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Peiyao Cai

Personal Website
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Education

PhD in Statistics **Sep 2023 - May 2028 (expected)**
University of Michigan, Ann Arbor

GPA: 4.0/4.0
Main courses: Casual Inference (A), Statistical Learning (A), Stochastic Process (A+).

Master in Mathematics **Jan 2022 - May 2023**
University of Michigan, Ann Arbor

GPA: 3.85/4.0
Main courses: Real Analysis(A), Algebraic Combinatorics(A+).

Master in Statistics **Sep 2021 - May 2023**
University of Michigan, Ann Arbor

GPA: 3.85/4.0
Main courses: Probability Distribution Theory(A), Statistical Learning: Regression(A), Computational Methods & Tools in Statistics(A), Statistical Inference(A).

Bachelor in Finance **Sep 2017 - June 2021**
Peking University

Core GPA: 3.6/4.0
Main courses: Macroeconomics(A), Data Analysis and Statistical Software(A), Mathematical Methods in Finance(A+), Analysis of Financial Time Series(A).

Exchange Student **Sep 2019 - Dec 2019**
Northeastern University

Main courses: International Finance, Investment Theories.

Publications

Cai, P., Lu, J., Tan, K.M., 2022. Inferring Hub Nodes on Differential Score Matching Graphical Models. (Under review in Journal of Machine Learning Research)
Cai, P., He, X., Tan, K.M., 2024. A Two-Step Estimation and Inference approach for Joint Autoregressive Quantile-Expected Shortfalll Models. (Preprint available)
Cai, P., Yu, M., Zhou, W.X., Tan, K.M., 2024. Deep Expected Shortfall Regression with Dependent Data. (In preparation)

Research Experience

Deep Expected Shortfall Regression with Dependent Data **Aug 2024 - Present**
Supervisors: Myeonghun Yu (University of Michigan), Kean Ming Tan (University of Michigan), Wen-Xin Zhou (University of Illinois Chicago) *Ann Arbor, MI, USA*

- Employed a two-step approach to model the conditional expected shortfall of time series data using deep neural network.
- Derived theoretical properties of the deep neural network estimator.

A Two-Step Estimation and Inference approach for Joint Autoregressive Quantile-Expected Shortfalll Models **May 2023 - Present**
Supervisors: Kean Ming Tan (University of Michigan), Xuming He (Washington University in St. Louis) Ann Arbor, MI, USA

- Proposed a two-step approach to estimate a class of joint autoregressive quantile-expected shortfall models.
- Derived theoretical properties of the two-step estimator, designed numerical simulations, empirical applications,and wrote the paper draft independently.

Inferring Hub Nodes on Differential Score Matching Graphical Models **Apr 2022 - May 2024**
Supervisors: Kean Ming Tan (University of Michigan), Junwei Lu (Harvard University) Ann Arbor, MI, USA

- Proposed a novel estimator for differential edge parameters between two independent probabilistic graphical models.
- Developed a general framework for making estimations and inferences for differential graph.
- Proved theorems, designed numerical simulations, empirical applications,and wrote the paper draft independently.

High-Frequency Price Jumps and News Impacts **Apr 2021 - Sep 2022**
Supervisor: Chenxu Li (Peking University) *Beijing, CHN*

- Cleaned the original high-frequency trading data sets for 44 Don Jones Index companies with the sample size reaching million level, reorganized the data structure and constructed firm-idiosyncratic features. Constructed the well organized panel data for further analysis.
- Combined the high-frequency stock return time series and company-related news from Thomson Reuters News Database together to detect abnormal stock return residuals and their characteristics for each company.
- Applied machine learning algorithms including probit-lasso regression and random forest to study the micro-structure of high-frequency stock market.

The Tournament Promotion Model in China's Prefecture-Level Cities **Mar 2021 - Jul 2021**
Supervisor: Li-An Zhou (Peking University) *Beijing, CHN*

- Conducted a DID-based method to evaluate the Tournament Promotion Model in China's prefecture-level cities.
- Established database of government annual report at the level of different prefecture-level city throughout the whole country.

Work Experience

Equity Capital Market Intern **Jun 2020 - Sep 2020**
Northeast Security

- Responsible for updating weekly capital market database and writing weekly reports. Designed a Python Crawler program to help collect important data on website automatically.
- Participated in a directional private placement project of a domestic investment bank with a volume of 6 billion RMB, being responsible for writing and checking important compliance documents.

Data Analytics Intern **Jan 2020 - Mar 2020**
PwC China

- Extracted financial data of Chinese enterprises from the data of the past 12 years with the volume of millions. Constructed risk factors according to the Beneish model.
- Applied models including logistics regression, random forest and XGB regressor predict Chinese bonds degradings.
- Constructed 27 different factors that could influence the bond degrading bond degradings. The prediction result achieved 92% AUC.

Skills

Programming	Python, R, Git, LaTeX, Matlab, MarkDown
Communication	Chinese (native), English (business)
Other	Github, Microsoft Office