Wu Zhu

Personal Website: https://zhuwu2012.github.io/

Education

PhD in Economics, University of Pennsylvania, Expected in 2021
(Networks, Finance, Macro, and Machine Learning)
Joint Master in Statistics, Department of Stats, Expected in 2021
(Machine Learning in Networks)
M.A in Economics, CCER, Peking University, 2016
B.S in Materials Physics, University of Science and Technology, Beijing, 2009

Programming and Skills

Python (High Proficiency), R(Proficiency), Stata (High Proficiency), and SQL.

Research Statement

Firms or agents are connected via various linkages which have significant impact on the asset pricing, investors' behaviors, firm decision, information propagation, and systemic risk. My current work spans several fields linked to networks – Macro, Finance, Theory, and Machine Learning. I am an expert and especially interested in using huge dataset to reveal a micro channel to support a vivid macro picture.

Papers under Review

1. **The Network Effects of the Agency Conflicts** (with Rakesh Vohra (Penn Econ and CIS) and Yiqing Xing (JHU), Under Review) (6th Annual Conference (U Chicago Booth))
2. **Tired Intermediation in Business Groups and Targeted SME Support** (with Yu Shi (IMF) and Robert M Townsend (MIT), Under Review) (Finalist Best PhD Paper in MFA (2020). Penn, Wharton, IMF, PKU, Asian Econometric Meeting (2019 Summer), North American Econometric Meeting (2019 Summer), AEA (2020), MFA (2020), CUFE, Vox China, 6th Annual Conference (U Chicago Booth))

Papers on Innovation Networks

3. **Innovation and Production Networks, Business Cycles, and Asset Pricing**
(Job Market Paper, with Yucheng Yang, Princeton Applied Math)
The speed at which the US economy has recovered from different recessions ranges from months to years. In this paper, we argue that the underlying network of knowledge flow on technology and its interactions with production networks and cross-sectional shocks explains the large variations in the speed of recovery across recessions in US.
Besides the production linkages, firms learn insights on production from each other through the innovation networks. In general, we show that these interactions allow us to decompose the effects of shocks, even idiosyncratic shocks, on future growth into components with various levels of persistence and loadings. The persistence can be fully captured by the eigenvalue distribution of the matrix representation for the innovation network, while the loadings can be fully captured by two sufficient statistics - the correlation between the centrality in innovation networks and shocks, and the correlation between centralities in innovation and production networks.

The slow recovery occurs when the loading on the persistent component increases sharply. We further document a set of new stylized facts in US and show the importance of our channel in explaining the slow recovery. Finally, we explore the explanations of our theory on puzzles in financial markets - time-varying equity-premium and risk-free rate puzzles.

4. **Innovation Networks, Linking Complexity, and Cross Predictability**
(Finalist of best paper in investment in FMA (Financial Management Association), 6th Annual Network Conference (2020, U Chicago), FMA (2020))

Papers on Equity-holding Networks.

5. **Tired Intermediation in Business Groups and Targeted SME Support** (with Yu Shi (IMF) and Robert M Townsend (MIT))
Using a proprietary dataset covering all registered firms in China (40 million), we document a rapid expanding but structure stable firm-to-firm equity-holding networks (5 million firms in network in 2017). We show that internal capital markets in business groups can propagate corporate shareholders' credit supply shocks to their subsidiaries. An average of 16.7% local bank credit growth where corporate shareholders are located would increase subsidiaries investment by 1% of their tangible fixed asset value, which accounts for 71% (7%) of the median (average) investment rate among these firms. We argue that equity exchange is one channel through which corporate shareholders transmit bank credit supply shocks to the subsidiaries and provide evidence to support the channel.
6. **The Network Effects of the Agency Conflicts** (with Rakesh Vohra (Penn Econ and CIS) and Yiqing Xing (JHU))
We propose a model of equity holding networks that allow firms to take an investment decision in response to an exogenous shock. It encompasses various firm level frictions - default cost, limited liability, interest conflicts between shareholders and mangers and moral hazard. We argue that the underlying frictions at the firm level and not just the network structure, play a key role in amplifying or muting the propagation of exogenous shocks. In the presence of default costs or limited liability, firms make investment choices that serve to mitigate the spread of an initial shock. In the face of interest conflicts or moral hazard, shocks are amplified by firm level investments choices. We also examine the role of network structure in propagating shocks. In the presence of interest-conflicts we show, unlike other work, that denser or more integrated networks need not facilitate the propagation of shocks. This suggests a potentially important role for corporate governance in macro fluctuations.
7. **Equity Holding Networks and Firm Growth – What 5 Million Firms Tell us about Chinese Economy?** (with Allen Franklin, Junhui Cai, Xian Gu, Jun "QJ" Qian, Linda Zhao) (AFA 2021, 6th Annual Network Conference (U Chicago), MFA 2020, FMA 2020, 2nd Annual USYD Financing and Banking Research (Sydney,2019), Bank of Finland (2019))
8. **Innovation and Equity Holding Networks** (with Allen Franklin, Junhui Cai, Xian Gu, Jun "QJ" and Linda Zhao, Wharton-China Conference)

Papers on Machine Learning and Investment

9. **Information Dispersion, Acquisition, and Cross Predictability – A Network Approach** (with Wayne Gao, Penn Econ and Yale, In Progress)
10. **Learning in Networks, Idiosyncratic Volatility, and Predictability.**
(with Junhui Cai, Linda Zhao, In Progress)
11. **Identifying Underlying Links, and Cross Predictability.**
(with Junhui Cai, Linda Zhao, Wharton Stats, In Progress)

12. **Semi-supervise Learning with Networking Data.**
(with Junhui Cai, Dan Yang, Linda Zhao, In Progress)

Other Previous Works

13. ***Project of Big Data with Long Credit Company (Reported by CCTV-2 for several times)***
Taking charge of a sub-project of LRLC Entrepreneurship-Innovation Project in China.

14. ***The Patterns and Drivers of E-commerce Development in China***
(With Xiaobo Zhang, Presented in CCER-NBER Conference in July 2015, and presented in AEA conference in Jan 2016, Working Paper is available)

Internship Experience

Jan 2019 – Now Collaboration with Alpha Group of Wisdom Tree, Strategy Dev & Test.
Jun 2018- Sep 2018 IMF (International Monetary Fund), Machine Learning, Behavior Bias and Credit Market Crashes (IMF Summer Funding Internship Program for Ph.D.)
Jan 2014-Jun 2014 Counsellor Office of the State Council, Central Government, China.

Conference and Seminar Talk

AFA(Jan2021), 6thAnnual-Network-Conference(Chicago, Booth), FMA(Nov 2020,NYC), MFA(Mar 2020, Chicago), AEA (Jan 2020,Sandiego), Summer Meeting of North American Econometric Society (July 2019, Seattle),IMF(April 2019), Jane Street Symposium (Jan 2019), Asian Meeting of Econometric Society (Jun 2019, Xiamen), Bank of Finland (July 2019), Penn-Wharton-GSM (June 2019), PKU(June 2018), Penn Econ (Econometric Lunch, April 2018), IMF (April 2018), Penn Wharton (Oct 2017, MBA Talk), AEA Conference San Francisco* (Jan 2016), Alibaba (2016), NBER-CCER Conference (June 2015), Stockholm-China Meeting (Sep 2014).

Honors and Awards Related to Math

Finalist best paper in investment (Financial Management Association, 2020), Finalist PhD Paper (MFA,2020), Wharton Mack Innovation Institute Fellowship (2020), UPENN SAS DEAN Travel Grant (3 Times).

Meritorious Winner (First Prize), Mathematical Contest Modeling United States (2008), First Prize, Chinese National College Mathematical Competition of Modelling (2007), First prize, the 17th and 18th College Mathematical Olympic of China (highest competition at that time)

Quantitative Courses Taken (all PhD Level)

Deep Learning (Stats 991), Optimization in Machine Learning (Audit), Non-Parametric & Machining Learning(A), Data Mining (A), Econometrics I (A), Bayesian Econometrics II (A), Econometrics IV (A), Continuous Time Asset Pricing (A),Asset Pricing (FNCE925), Empirical Methodology of Asset Pricing (A), Empirical Corporate Finance (Audit), Probability Theory (A), Stochastic Process I (A), Stochastic Process II (A), Measure Theory (A), Real Analysis(A), Financial Market and Macro Finance (A).

Conference Organizer.

The 1st NSE Summer Conference (2014). Editors' conference of Oxford-Economic Growth handbook of Africa, Joint with World Bank &IMF (2013)