Tianshu Lyu
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February 1, 2025

Dear Committee,

I am writing to apply for the NBER Innovation Research Boot Camp in July 2025. I am currently a fifth-year Ph.D. student in financial economics at the Yale School of Management.

With ongoing research at the intersection of corporate innovation and behavioral finance, the boot camp is a great opportunity for me to gain broader exposure to innovation as a field and form new research ideas at the intersection of these topics. I describe my research interests and motivation for the boot camp in detail in the essay attached.

I attended the NBER Entrepreneurship Boot Camp in 2022, but I will still greatly benefit from the innovation boot camp for three main reasons. First, one of my working papers studies how public market reacts to patent issuance news and how this reaction affects firms' future innovation directions. Innovation decisions in public firms were not the focus in the entrepreneurship boot camp. Second, I have several ongoing projects as part of my research agenda on how financial markets, both private and public, affect future innovation outputs, and patent-to-product decisions. Therefore, this boot camp can familiarize me with the existing literature on heterogenous innovation decisions and help me establish my agenda. Finally, as a finance student PhD and an I3 Open Data Fellow of 2025, I am eager to know the innovation research community and contribute by providing a finance perspective and creating new open innovation data. The innovation boot camp is a crucial venue to gain familiarity with the cutting-edge research and connect with colleagues, which I have not yet had great exposure to in my graduate studies and the entrepreneurship boot camp.

I enclose in this application the following materials:

1. A current CV
2. A list of current and completed PhD courses
3. An essay describing my research and reasons for wanting to attend the boot camp

Moreover, you should be receiving a recommendation letter for me directly from Song Ma, Professor of Finance and Entrepreneurship at Yale School of Management (song.ma@yale.edu).

Thank you for your consideration.

Sincerely,
Tianshu Lyu

Tianshu Lyu

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EDUCATION

Yale School of Management — New Haven, CT
Ph.D. in Financial Economics — 2020 - 2026 (expected)

MIT Sloan School of Management — Cambridge, MA
Master of Finance — 2017 - 2018
Financial Engineering Concentration

New York University Shanghai — Shanghai, China
B.S. in Computer Science and Business & Finance Double Major — 2013 - 2017
magna cum laude

RESEARCH INTERESTS

Behavioral Finance, Innovation, Sustainability, Entrepreneurship

PUBLICATIONS

The Risk and Return of Impact Investing Funds
(with Jessica Jeffers and Kelly Posenau), 2024
Journal of Financial Economics 161, 103928

Abstract: We provide the first analysis of the risk exposure and risk-adjusted performance of impact investing funds, private market funds with dual financial and social goals. We introduce a dataset of impact fund cash flows and exploit distortions in VC performance measures to characterize risk profiles. Impact funds have a lower market β than comparable private market strategies. Accounting for β, impact funds underperform the public market, though not necessarily more so than comparable strategies. We consider alternative pricing models, accounting for sustainability and emerging markets risk. We show investors' wealth portfolios and taste change the perceived financial merit of impact investing.

WORKING PAPERS

Taking the Road Less Traveled? Market Misreaction and Firm Innovation Directions
(with Zunda Winston Xu)

Abstract: We propose that public investors react differently to patent issuance depending on its novelty, and these misreactions exert real impacts on the firms' future innovations. First, using textual analyses of patent documents to measure patent novelty, we find that investors underreact to the issuance of path-breaking innovations while overreact to the trend-following ones. Novel patent issuance predicts lower risk but positive forecast errors, consistent with a non-risk-based novelty *mispricing* mechanism. A bounded-rationality model, where investors cannot figure out the true novelty of a patent at issuance due to cognitive limits, explains the empirical patterns well. Second, using exogenous distraction shocks, such as sensational news, we present causal evidence that after disappointing returns, novel firms shift from creating and following up on novel innovations to copycatting. The findings highlight that investors' misreactions to patent novelty impact firms' future innovation directions by steering them away from higher-valued, groundbreaking research.

Associative Memory is Machine Learning
(with J. Leland Bybee)

Abstract: We document a relationship between memory-based models of beliefs and a general class of kernel methods from the statistics and machine learning literature. Motivated by this relationship, we propose a new form of memory-based beliefs which aligns more closely with the state of the art in the machine learning literature. We explore this approach empirically by introducing a measure of "narrative memory"– similarity between states of the world based on similarity in narrative representations of those states. Using textual embeddings extracted from conference call transcripts, we show that our estimates of memory-based beliefs explain variation in errors in long-term growth forecasts of IBES analysts. We conclude by discussing implications of this relationship for the literature on memory-based models of beliefs.

WORK IN PROGRESS

The Cause and Consequence of Sleeping Beauties: Evidence from Patent-to-Product Strategies
(with Zunda Winston Xu)

Context Dependence in Managerial Expectations

Financial Event Studies
(with Paul Goldsmith-Pinkham)

A Unified Model of Short-Term and Long-Term Earnings Expectations

What Do Investors Overreact to? An Empirical Analysis of Long-Term Earnings Growth Forecast
Second-year paper

TEACHING EXPERIENCE

Asset Pricing Theory Fall 2024, Fall 2023, Fall 2022
Teaching Assistant, Yale School of Management
Fall 2024 with Saman Majd & Jeffrey Rosenbluth, Fall 2023 with Paul Fontanier, Fall 2022 with Stefano Giglio

Behavioral Finance Spring 2025, Spring 2024, Spring 2023, Spring 2022
Teaching Assistant, Yale School of Management
with Nicholas C. Barberis

Financial Instruments for Speculation and Hedging Fall 2022
Teaching Assistant, Yale School of Management
with Stefano Giglio

Financial Markets & Macroeconomic Policy Fall 2023, Fall 2021
Teaching Assistant, Yale School of Management
with Alp Simsek

Hedge Fund Strategies Spring 2025
Teaching Assistant, Yale School of Management
with Andrea Frazzini and Ronen Israel

Venture Capital & Private Equity Fall 2024, Spring 2024, Spring 2023
Teaching Assistant, Yale School of Management
with Song Ma

CONFERENCE PRESENTATIONS

2025 EFA, MFA, AFA Regular Session
2024 FMA, WUSTL EGSC, NFA PhD Session, MFR Summer Session (Poster), ESSFM Evening Seminar*, USC Marshall PhD Conference
2022 5th Private Markets Research Conference; MFA*
2021 UN PRI Academic Network Conference; NBER Entrepreneurship Working Group*; PERC Symposium*; EUROFIDAI-ESSEC Paris December Finance Meeting*; Pre-WFA Early Career Women in Finance Conference*; Workshop on Entrepreneurial Finance and Innovation (WEFI)*; Southern California PE Conference*
2020 Chicago-Area Entrepreneurship Workshop*

*Including scheduled, * indicates presentation by coauthor*

PROFESSIONAL SERVICES

Referee: The Quarterly Journal of Finance

AWARDS, GRANTS & HONORS

Open Data Fellowship, Innovation Information Initiative (I^3)	2025
Semifinalist for Best Paper Award (Asset Pricing & Investments), FMA	2024
Best Paper Award, USC Marshall PhD Conference in Finance	2024
Yale SOM Broad Center Research Grant (with Song Ma)	2024
Yale Graduate Fellowship	2020-2025
MFin Excellence Award	2018
Honors in Business Major	2017
NYU Shanghai Excellent Graduate	2017

INVITED PARTICIPATIONS

MFR Summer Session for Young Scholars	2024
Summer School on Structural Estimation in Corporate Finance	2023
NBER Entrepreneurship Research Boot Camp	2022
NBER Behavioral Macroeconomics Research Boot Camp	2022
Yale Summer School in Behavioral Finance	2022

OTHER RESEARCH EXPERIENCE

Research Professional, Fama-Miller Center 2018 - 2020
University of Chicago Booth School of Business
PIs: Professors George M. Constantinides, Zhiguo He, Jessica S. Jeffers, Elisabeth Kempf, Stefan Nagel

NYU Shanghai Business Honors Program 2016 - 2017
NYU Stern School of Business
Advisor: Professor Jennifer N. Carpenter
Thesis: On Performance and Persistence of Mutual Funds in China

Research Assistant 2016 - 2017
New York University Shanghai
PI: Professor Yiqing Lü
Textual analysis of corporate 10-K filings

INDUSTRY EXPERIENCE

MSCI - MIT Sloan, Joint Finance Research Practicum, Boston, MA 2018
Constructed measures of factor crowding in systematic trading strategies

Accenture - MIT Sloan, Joint Analytics Lab, Cambridge, MA 2017
Performed sentiment analysis on earnings call transcripts

Shanghai Securities Co., Ltd., Shanghai, China 2016
Mutual Fund Center Research Intern

Morgan Stanley, Shanghai, China 2015
Technology Summer Analyst

SKILLS & LANGUAGE

Certificates: CFA Level I (2017); Machine Learning at Stanford University (Coursera); Deep Learning Specification at deeplearning.ai (Coursera)
Programming: Stata, MATLAB, Python, R, SAS, Java, Perl, C; HTML, CSS, JavaScript, PHP
Language: Chinese (Native), English (Professional)

Last updated: February 1, 2025
https://tianshulyu.com/

Completed PhD Courses **Grade**

YALE UNIVERSITY[1]
Ph.D. in Financial Economics, expected May 2026

Spring 2024
- Corporate Finance (Song Ma, Kelly Shue) H
- Finance of Information (Jonathan E. Ingersoll Jr.) Audit

Spring 2023
- Financial Economics of Climate and Sustainability (Stefano Giglio) H
- Advanced Macro II (Fabrizio Zilibotti, Marta Prato) Audit
- Mathematical Economics II (Eduardo Davila) Audit

Fall 2022
- Industrial Organization I (Philip Haile) Audit
- Macro Finance (Alp Simsek) Audit

Spring 2022
- Applied Empirical Methods (Paul Goldsmith-Pinkham) H
- Financial Crisis (Gary Gorton) H
- Household Finance (James Choi) H
- General Economic Theory: Macroeconomics II (Giuseppe Moscarini) Audit

Fall 2021
- Advanced Macro I (George-Marios Angeletos, Zhen Huo) H
- General Economic Theory: Macroeconomics I (Zhen Huo, Michael Peters) H
- Financial Econometrics (Bryan Kelly) H
- International Finance (Costas Arkolakis, Ana Cecilia Fieler) Audit

Spring 2021
- Behavioral Finance (Nicholas Barberis) H
- Econometrics II (Timothy Armstrong) H
- General Economic Theory: Microeconomics II (Johannes Horner, Ryota Iijima) HP
- Natural Language Processing (Dragomir Radev) Audit

Fall 2020
- Financial Economics I (Jonathan Ingersoll & Stefano Giglio) H
- Econometrics I (Donald Andrews) H
- General Economic Theory: Microeconomics I (Larry Samuelson, Johannes Horner) HP

THE UNIVERSITY OF CHICAGO
- Theory of Income I (Fernando Alvarez) B+
- Corporate Finance II (Amir Sufi) Audit

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Master of Finance, June 2018
- Econometrics (Victor Chernozhukov) A+

[1] Yale graduate school uses the following grading policy: H – Honors, HP – High Pass, P – Pass, F – Fail

Dear Committee,

I am a fifth-year Ph.D. student in Financial Economics at Yale School of Management. My research interests lie in innovation and behavioral finance. I am applying to the NBER Innovation Boot Camp as I am eager to develop a solid foundation in the economics of innovation for my own research. I am actively researching how financial market behavior interacts with corporate innovation decisions, and would greatly benefit from the program. Innovation is an exciting field with a rapidly growing body of research, and I believe the NBER boot camp is the best place to master this body of work. I am developing a research agenda connecting financial markets, product markets, and innovation decisions, which can expand our understanding of financing innovation and shed light on innovation policies.

In an ongoing project with Zunda Winston Xu, we document that public-market investors underreact to novel patents while overreacting to trend-following innovations. We provide a behavioral explanation for this systematic misreaction to novelty. Bounded-rational investors are unsure about the true novelty of the patent at issuance. Instead, they receive noisy, but unbiased, signals. This would shrink their posterior to an intermediate prior level, which generates such misreaction. We emphasize the economic importance of the misreaction, as novel patents bring higher economic value to the firm and have higher social values. We further connect the financial market reactions to firms' future innovation decisions. We find that following disappointing returns, novel firms change innovation directions from novelty-seeking to copycat innovations. Therefore, this project highlights that behavioral biases in the financial market have real impacts on future innovation directions by steering firms away from groundbreaking, higher-valued research.

For my future research plan, I am interested in innovation research in two main directions. First, I plan to write a follow-up paper on the delayed investment in novel innovation. In particular, many inventions that we think are breakthroughs were not followed up when they initially came around. The current paper argues that the under-reaction to initially novel patents could be one of the reasons. To follow up, we plan to do a comprehensive analysis of different channels, especially by tying innovation to commercialization. For example, the firm may not want to follow up because there was not enough consumer demand, or the new technology may disrupt the firms' current products. To study both effects, we need novel historical data of patent-to-product-level match. I was selected as one of the 2025 Open Data Fellows of Innovation Information Initiative (I^3) to build this dataset with Consumer Reports as data vendor.

Second, I plan to further explore the different mechanisms through which financial markets can affect innovations, especially through the interplay between public and private markets. Public firms only contribute to less than half of the patents issued in the U.S. (Kogan et al. (2017)) – majority of innovations are done in private firms. Therefore, it is crucial to study private-market innovations, e.g. how patents are valued by private equity funds. I plan to back out patent valuation from company valuation in different funding rounds. The valuation of private market innovations could spur many important questions. For example, how do PE funds value new technology? How are they different from the public market? Related to my current research, private investors' perception of novel technology may better predict the VC boom-bust cycles and technology lifecycle if innovation is a significant component of private-firm valuation. On the other hand, could the PE valuation of technology change the type of firms they invest and thus shift the innovation direction? Howell et al. (2020) suggest that VC firms are more willing to fund radical innovations especially during booms. In the meantime, VC cycles are largely driven by fund managers' expectations about the public market. If startups are more likely to do radical innovations during booms, would the interplay between VC and public market boom-bust cycles affect the innovation composition between private versus public firms? Would it lead to changes in the types of innovation and influence growth?

Given my research agenda, the NBER Innovation Boot Camp is an excellent opportunity to learn the field's cutting-edge research and think about how finance can play a role beyond existing mechanisms. I also want to get involved in the innovation research community. The boot camp is an invaluable experience to interact with peers who have similar research interests and seek potential collaborations. I sincerely hope that I can be a participant in the workshop to learn about the field and interact with active researchers in innovation.

References

Howell, S. T., J. Lerner, R. Nanda, and R. R. Townsend (2020). How resilient is venture-backed innovation? evidence from four decades of us patenting. Technical report, National Bureau of Economic Research.

Kogan, L., D. Papanikolaou, A. Seru, and N. Stoffman (2017). Technological innovation, resource allocation, and growth. *The Quarterly Journal of Economics 132*(2), 665–712.

Yale SCHOOL OF MANAGEMENT

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Re: Recommendation Letter for Tianshu Lyu

Dear Admissions Committee,

I am writing to highly recommend Tianshu Lyu for the NBER Innovation Research Bootcamp. Tianshu is a 5th Year PhD student at Yale University. He has broad interests in innovation economics, particularly the way financial markets react to technological evolution, and how that may affect the production and financing of new innovation efforts. I serve on Tianshu's dissertation committee, and we meet regularly to talk about research. He also serves as a TA for me in my course on Venture Capital and the Financing of Innovation. Over the years, I have been constantly impressed by his intellectual curiosity, ability to understand both theory and data, and work ethics.

I strongly encourage you to consider Tianshu's application seriously: he has a genuine interest in the field of innovation; he has a ton of option value and the potential to do interesting work in this field; and he is a great colleague, and people around him like talking about research with him. Meanwhile, I think he will benefit a lot from learning from experts like you all and grow from this experience.

At last: thank you for organizing this wonderful camp again!

Sincerely,



Song Ma