

# Chaoyi Zhao 赵朝熠

Updated January 31, 2025

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Affiliations	<b>Massachusetts Institute of Technology, Sloan School of Management</b>	MA, USA
	Postdoctoral Associate @ MIT Laboratory for Financial Engineering	2024 – Present
	– Advisor: Prof. <a href="#">Andrew W. Lo</a>	
	<b>Society of Actuaries</b>	
	<a href="#">Fellow</a> (FSA, SOA)	2024 – Present
	Associate (ASA, SOA)	2023 – 2024
Research Interests	<b>Investments:</b> Factor investing, High-frequency investing/trading, Healthcare investing	
	<b>Statistics:</b> High-dimensional statistics, Machine learning & deep learning	
	<b>Actuarial Sciences:</b> Copula theory	
Education	<b>Peking University, School of Mathematical Sciences</b>	Beijing, China
	Ph.D. in Statistics	Sep 2019 – Jan 2024
	– Main advisor: Prof. <a href="#">Lan Wu</a> Secondary advisor: Prof. <a href="#">Ruixun Zhang</a>	
	– Early graduated for half a year	
	<b>Peking University, School of Mathematical Sciences</b>	Beijing, China
	B.S. in Mathematics and Applied Mathematics	Sep 2015 – Jul 2019
	– <a href="#">Elite Undergraduate Program of Applied Mathematics</a>	Sep 2017 – Jul 2019
	<b>Peking University, School of EECS</b>	Beijing, China
	B.S. (Double Degree) in Computer Science and Technology	Sep 2016 – Jul 2019
Honors	<b>Awards</b>	
	Outstanding Doctoral Dissertation Award (Peking University)	2024
	Beijing Outstanding Graduate, Peking University Excellent Graduate	2019, 2024
	Merit Student (Peking University)	2016, 2020 – 2023
	<a href="#">S&amp;P Global Academic ESG Research Award</a>	2022
	<a href="#">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)</a>	2022
	Excellent Graduate of Elite Undergraduate Program of Applied Mathematics	2019
	The Student of The Year (10 students per year, Peking University)	2018
	Merit Student Pacesetter (Peking University)	2018
	Beijing Merit Student	2018
	Excellent Student Leader (Peking University)	2017
	<b>Scholarships</b>	
	National Scholarship	2018, 2023

President Scholarship (Peking University)	2019 – 2022
Leo KoGuan Scholarship (Peking University)	2022
Huatai Science and Technology Scholarship (Peking University)	2021
CETC the 14th Research Institute Glarun Scholarship (Peking University)	2020
The National Southwest Associated University Scholarship (Peking University)	2018
Shenzhen Finance Institute Scholarship (the Chinese University of Hong Kong, Shenzhen)	2017
Founder Scholarship (Peking University)	2016

**Publications**    # Alphabetical order;    \* Corresponding author.

### Factor Investing

1. Breaking the Factor Zootopia: Factor Selection via Significant Tests of Multi-Task Lasso  
Chaoyi Zhao\* and Lan Wu.  
Working Paper.

### High-Frequency Investing/Trading

2. High-Frequency Liquidity in the Chinese Stock Market: Measurements, Patterns, and Determinants  
Chaoyi Zhao, Yufan Chen, Lintong Wu, Yuehao Dai, Ermo Chen, Lan Wu, and Ruixun Zhang.  
*Pacific-Basin Finance Journal*, 90, 102681, 2025. [[PDF](#)][[Appendix](#)][[Journal](#)]
3. Order Types and Natural Price Change: Model and Empirical Study of the Chinese Market  
Siyu Liu, Chaoyi Zhao\*, and Lan Wu.  
*International Journal of Financial Engineering*, 9(04), 2250033, 2022. [[PDF](#)][[Journal](#)]

### Healthcare Investing

4. Measuring and Optimizing the Risk and Reward of Green Portfolios  
Andrew W. Lo<sup>#</sup>, Ruixun Zhang<sup>#</sup>, and Chaoyi Zhao<sup>#\*</sup>.  
*The Journal of Impact and ESG Investing*, 3(2), 55-93, 2022. [[PDF](#)][[Journal](#)]  
Winner of the [S&P Global Academic ESG Research Award](#).  
Reported by [Center for Statistical Science](#) and [School of Mathematical Sciences](#), Peking University.
5. Optimal Impact Portfolios with General Dependence and Marginals  
Andrew W. Lo<sup>#</sup>, Lan Wu<sup>#</sup>, Ruixun Zhang<sup>#</sup>, and Chaoyi Zhao<sup>#\*</sup>.  
*Operations Research*, 72(5), 1775–1789, 2024. [[PDF](#)][[Appendix](#)][[Journal](#)]  
[Second place in the Best Paper Prize for Young Scholars, Annual Conference of the Operations Research Society of China \(Financial Engineering and Risk Management Branch\)](#).  
Reported by [Center for Statistical Science](#), Peking University.

### Machine/Deep Learning and Applications in Finance

6. On Consistency of Signature Using Lasso  
Xin Guo<sup>#</sup>, Binnan Wang<sup>#</sup>, Ruixun Zhang<sup>#</sup>, and Chaoyi Zhao<sup>#\*</sup>.  
Under review. [[arXiv](#)]
7. Interpretable Image-Based Deep Learning for Price Trend Prediction in ETF Markets  
Ruixun Zhang, Chaoyi Zhao, and Guanglian Lin.  
*The European Journal of Finance*, forthcoming, 2023. [[PDF](#)][[Journal](#)]

8. The Success of AdaBoost and its Application in Portfolio Management  
Yijian Chuan, Chaoyi Zhao, Zhenrui He, and Lan Wu.  
*International Journal of Financial Engineering*, 8(02), 2142001, 2021. [[PDF](#)][[Journal](#)]

### Actuarial Sciences

9. The Checkerboard Copula and Dependence Concepts  
Liyuan Lin<sup>#</sup>, Ruodu Wang<sup>#</sup>, Ruixun Zhang<sup>#</sup>, and Chaoyi Zhao<sup>#</sup>.  
*SIAM Journal on Financial Mathematics*, forthcoming, 2025. [[arXiv](#)]
10. Construct Smith-Wilson Risk-Free Interest Rate Curves with Endogenous and Positive Ultimate Forward Rates  
Chaoyi Zhao\*, Zijian Jia, and Lan Wu.  
*Insurance: Mathematics and Economics*, 114: 156–175, 2024. [[PDF](#)][[Journal](#)]

### Books

11. Quantitative Investing (in Chinese)  
Jian Sun, Lan Wu, and Chaoyi Zhao.  
Science Press, 2023. [[Link](#)]
12. Financial Market Risk Management Analytics (in Chinese)  
Frank H. Koger. Translated by Chaoyi Zhao.  
Truth & Wisdom Press, 2022. [[Link](#)]
13. The Maths Book (in Chinese)  
Dorling Kindersley Ltd. Translated by Chaoyi Zhao.  
Publishing House of Electronics Industry, 2021. [[Link](#)]

### Research Projects

#### Data-driven Financial Risk Forecasting

National Key R&D Program of China, participant 2023 – 2024

#### Portfolio Analytics and Risk Management for Green Investing: Theory and Application

National Natural Science Foundation of China, participant 2023 – 2024

#### High-Frequency T+0 Quantitative Trading Strategy Based on Deep Learning

Peking University and Founder Securities, participant 2019 – 2020

#### Gradient Optimization Model Based on Genetic Programming

Ernst & Young (China) Advisor Ltd, intern 2019

#### Multi-Factor Alpha Strategy Based on the AdaBoost Algorithm

Peking University and Founder Securities, participant 2018 – 2019

#### Application of Statistical Learning in Modeling the Relationship Between Stock Index and Futures

Peking University, undergraduate research, group leader 2017 – 2018

### Teaching Experience

#### Teaching Assistant for Massachusetts Institute of Technology

*Healthcare Finance* Fall 2024

Elective for Graduate and Senior Undergraduate Students. Instructor: Prof. Andrew W. Lo

#### Teaching Assistant for Peking University

<i>Quantitative Trading</i>	Fall 2020, 2022
Elective for Graduate and Senior Undergraduate Students. Instructors: Prof. Jian Sun and Lan Wu	
<i>Practice for Fixed Income Securities</i>	Fall 2021, 2022
Elective for Graduate and Senior Undergraduate Students. Instructors: Prof. Lan Wu <i>et al.</i>	
<i>Theory and Practice for Futures and Other Derivatives</i>	Spring 2022
Elective for Graduate and Senior Undergraduate Students. Instructors: Prof. Lan Wu <i>et al.</i>	
<i>Mathematical Analysis III (Including Exercise Class)</i>	Fall 2021
Core Class for Undergraduate Students. Instructor: Prof. Jiazhong Yang	
<i>Mathematical Analysis II (Including Exercise Class)</i>	Spring 2021
Core Class for Undergraduate Students. Instructor: Prof. Jiazhong Yang	
<i>Risk Management and Financial Regulation</i>	Spring 2021
Core Class for Graduate Students. Instructor: Prof. Lan Wu	
<i>Exercise Class for Probability and Statistics</i>	Spring 2020
Elective for Undergraduate Students.	
<i>Introduction to Financial Mathematics</i>	Fall 2019
Core Class for Undergraduate Students. Instructor: Prof. Lan Wu	

## Talks

### On Consistency of Signature Using Lasso

<i>CSIAM 2023</i>	Oct 15, 2023
<i>UC Berkeley Seminar</i>	May 7, 2023

### Breaking the Factor Zootopia: Factor Selection via Significant Tests of Multi-Task Lasso

<i>7th PKU-NUS Annual International Conference on Quantitative Finance and Economics</i>	May 20, 2023
<i>PKU Seminar</i>	Apr 21, 2023
<i>CSIAM Financial Math Annual Conference</i>	Nov 13, 2022

### Optimal Impact Portfolios with General Dependence and Marginals

<i>ICIAM 2023 @ Tokyo</i>	Aug 20–25, 2023
<i>The 11th Annual Conference of the Operations Research Society of China (Financial Engineering and Risk Management Branch)</i>	Dec 10, 2022
– Second place in the Best Paper Prize for Young Scholars	
<i>Sun Yat-sen University Seminar</i>	Nov 4, 2022
<i>The 19th Chinese Finance Annual Meeting</i>	Oct 30, 2022

### High-Frequency Liquidity in the Chinese Stock Market: Measurements, Patterns, and Determinants

<i>China Finance Review International &amp; China International Risk Forum Joint Conference</i>	Jul 29, 2023
<i>CSIAM Financial Math Annual Conference</i>	Nov 12, 2022
<i>IFZ FinTech Colloquium 2022, Lucerne University of Applied Sciences and Arts</i>	Nov 2, 2022
<i>2022 INFORMS Annual Meeting</i>	Oct 17, 2022
<i>11th World Congress of Bachelier Finance Society</i>	Jun 15, 2022

### Statistical Patterns of High-Frequency Data for A-share stocks in Shenzhen Stock Exchange

<i>3rd Seminar for Young Scholars in Financial Engineering and Risk Management</i>	Jun 12, 2021
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### Construct Smith-Wilson Interest Rate Curves with Endogenous Ultimate Forward Rates

<i>United As One: 24th International Congress on Insurance: Mathematics and Economics</i>	Jun 5, 2021
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## **Speech for the Opening Ceremony of School of Mathematical Sciences**

*Opening Ceremony, School of Mathematical Sciences, Peking University*

Sep 15, 2018

– Representative of seniors [[Link](#)]

### **Skills**

**Programming:** Python, R, C/C++, MATLAB, Java, SQL

**Languages:** Mandarin Chinese, English

**Hobbies:** Swimming, Ukulele