2022
IFZ FinTech Colloquium Nov-2022
INFORMS Annual Meetings, Indianapolis, IN, USA Oct-2022
UC Berkeley IEOR Oct-2022
Soochow University Center for Financial Engineering Sep-2022
Collective Intelligence Launch Event Sep-2022
China International Conference in Finance (CICF), Shanghai, China Jul-2022
Asian Finance (AsianFA) Annual Conference, Hong Kong Jun-2022
Bachelier Finance Society 11th World Congress, Hong Kong Jun-2022
BlackRock Research Brown Bag Series, New York May-2022
University of Washington Financial Engineering Seminar Apr-2022
Cardiff University OR/Statistics Seminar Mar-2022
International Association for Quantitative Finance (IAQF) / Thalesians joint webinar Feb-2022
American Finance Association (AFA) Annual Meetings, Boston, MA, USA Jan-2022
Inaugural Conference of the CSIAM Activity Group of Financial Technology and Algorithm, Zhuhai, China Jan-2022
China Society for Industrial and Applied Mathematics (CSIAM) Annual Meeting, Hefei, China Oct-2021
Peking University Center for Statistical Science, Beijing, China Oct-2021
Peking University School of Mathematical Sciences, Beijing, China Sep-2021
University of Hong Kong, Hong Kong, China Mar-2020
Peking University School of Mathematical Sciences, Beijing, China Jul-2019
Google Research, Mountain View, CA, USA Mar-2019
New York University Department of Finance and Risk Engineering, New York, USA Jan-2019
Applied Mathematics and Statistics Youth Forum, Peking University, Beijing, China Dec-2018
Conference on Evolution and Financial Markets, Cambridge, MA, USA Oct-2018

Nankai University, Tianjin, China — Jul-2018
Google Research, Mountain View, CA, USA — Apr-2018
American Economic Association (AEA) Annual Meetings, Philadelphia, PA, USA — Jan-2018
Yahoo Research, Sunnyvale, CA, USA — Apr-2017

Teaching

PKU, Introduction to Financial Mathematics — Fall 2023
Core Class For Undergraduate Students, Instructor

PKU, Fixed Income Markets — Fall 2023
Elective Class For Graduate Students, Organizer

PKU, Statistical Methods for Finance — Spring 2023
Core Class For Graduate Students, Instructor

PKU, Introduction to Financial Mathematics — Fall 2022
Core Class For Undergraduate Students, Instructor

PKU, Statistical Methods for Finance — Spring 2022
Core Class For Graduate Students, Instructor

PKU, 3+X Seminar in Financial Mathematics — Fall 2021
Elective Seminar For Undergraduate Students, Co-Instructor

MIT, Undergraduate Research Opportunities Program (UROP) — 2014–2015
Research Mentor, (Topic: A Study on Risk Preference and Decision Making.)

MIT, Dynamic Programming and Stochastic Control — 2012–2013
Elective For Graduate Students, Grader

MIT, Summer Program in Undergraduate Research (SPUR) — 2012
Research Mentor, (Topic: Least Absolute Deviations Method For Sparse Signal Recovery.)

Academic Services

Conference and Seminar Organizations

- 4th ACM International Conference on AI in Finance (ICAIF), New York, NY, USA — Nov-2023
- INFORMS Annual Meetings, “Information and Market Microstructure”, Phoenix — Oct-2023
- 10th International Congress on Industrial and Applied Mathematics (ICIAM), “Climate Risks: From Modelling to Applications”, Tokyo — Aug-2023
- Inaugural China Joint Statistical and Data Science Meeting, Beijing — Aug-2023
- SIAM Conference on Financial Mathematics and Engineering (FM23), “Climate Risk Modelling and Green Investing”, Philadephia — Jun-2023
- Seventh PKU-NUS Annual International Conference on Quantitative Finance and Economics, Shenzhen, China — May-2023
- INFORMS Annual Meetings, “Portfolio Risk and ESG”, Indianapolis, IN, USA — Oct-2022
- Sixth PKU-NUS Annual International Conference on Quantitative Finance and Economics, Beijing, China — May-2022
- ESG Investing and Development Seminar, Beijing, China — Apr-2022
- Inaugural Conference of the CSIAM Activity Group of Financial Technology and Algorithm: “FinTech and Risk in Digital Economy”, Zhuhai, China — Jan-2022
- PKU Laboratory for Mathematical Economics and Quantitative Finance Seminar — 2021-Present

Academic Membership

– AFA, INFORMS, SIAM, CSIAM, Econometric Society, Society of Financial Econometrics

Referee Service

– *Scientific Reports*, *Financial Analyst Journal*, *Journal of Risk*, *Journal of Economic Dynamics and Control*, *Mathematics and Financial Economics*, *Annals of Operations Research*, *European Financial Management*, *Journal of Empirical Finance*, *Expert Systems with Applications*, *The Journal of Impact & ESG Investing*, *Artificial Intelligence Review*, *Measurement*, *Journal of Manufacturing Processes*, *Computers in Biology and Medicine*, *Computers and Electronics in Agriculture*, *BioEssays*, *Environmental Pollution*.

Other Services

– Interviewing students for the PKU Financial Mathematics PhD/Masters Program 2021-Present
– Thesis committee for PhD/Masters students in Financial Mathematics 2021-Present

Other Experiences

Google LLC Mountain View, CA and New York, NY, USA
Tech Lead, Senior Data Scientist 2017–2021

Vatic Labs New York, NY, USA
Partner, Market Scientist 2015–2017

Goldman Sachs New York, NY, USA
Strategist Summer 2015

Harvard Management Company Boston, MA, USA
Analytics Summer 2014

Princeton University Princeton, NJ, USA
RTG Summer School in Financial Mathematics Summer 2013

National University of Singapore Singapore
Asia Summer Institute in Behavior Economics Summer 2013

UCLA, Department of Statistics Los Angeles, CA, USA
Summer Research Summer 2010

National Center for Gene Research, CAS Shanghai, China
Summer Research Summer 2009

Skills

Programming: Python, R, Matlab, C++, Java, Golang, SQL, MapReduce.

Hobbies: Basketball, Table Tennis, Board Games, Travel.

Languages: Chinese (native), English (proficient).