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To
NBER Entrepreneurship Research Boot Camp

February 15, 2023

Application for NBER Entrepreneurship Research Boot Camp 2023

Dear organizing committee,

I hope the letter finds you well. I am writing to apply to the NBER Entrepreneurship Research Boot Camp 2023. I'm a second-year PhD student in finance at MIT Sloan School of Management. My research projects cover fields from operations research to cryptocurrency, but the central theme lies in the dynamics and externalities of entrepreneurship and innovation. I believe the boot camp would expose me to the leading research topics in the economics of entrepreneurship and finance, and help me become a well-rounded researcher in the field. I am also hoping to talk with fellow researchers with similar interests and looking for collaboration opportunities.

I attach my application materials in the email:
- My CV, with the list of Ph.D.-level courses attached at the end.
- My Research statement.

Professor Antoinette Schoar (Email: `aschoar@mit.edu`) has kindly agreed to write the letter of recommendation for me. I would like to express my gratitude to her.

Thank you for your attention. If anything is missing, I'd appreciate if you could please let me know.

Best wishes,

Jiageng Liu

Jiageng Liu

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Education

Ph.D. Finance, MIT	2021 –
M.S. Statistics, University of Chicago	2018 – 2019
B.S. Mathmatics, *summa cum laude*, UCLA	2014 – 2017

Research

1. Anatomy of a Run: The Terra Luna Crash, 2023, with Igor Makarov and Antoinette Schoar
2. Delayed and Distorted Price Discovery: Post-IPO Stocks in China, 2020.

   Abstract: I find that two rules introduced to the Chinese IPO market in 2013-14 delay and distort price discovery of new stocks. The rules impose an low IPO price limit and restrict the daily price change after listing. Under the new rules, prices go to the upper limit with little trading for about two weeks after the listing date. Due to inattention and anchoring biases, the actual price when trading starts is on average 15% to 30% higher than that before the rules and implies more than 240 billion CNY higher valuation among post-IPO stocks. The price reverses to the market average over one year after listing. Evidence suggests that the rules enable institutional investors to perform a pump-and-dump scheme on each post-IPO stock and suppress market liquidity.

Publications

1. Variance-Reduced Stochastic Learning by Networked Agents under Random Reshuffling, with Kun Yuan, Bicheng Ying, and Ali H. Sayed, 2019. *IEEE Transactions on Signal Processing* 67(2), pp.351-366.

   Abstract: We propose a decentralized variance-reduced optimization algorithm for a collection of interacting agents that are connected by a graph topology. The diffusion-AVRG algorithm is shown to have linear convergence to the exact solution, and is more memory efficient than other alternative algorithms. When a batch implementation is employed, it is observed in simulations that diffusion-AVRG is more computationally efficient than exact diffusion or EXTRA, while maintaining almost the same communication efficiency.

Academic Positions

Research Assistant, MIT Sloan School of Management 2019 – 2021

- Makarov, Igor, and Antoinette Schoar. *Blockchain analysis of the bitcoin market.* Working Paper No. w29396. National Bureau of Economic Research, 2021.
- Fishman, Michael J., Jonathan A. Parker, and Ludwig Straub. *A dynamic theory of lending standards.* Working Paper No. w27610. National Bureau of Economic Research, 2020.

Visiting Scholar, Shanghai University of Finance and Economics 2018

with joint appointment at Cardinal Operations, Shanghai

Academic writing

Credit Card Offers Target Less-educated Consumers with More Shrouded and Backloaded Fees. *Draft for Antoinette Schoar. Duke FinReg Blog,* 2020. Link

Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu. *MIT GCFP briefs and blogs*, 2020. Link

Egyptian Hieroglyphs and Unsupervised Machine Translation. *UCLA Natural Language Processing blog series, 2017.* Link

Teaching

Teaching Assistant, MIT

Managerial Finance (MBA, Rating: 6.4/7)

Teaching Assistant, Shanghai University of Finance and Economics

Linear Algebra (undergraduate), Operations Research II (undergraduate)

Miscellaneous

Citizenship: China. F-1 visa status.

Languages: Mandarin (native), English (professional), Japanese (intermediary), Spanish (introductory)

Last updated: February 13, 2023

Ph.D. courses taken and in progress

MIT: asset pricing (2021, 2022), corporate finance (2022, 2023), labor economics (2023), industrial organization (2022), microeconomics, macroeconomics, and econometrics (2021, 2022).

Harvard: perspectives of entrepreneurship (2023).

University of Chicago: applied econometrics (2019), multivariate time-series analysis (2019).

UCLA: natural language processing (2017), Monte-Carlo optimization (2017), high-dimensional statistics (2017), probability theory (2016), machine learning (2016).

Last updated: February 13, 2023

Research Statement of Jiageng Liu
NBER Entrepreneurship Bootcamp 2023

I'm a second-year PhD student at MIT finance. My research projects cover various fields from operations research to cryptocurrency, but the central theme lies in the dynamics and externalities of entrepreneurship and innovation. I believe program would expose me to the leading research topics in the economics of entrepreneurship and finance. I am also hoping to talk with fellow researchers with similar interests and looking for collaboration opportunities.

Previous research I started my research career in computer science. When I studied at UCLA, I designed a novel decentralized algorithm with Professor Ali Sayed. In **large-scale computing**, decentralized networks often suffered from communication congestion. We proposed a simple implementation that allowed an efficient and flexible trade-off between intra-node computation and inter-node consensus. However, soon I became concerned about the limitations of building these algorithms without a proper model of economic objectives and the incentives of individuals. Although our decentralized algorithm achieved state-of-the-art performance in-sample and influenced follow-up research, it could not perform well on problems involving people's decisions. Our decentralized algorithm assumed that all computing nodes are honest CPUs under central control, but nowadays datasets are produced and managed by human beings with their own incentives and biases. If some nodes cheat, such as adulterating data with fake product reviews or political disinformation, the network will soon converge to a consensus over the manipulated answer. Given a black box, it is hard to detect that malicious input.

When I worked in a operations research startup in Shanghai, I found that even efficient and data-driven algorithms decisions could cause harm without the economic foundation. In the optimization industry, an online food-delivery platform in the industry reportedly ***over-optimized delivery routes*** and I reflected on the externalities of the algorithm. When the platform emerged initially, customers only knew a rough estimate of the time it took to deliver the food, so drivers could decide their speeds and routes without hurting customer satisfaction. Drivers knew the weather, the traffic, and more asymmetrically, their driving skills and familiarity with each road. The driver-customer equilibrium started to break down as the GPS got cheaper and the algorithm improved. Drivers in the same route competed without knowing about each other, but the platform constantly updated its expectation by learning the shortest time from the most competitive drivers. Customers also became more impatient as the mobile app replaced its hour-level estimates with a minute-level delivery timer. Drivers had to aim for stricter time limits at the expense of a higher risk of accidents. Over time, as rule-obeying drivers dropped out, the platform started to deteriorate and the entire road traffic turned more dangerous. This observation revealed to me the importance of recognizing how people and data interact. We can use new data and algorithms to better model consumer behavior, but the availability of such data also changes people's behavior itself.

When I studied at the University of Chicago, I wrote my Master's thesis in the **Chinese IPO market**. I have always been interested in the development of the Chinese financial market for its significant volatility and evolving regulations. For example, two 2013-2014 rules aimed at reducing post-IPO volatility specified the maximum funds a firm could raise

relative to its earnings and restricted the daily price change after listing. However, I found that undervalued new stocks under these rules hit the upper price limit every day for weeks with very little volume. I documented 15% to 30% more severe overpricing among post-IPO stocks after 2014, which may stem from shareholders' biased beliefs anchored on the persistent daily returns. As prior studies in the literature have shown, institutional investors are able to perform a pump-and-dump strategy on each post-IPO stock. As a potential consequence of large investors' extra funds bidding for these illiquid assets, the market exhibited lower liquidity on days with more post-IPO stocks in my preliminary results. I also explored if the composition of industries in the Chinese IPO market changed after the imposed limit on the IPO price-to-earning ratio.

Current and future projects I have worked on **cryptocurrency** research with Professor Antoinette Schoar and Professor Igor Makarov. In the first project on Bitcoins, I analyzed the **Bitcoin blockchain** using my computer science skills. We inverted the blockchain to trace transactions across addresses and dissected the entire trading volume. Two facts stand out from the results. First, the majority of bitcoin usage is linked to exchanges, suggesting that the speculative demand dominates other usages like payment. Second, both the holding and the mining of bitcoins are highly concentrated.

Currently, we are working to understand the **Terra Luna crash** in May 2022. The blockchain issues a stablecoin called TerraUSD that was redeemable for 1 dollar worth of its own native cryptocurrency, LUNA. We found that a highly subsidized savings product, Anchor, promises 20% return on stablecoin deposits and accounts for over 70% of the stablecoin supply. Various smart contracts are built upon Anchor. Similar to traditional markets, some products cancel the risk-management restrictions through complex algorithms and offer high leverages. When the run happened, we found that small users are less likely to take actions and suffer from larger loss.