Address: Peking University HSBC Business School,
Nanshan District, Shenzhen, China, 518055
Tel: 86-755-2603 2551 Email: SIQEFadms@phbs.pku.edu.cn
Web: http://siqef.phbs.pku.edu.cn/en/
bilibili: https://space.bilibili.com/1868128581

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PHBS Peking University HSBC Business School
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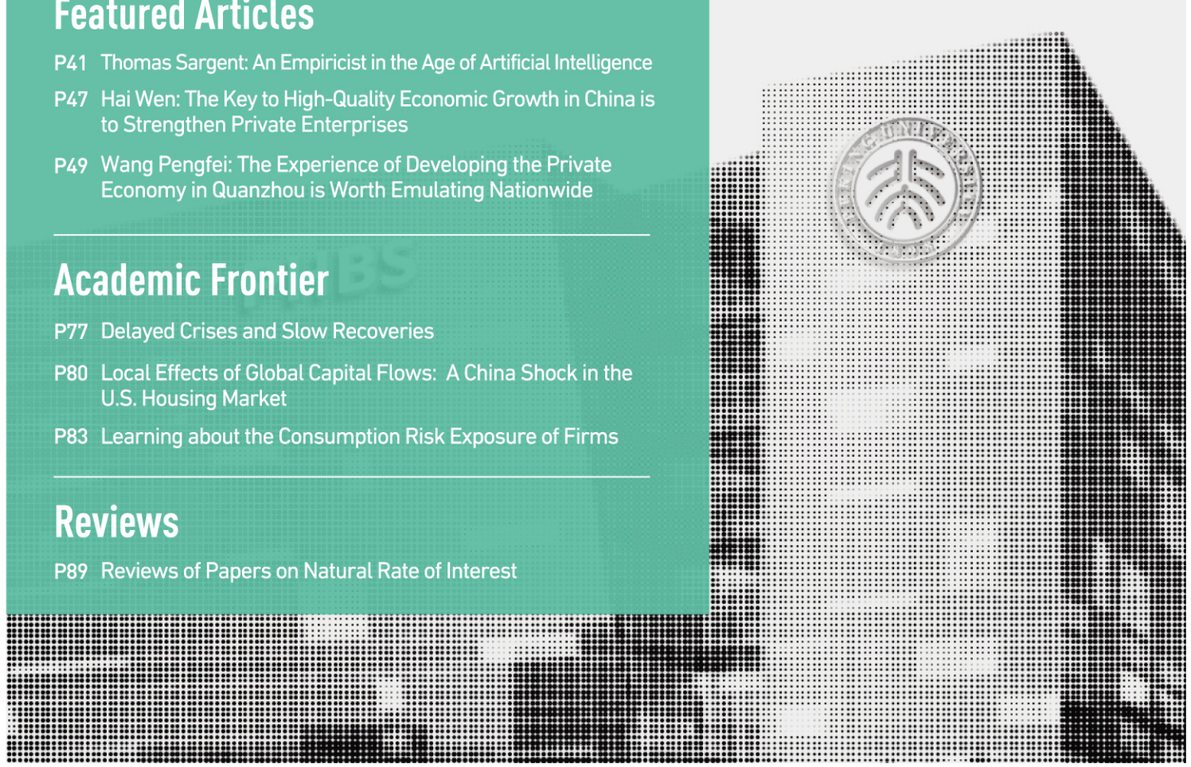
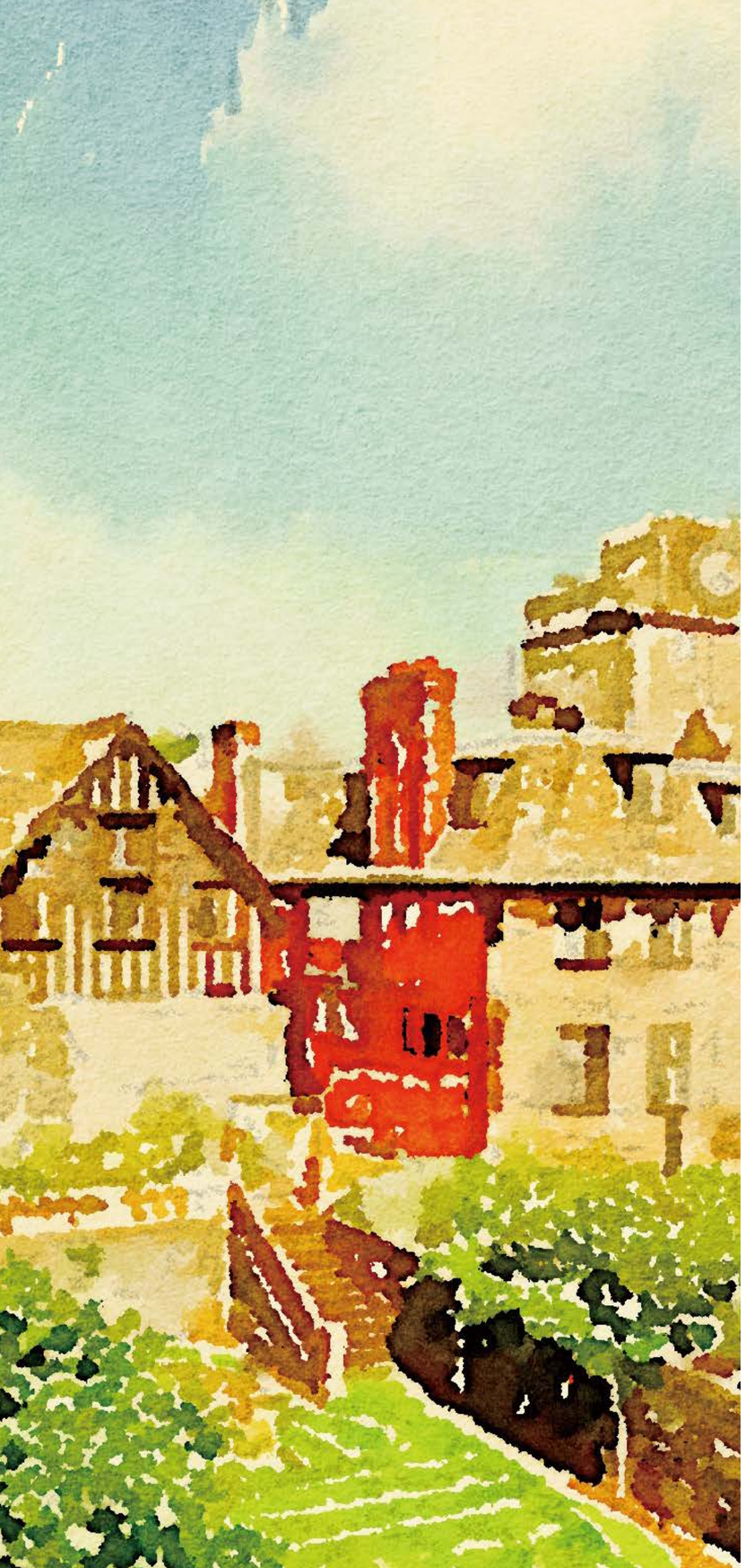
NEWSLETTER





SARGENT INSTITUTE OF
QUANTITATIVE ECONOMICS
AND FINANCE

SIQEF
NEWSLETTER

ISSUE 06 / 2024

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SIQEF

Mission Statement

“Our institute strives to put mathematics and statistics at the service of quantitative analysis of questions about economics, finance, and government policy. Scientists use mathematics because we want our models to be coherent. We use statistics because we want our models to describe data well. Our purpose is to learn, teach, and apply an array of methods made possible by the availability today of powerful and inexpensive computational methods and large data sets. We provide a platform for developing computational economics and finance based on user friendly and powerful open source languages, especially Python and Julia.”

— *Thomas Sargent*

SARGENT INSTITUTE OF QUANTITATIVE ECONOMICS AND FINANCE

News

SARGENT INSTITUTE OF QUANTITATIVE ECONOMICS AND FINANCE

PHBS Holds the 4th PHBS-CUHKSZ Economics and Finance Workshop

By Zhang Wenrui, Wu Zouyi, and Annie Jin

> The PHBS-CUHKSZ Economics and Finance workshop is committed to stimulating the research potential of young scholars, facilitating academic exchanges among them, and promoting the academic development as well as research cooperation in the fields of economics and finance in the Guangdong-Hong Kong-Macao Greater Bay Area. Initiated in 2021, the first workshop was held at Shenzhen Finance Institute, CUHK-Shenzhen and will be held every six months by PHBS or Shenzhen Finance Institute, CUHK-Shenzhen.

The 4nd PHBS-CUHKSZ Economics and Finance Workshop Held at PHBS

- The group photo of participants

Co-hosted by Peking University HSBC Business School (PHBS), School of Management and Economics of the Chinese University of Hong Kong, Shenzhen (CUHK-Shenzhen), and Shenzhen Finance Institute at CUHK-Shenzhen, organized by Center for Macroeconomy and Finance at Peking University, the 4th PHBS-CUHKSZ Economics and Finance workshop was held on June 10 at Qianhai Institute of China-Britain.

This year's workshop attracted scholars from world-class universities including Peking University, Hong Kong University, CUHK-Shenzhen, Southern University of Science and Technology, University of Colorado Boulder, and City University of New York to have in-depth discussions on the latest academic topics in the fields of economics and finance.

- Wang Pengfei, Dean of PHBS

At the opening ceremony, Wang Pengfei, Dean of PHBS, and Ye Lixin, academic director of the Ph.D. program in economics at CUHK-Shenzhen and professor of Ohio State University, delivered remarks on behalf of the organizers. Professor Wang expressed his gratitude to the partners of this workshop, and hoped that the event could continue to strengthen the ties between academic institutions and to keep track of academic advancements. Professor Ye hoped that it could become an excellent academic platform for Shenzhen and even for the whole China, and promote the academic development and research cooperation in the Greater Bay Area. The opening ceremony was presided over by Liu Baixiao, tenured associate professor of PHBS.

-Ye Lixin, Academic Director of the Ph.D. Program in Economics at CUHK-Shenzhen and Professor of Ohio State University

-PHBS Associate Professor Liu Baixiao

-From left to right: Chen Liang and Luo Ye

PHBS Assistant Professor Chen Liang presented his paper Common Correlated Effects Estimation of Nonlinear Panel Data Models. The article focuses on estimating coefficients and average partial effects in nonlinear panel data models with interactive fixed effects. It proposes a two-step estimation method using the common correlated effects (CCE) framework. The first step involves estimating latent factors based on cross-sectional averages of the regressions using principal component analysis. In the second step, the coefficients and factor loadings are jointly estimated. The paper derives the asymptotic distributions of the estimators and introduces bias-correction methods. Monte Carlo simulations confirm the good performance of the proposed methods. An empirical application explores the arbitrage behavior of nonfinancial firms in different security markets. The CCE approach offers computational advantages and assumes cross-sectional dependence driven by the same latent factors. Associate Professor Luo Ye from the University of Hong Kong provided comments and suggestions on the possibility of endogeneity problem and alternative bias correction methods.

-From left to right: Zhao Shen and Albert Tsang

Assistant Professor Zhao Shen from CUHKSZ introduced her paper Hide in the herd: macroeconomic uncertainty and analyst forecasts dispersion. This article explores the relationship between macroeconomic uncertainty and analyst earnings forecast dispersion. The study finds a negative correlation between the two, suggesting that when macro uncertainty increases, analysts tend to exhibit herding behavior and agree more with each other. The herding firms, characterized by higher uncertainty levels, experience stronger momentum in stock prices and underreact to both firm and macro news. Additionally, these firms are more likely to be overpriced and earn lower subsequent returns. The findings highlight the interaction between macro uncertainty, herding behavior, and informational inefficiency in the market. Professor Albert Tsang from Southern University of Science and Technology gave comments and suggestions on the benefit of herding behavior, the similarity between dependent and independent variables and alternative explanations on this phenomenon.

-From left to right: Ma Fangyuan and Darwin Choi

PHBS Assistant Professor Ma Fangyuan presented a collaborative paper titled 'Launching for the "Greater Good": Spillover Effect of ESG Funds', which explores the relationship between ESG funds and within-family non-ESG funds' capital flows. The study uses data from US open-ended equity funds and finds that the launch of ESG funds has a positive spillover effect on the capital flows of non-ESG sibling funds within the same fund family. Associate Professor Darwin Choi from the Chinese University of Hong Kong commented on the paper, leading to discussions on various related topics.

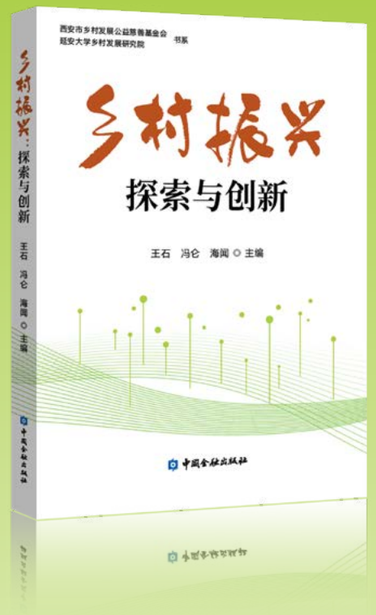
-From left to right: Zhang Yifei and Zhou Dexin

PHBS Assistant Professor Zhang Yifei introduced the paper titled " The Impact of Corporate Climate Action on Financial Markets: Evidence from Climate-Related Patents." The paper addresses two main challenges in studying the impact of corporate climate action, which are endogeneity and the measurement errors in ESG ratings. The study uses patent grants as the instrumental variable. The results show that companies granted climate-related patents experience significant abnormal returns in the stock market and a reduction in implied cost of capital. Additionally, the study explores the reaction of ESG-minded investors and ESG rating agencies to climate patent approvals. The findings suggest that climate-related patents have a positive impact on firms' carbon efficiency. Assistant Professor Zhou Dexin from City University of New York had discussions on various related topics like marginal utility.

-From left to right: Wu Shijia and Tony Cookson

Assistant Professor Wu Shijia from CUHKSZ introduced her paper GIF Sentiment and Stock Returns. This paper introduces a new measure of investor sentiment called GIFSentiment, which is derived from graphics interchange format images (GIFs) found in postings about firms on Stocktwits.com. The study finds that GIFSentiment is positively correlated with same-day stock returns and predicts stock return reversals in the following two weeks. The results are stronger for GIFs with salient content, viral GIFs, GIFs posted by influencers, and GIFs related to stocks with more retail ownership and stricter limits to arbitrage. GIFSentiment also predicts increases in retail order imbalances and short sale volumes. The findings suggest that sentiment expressed through GIFs can influence stock market behavior. Associate Professor Tony Cookson from University of Colorado Boulders provided comments and suggestions on cross-stock differences and methods to deal with special time period.

-The workshop



This book is the result of 32 speeches on the theme of rural revitalization in the second, third, and fourth seasons of the "Tomorrow's Horizon Lecture Hall" organized by the Xi'an Rural Development Charity Foundation and the Rural Development Institute of Yan'an University.

Starting with theoretical approaches to rural revitalization, the book elaborates on the practical exploration and path innovation of entrepreneurs and start-ups in industrial revitalization, talent revitalization, cultural revitalization, ecological revitalization, and organizational revitalization.

Editor-in-Chief's Profile

Hai Wen

Hai Wen is the Founder of Xi'an Rural Development Charity Fund, the Founding Director of Rural Development Institute of Yan'an University, Chair Professor in Economics of Peking University, Vice Chairman of Peking University Council, and the Founding Dean of Peking University HSBC Business School. He received his Ph.D. degree in economics from the University of California, Davis.His research interests in-clude international economics, development economics, transition economics, and Chinese economy.

Wang Shi

Wang Shi is the Founder of Xi'an Rural Development Charity Foundation, the Founder of Vanke Group, the Honorary Chairman of the Board of Directors, and the Chairman of Vanke Foundation. He is currently the Executive Chairman of One Foundation, the Chairman of Shenzhen Federation of Social Organizations, the Chairman of Shenzhen Business Federation, and the Director of WWF-US.

Feng Lun

Feng Lun, Founder of Xi'an Rural Development Charity Fund, Founder of Vantone Group, Chairman of Yufeng Group. He is an advocate for private enterprises and an evangelist of mainstream values. He is the author of *Savage Growth, Ideal Plenty and Fierce Years.* He is also a practitioner of corporate social responsibility, and has initiated and founded a number of famous public welfare organizations.

From the Editor-in-Chief

Cai Yuanpei, a former President of Peking University, once said, "Education is the first step in improving society." In order to prevent "the wise and rich from becoming much richer and the foolish and poor from becoming terribly poorer," "the only way is to educate farmers and laborers and to enhance their intelligence, so that they will not be permanently subordinated to others." In past decades, we were on the road to help revitalize the countryside. Today, we still need to help new farmers to acquire knowledge, broaden their perspectives, and enlarge their opportunities for future innovation and development through continuous education. It is hoped that the online lectures and corresponding books jointly organized by the Xi'an Rural Development Public Welfare and Charity Foundation and the Rural Development Institute of Yan'an University will do their part to achieve this goal.

-- Wang Shi, Feng Lun, Hai Wen
December 2022

Rural Revitalization: Explorations and Innovations, co-edited by Professor Hai Wen, was Published

Contents

-Professor Ma Xiao is presented with 2023 Essay Award for Young Economists

PHBS Assistant Professor Ma Xiao Wins 2023 WTO Essay Award for Young Economists

By Annie Jin

On 14 September, Assistant Professor Ma Xiao of Peking University HSBC Business School (PHBS) was conferred with the 2023 WTO Essay Award for Young Economists with his paper, "College Expansion, Trade, and Innovation: Evidence from China." Established in 2009, the annual award aims to promote high-quality research on trade policy and international trade cooperation and to reinforce the relationship between the WTO and the academic community. Professor Ma is the first young scholar from one of the Chinese mainland universities to win this award.

> "Professor Ma's paper probes the link between trade openness and education policy."

China has deployed many measures to expand college enrollment since 1999 including building schools, hiring professors, and offering scholarships to underprivileged students. How did this massive education expansion affect firms' export and innovation choices? Professor Ma's paper probes the link between trade openness and education policy, which shows how China's education policy, in particular the dramatic expansion of college enrolment, could eventually led to a considerable increase in manufacturing firms' innovation, especially among exporting firms, once these students entered the job market.

In this paper, Professor Ma combines a quantitative model with empirical evidence to shed light on the contribution of China's massive college expansion to China's recent surge in innovation levels and the skill content of exports. His empirical strategy employs the differential magnitude of the college expansion across regions due to historical factors. In addition, Professor Ma develops a multi-industry spatial equilibrium model, featuring skill intensity differences across industries and heterogeneous firms' innovation and export choices, to better understand the evidence and conduct the quantitative analysis.

Quantitatively, he finds that the college expansion could explain 72% of increases in China's manufacturing R&D intensity between 2003 and 2018 and also triggered a sizable portion of export skill upgrading. Meanwhile, Professor Ma points out without trade openness, the impact of this education policy change on China's innovation and production would have declined by 10–30%. These results suggest that enlarging the higher education system serves as an effective tool for developing countries to promote innovation and growth, and that maintaining a high level of trade openness further improves the effectiveness of such an education policy in stimulating innovation.

With his paper ranked first by the Selection Panel, Professor Ma was presented with his prize of CHF 5,000 at the annual meeting of the European Trade Study Group in Guildford, the United Kingdom. In the view of the Selection Panel, Professor Ma's paper tackles a topic of paramount importance and increases understanding of the policies that can lead to more technologically sophisticated exports, as has been observed in China since it joined the WTO. "I am deeply honored to receive this award," Professor Ma noted, adding that "China's embrace of globalization and its policy environment have provided me with a remarkable opportunity to delve into the interplay between trade and domestic policies."

In recent years, PHBS is growing stronger academically with an increasing number of its publications in the world's top academic journals and international conferences. Our faculty members have published 45 papers (incl. forthcoming) in first-class domestic and foreign academic journals since this year, including *International Economic Review, Journal of Accounting Research, Journal of Finance, Journal of Financial Economics, Journal of Financial and Quantitative Analysis, Journal of International Business Studies, Journal of Development Economics, Journal of Economic Theory, Journal of International Economics, Journal of Monetary Economics, Manufacturing & Service Operations Management, Management Science, Marketing Science, Review of Accounting Studies, Review of Economic Studies, Review of Economics & Statistics,* and *Review of Financial Studies.*

- The WTO Essay Award for Young Economists 2023

- WTO Director-General Ngozi Okonjo-Iweala meets Professor Ma Xiao

> **Established in 2009, the annual award aims to promote high-quality research on trade policy and international trade cooperation and to reinforce the relationship between the WTO and the academic community. Professor Ma is the first young scholar from one of the Chinese mainland universities to win this award.**

Ma Xiao

Assistant Professor
Ph.D. in Economics, University of California, San Diego

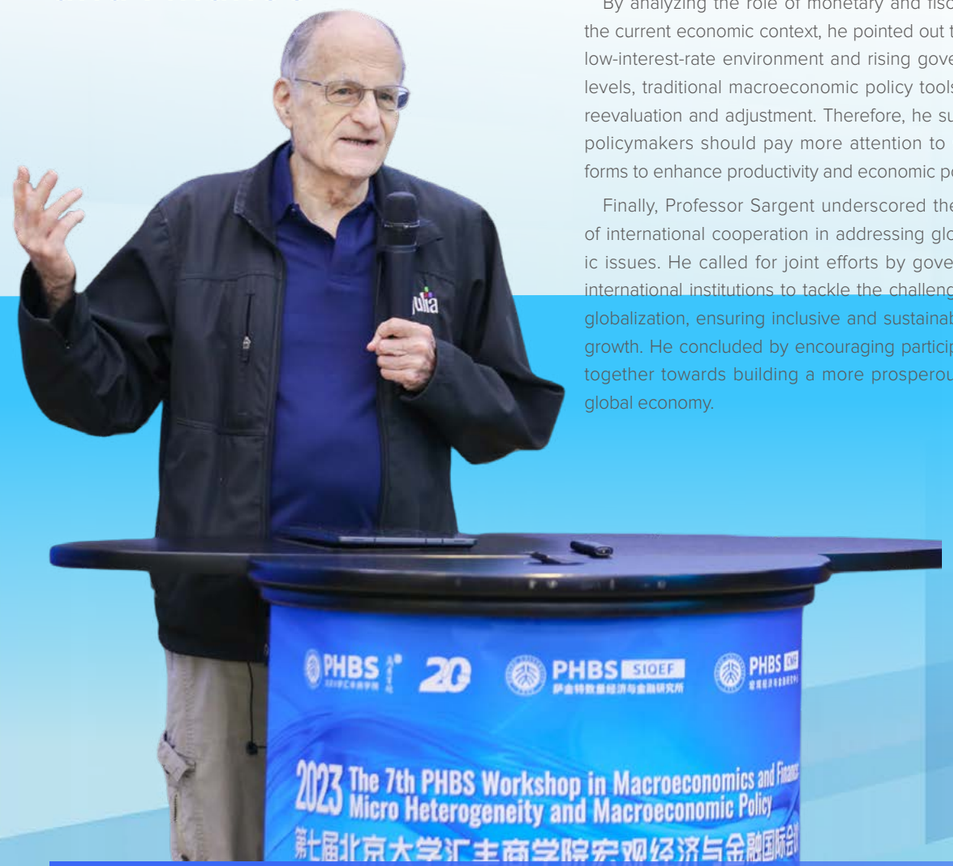
PHBS Hosts the 7th International Workshop in Macroeconomics and Finance

By Chen Man, Chen Bixiao, Cui Chang, Wu Wu, Li Tuoda, Yin Huanyu, Yang Zijun, and Annie Jin

The 7th PHBS International Workshop in Macroeconomics and Finance was held at Peking University HSBC Business School (PHBS) on December 12 to 13, 2023. More than 80 young scholars in the field of macroeconomics and finance attended the event to exchange academic achievements and keep track of the latest breakthroughs with renowned scholars from Cornell University, University of Southern California, Queen Mary University of London, National Center for Scientific Research, Seoul National University, University of Hong Kong, Hong Kong University of Science and Technology, Chinese University of Hong Kong, Peking University, Tsinghua University and other top universities at home and abroad, industry experts from the Federal Reserve Bank of San Francisco.

Initiated in 2018, PHBS Workshop in Macroeconomics and Finance has provided an effective platform for some of the most prominent scholars and young researchers to promote academic exchanges among macroeconomic and financial research institutions, deepen the understanding of China's macroeconomic and financial issues, and facilitate the application of research findings into China's reform and development.

PHBS Hosts the 7th International Workshop in Macroeconomics and Finance



Thomas Sargent, Nobel laureate in Economics and honorary director of Sargent Institute of Quantitative Economics and Finance (SIQEF) at PHBS

Professor Thomas Sargent delivered opening remarks. By recalling his journey in economic research, he emphasized the importance of integrating economic theories with practice, and how these theories can be used to explain and predict economic trends. Subsequently, Professor Sargent shifted his focus to the current international economic situation, probing the main challenges faced by the global economy, including slowing growth, trade tensions, and financial market instability. He highlighted how technological advancements and globalization have transformed economic structures and how policymakers need to adapt to these changes to promote growth and stability.

By analyzing the role of monetary and fiscal policies in the current economic context, he pointed out that given the low-interest-rate environment and rising government debt levels, traditional macroeconomic policy tools might need reevaluation and adjustment. Therefore, he suggested that policymakers should pay more attention to structural reforms to enhance productivity and economic potential.

Finally, Professor Sargent underscored the importance of international cooperation in addressing global economic issues. He called for joint efforts by governments and international institutions to tackle the challenges posed by globalization, ensuring inclusive and sustainable economic growth. He concluded by encouraging participants to work together towards building a more prosperous and stable global economy.

Professor Song Zheng from Chinese University of Hong Kong

Professor Song Zheng offered insights into his collaborative paper titled "The Mandarin Model of Growth." The study delves into the macroeconomic factors contributing to China's rapid economic growth and deceleration, with a central focus on the bureaucratic model. This model examines the interactions between local governments and the private sector and their influence on the Chinese economy. Researchers utilized a dynamic general equilibrium model to study local government decisions related to infrastructure investments and borrowing. They designed counterfactual experiments to explore the impact of removing career incentives and restricting local government borrowing on Gross Domestic Product (GDP). Their findings indicated that before 2008, local officials were highly motivated by career incentives, leading them to actively invest in infrastructure to boost their performance records. However, over time, this motivation waned, likely due to growing local government debt, increasing sensitivity to debt risks, or central government policies aimed at curbing excessive borrowing. This research offers valuable insights into the complex relationship between Chinese local government behavior and economic growth.

Professor Alireza Tahbaz-Salehi from Northwestern University

Professor Alireza Tahbaz-Salehi provided insights into the collaborative paper, "The Macroeconomics of Supply Chain Disruptions," co-authored with Daron Acemoglu. Their research delves into the macroeconomic implications of intricate supply chains in modern economies, with a particular focus on the repercussions of supply chain interruptions on productivity and the broader economy. They introduced a macroeconomic model with three critical components: firm-specific relationships, non-competitive frameworks, and essential extensive margin adjustments. Their findings highlighted that supply chain disruptions could have consequences not only for individual companies but also for the entire economy due to spillover effects. By addressing the vulnerability and efficiency of supply chains and how these factors manifest at the macroeconomic level, their research underscores a delicate balance between economic efficiency and fragility, where supply chains are more active and resilient during periods of high productivity but may disintegrate during productivity slowdowns, leading to a cascade of relationship failures. He concluded by emphasizing the importance of comprehending and mitigating supply chain disruptions and underscoring the significance of considering the macroeconomic repercussions when designing and managing supply chains.

-Opening ceremony

Li Wenhao and Piotr Żoch

Assistant Professor Li Wenhao from the University of Southern California introduced his paper titled "Firm Quality Dynamics and the Slippery Slope of Credit Intervention." The article employs a dynamic two-sector model to analyze the long-term effects of credit intervention on the dynamics of firm quality. In a laissez-faire economy, crises have a cleansing effect as low-quality firms face stricter financial constraints during these times, resulting in lower Tobin's q compared to high-quality firms. Therefore, the end of an economic crisis is accompanied by an increase in the proportion of high-quality firms. Professor Li pointed out that credit intervention if properly designed could enhance societal welfare compared to laissez-faire conditions. However, credit intervention suppresses the cleansing effect and distorts the distribution of firm quality by inducing excessive investment by low-quality firms during both crisis and normal periods. This kind of intervention could exhibit a "slippery slope" effect. Current intervention skews the distribution of firm quality downward, causing the economy to enter the next crisis with lower overall productivity, requiring larger-scale intervention. Larger-scale intervention leads to more severe distortions, necessitating even larger-scale intervention in the future. Assistant Professor Piotr Żoch from the University of Warsaw outlined the paper's model framework, offered viewpoints on the model's setup, and provided policy suggestions on how to avoid the "slippery slope" effect.

Tim Lee and Anson Zhou

Associate Professor Tim Lee from Queen Mary University of London introduced his paper titled "Transforming Institutions: Labor Reallocation and Wage Growth in a Reunified Germany." The article explores how the allocation of workers across firms and factories affects wage growth, and examines how labor institutions, barriers to job mobility, and hiring/firing restrictions impact labor (mis)allocations. Under the background of German reunification, Professor Lee utilized matched employer-employee data constructed from German social security records to investigate the labor reallocation that occurred in East Germany following reunification. He also constructed a theoretical model to simulate the economy in East Germany and uses the model to explore the changes in the economic equilibrium before and after German reunification. The research findings indicated that the sharp growth in East German wages strongly correlated with a rapid reallocation of workers across plants within East Germany. Assistant Professor Anson Zhou from the University of Hong Kong summarized the paper's content, outlined its contributions, provided suggestions for the empirical section, and offered viewpoints on both the model's setup and its stretch.

Ji Yan and Jasmine Xiao

Associate Professor Ji Yan from the Hong Kong University of Science and Technology presented the collaborative paper "Misallocation and Asset Prices" by Professor Winston W. Dou of the University of Pennsylvania, Dr. Tian Di from the Hong Kong University of Science and Technology, and Professor Wang Pengfei from Peking University. It explores the interplay between resource misallocation and asset pricing against a backdrop of financial friction. By employing a model that incorporates technological innovation and macroeconomic elements, the study revealed how misallocation could affect overall productivity and asset values. Their findings indicated significant impacts of misallocation-induced fluctuations on asset pricing, predicting declines in R&D, consumption, and output growth. Moreover, lower levels of misallocation at the industry level could encourage higher R&D activities, with empirical data underpinning these insights. Assistant Professor Jasmine Xiao from University of the Notre Dame shared her views and engaged in in-depth debates on the measurement of misallocation, its influence on innovation margins, and the degree of misallocation in the U.S. economy.

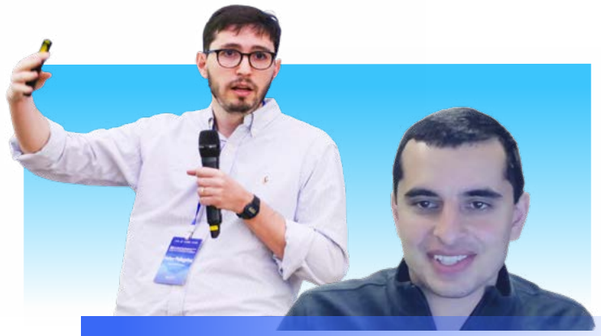
Luo Wenlan and Li Minghao

Associate Professor Luo Wenlan from Tsinghua University introduced "Financing Multinationals". Many literature emphasizes the important role of technology in cross-border trade. Professor Luo's article explores the role of cross-border production (MP) in cross-border financing from the perspective of cross-border production. The article established a multi country general equilibrium model for multinational corporations and explored the relationship between FDI, MP, and financial friction. Finally, the model found from a static perspective that factors related to financial market environment and productivity are equally important, and from a dynamic perspective, it indicated that changes in financial market conditions accounted for a significant share of foreign direct investment from 2001 to 2012. Assistant Professor Li Minghao from Peking University National School of development discussed topics such as empirical methods, bond markets and interest rates, and welfare utility.

Xie Shihan and Pei Guangyu

Assistant Professor Xie Shihan from University of Illinois, Urbana-Champaign introduced her paper “Macroprudential Policy and Housing Market Expectations”. The paper investigates the relationship between macroprudential policy and housing market expectations, finding that macro-prudential policies could move consumers expectations of national house price where a tightening (loosening) of a policy ratio drives down (up) consumers’ house price expectations, and asymmetry in the sign of policy change and geographical heterogeneous effects. The paper showed that design of the online “strategic” survey on housing market expectations is new for the existing literature. Assistant professor Pei Guangyu from The Chinese University of Hong Kong discussed topics such as asymmetry and geographical heterogeneity.

Assistant professor Heitor Pellegrina from University of Notre Dame presented his research "Deforestation: A Global and Dynamic Perspective." In the context of globalization and deforestation, they used a global economic model, incorporating dynamic multi-sector trade theory, to analyze the effects of trade barriers on deforestation using national-level data from 1990-2020. Their methodology integrated empirical models to scrutinize the role of structural changes and comparative advantages in land use. The study revealed that lower global trade costs could significantly reduce deforestation rates, especially in Brazil. Ishan Nath from Federal Reserve Bank of San Francisco discussed topics on the model's implications and methodologies.



Heitor Pellegrina and Ishan Nath

Qiu Xincheng and Piotr Denderski

Assistant Professor Qiu Xincheng from Arizona State University's Department of Economics introduced his paper "Precautionary Mismatch". The paper constructed a framework involving two-sided heterogeneity, search frictions, and incomplete markets to explore how the wealth held by workers affects the matching between workers and firms in the labor market. In the theoretical model, both workers and firms face a trade-off between the speed of matching and the returns: Wealth-poor workers speed up job search by accepting a wider range of jobs at the cost of lower payoffs (we call this phenomenon "precautionary mismatch"), reducing allocative efficiency of the labor market. Based on empirical data from NLSY79 and O*NET, the paper calibrated the model to the U.S. economy and suggested that if workers could be reallocated to the "right" jobs, total output would increase by around 3%. Assistant Professor Piotr Denderski from the University of Leicester's Department of Economics discussed the model's setup, provided suggestions for the empirical section, and offered his viewpoints on policy experiments.

Professor Lin William Cong from Cornell University provided an overview of their collaborative paper, "The Tokenomics of Staking," which centers on exploring the pivotal role of staking mechanisms in the cryptocurrency market. Through empirical research using extensive cryptocurrency market data, they examined the relationships between staking ratios, staking rewards, wealth concentration, and their impact on cryptocurrency prices. One key finding of their research is that higher staking reward rates often stimulate increased staking activity, typically accompanied by rising cryptocurrency prices. This underscores the potential value of staking mechanisms in enhancing network security and positively influencing cryptocurrency market health and stability. Furthermore, they explored the impact of staking economics on blockchain technology and decentralized finance. Staking has become a cornerstone of these domains, offering participants profit opportunities and contributing to the stability and growth of decentralized networks. Research Director CNRS, CREST Julien Prat engaged in a thorough discussion of staking economics, market dynamics, and their future implications.

Lin William Cong and Julien Prat

Associate Professor Yena Park from Seoul National University presented the paper “Optimal Firm Regulation with Labor Market Monopsony” coauthored with Hanvit Kim, which explores the optimal redistribution policy in a monopolistic labor market. They considered the case where firms have wage-setting power and workers have idiosyncratic preferences across firms and analyzed the constrained planner’s problem and the trade-off between redistribution and allocative efficiency. Results showed that optimal redistribution policy required wage compression, which means providing higher subsidies to low-productivity firms to encourage them to pay higher wages and employ more workers. They also found that different inequality and sorting mechanisms could affect the shape of the optimal policy. Zhu Lijun, Assistant Professor from the Institute of New Structural Economics at Peking University, started a discussion on topics such as worker subsidies and monopoly power heterogeneity.

Zhu Lijun and Yena Park

Li Kai and Ji Yan

PHBS Associate Professor Li Kai presented the paper “Leasing, Pecuniary Externalities, and Aggregate Efficiency”. He argued that leasing could improve efficiency by mitigating pecuniary externalities in the context of capital misallocation caused by financial frictions. By using US firm-level leasing data and a dynamic general equilibrium model, Professor Li and his coauthors studied the effects of leasing on capital allocation and welfare. Their results showed that leasing could relax financial constraints, increase the use of new investment and leased capital, lower the price of old capital, and mitigate distributional and collateral externalities. They also found that ignoring the leasing market could lead to suboptimal tax/subsidy policies. Professor Li concluded that leasing could serve as an important topic in the intersection of finance, macroeconomics, and accounting. Associate Professor Ji Yan from the Hong Kong University of Science and Technology discussed topics such as the relationship between leasing and other methods that could alleviate financial frictions.

On behalf of the organizers, Professor Wang Pengfei, dean of PHBS, expressed sincere gratitude to all the participants. He introduced the student cultivation and employment of the school’s master’s and doctoral programs, and expressed the hope to strengthen academic exchanges and promote cutting-edge research through this annual event.

Professor Wang Pengfei delivers closing remarks

Assistant Professor Shi Jiao's New Book "*International Finance: China Scenario*" Published

Source: Peking University Press, Public Relations and Media Office at Peking University HSBC Business School
Photo: Youmi

Recently, *International Finance: Chinese Scenario*, a textbook co-authored by Assistant Professor Shi Jiao from Peking University HSBC Business School, has been published by Peking University Press as the latest addition to the prestigious Peking University HSBC Series. This book systematically introduces classic theories, models, and cases in the field of international finance, integrating practical experiences from China and other developing countries, and discusses specific applications of classic theories in China. The co-authors are Professor Wang Xiao from the School of Management at the University of Science and Technology of China, and Professor Wang Jian from The Chinese University of Hong Kong, Shenzhen.

> This book systematically introduces classic theories, models, and cases in the field of international finance, integrating practical experiences from China and other developing countries, and discusses specific applications of classic theories in China.

Introduction

In *International Finance: Chinese Scenario*, the three authors draw upon the practical experiences of China and other developing countries to systematically introduce the classic theories, models, and cases in the field of international finance, with a focus on their application in China. The book begins by discussing the most critical variable in international finance—exchange rates—followed by an exploration of a country's balance of payments, cost-benefit analysis of financial globalization, and the mix of fiscal and monetary policies in an open economy. The book also covers the selection of exchange rate regimes and the potential for countries to coordinate monetary policies in response to global economic shocks. After presenting the classic models, the book examines how these models can be applied to analyze China's economic issues, and particularly the dynamics of China's gradual opening. Additionally, the book includes numerous data-based cases, guiding readers on how to extract key insights from data using statistical and econometric tools to better understand the empirical facts of international finance and its underlying theories.

This book can serve as a textbook for international finance courses at colleges and universities, as well as training material for government officials. It is also a valuable reference for readers interested in acquiring knowledge of international finance.

Authors

Wang Xiao

Professor and Ph.D. advisor at the School of Management, University of Science and Technology of China, and Assistant Director of the Institute of International Finance. She holds a Ph.D. in Economics from the University of Wisconsin-Madison and previously served as an Associate Professor at the University of North Dakota. Her primary research interests are international finance and international trade.

Shi Jiao

Assistant Professor at Peking University HSBC Business School, and Deputy Director of the Sargent Institute of Quantitative Economics and Finance. She holds a Ph.D. in Economics from the University of Wisconsin-Madison. Her primary research interests include international macroeconomics, development economics, and macroeconomics.

Wang Jian

Professor at The Chinese University of Hong Kong, Shenzhen, and the Deputy Director of the Shenzhen Institute of Advanced Finance. He is also a Master's advisor at the Tsinghua University PBC School of Finance and a member of the China Finance 40 Forum Youth. Wang holds a Ph.D. in Economics from the University of Wisconsin-Madison. His primary research areas are international financial markets and monetary policy.

Preface

This textbook in international finance is distinguished by its use of Chinese data as a laboratory to examine the fitness and application of classic international finance theories.

The three authors of this book have known each other since our time pursuing our Ph.D.s at the University of Wisconsin - Madison in the United States. We all studied international finance under the guidance of Professor Charles Engel, a renowned scholar in the field. Eventually, we returned to China, hoping to apply what we had learned to the study of the Chinese economy.

After years of teaching international finance, we reached a consensus: Theories in international finance can be effectively taught only by integrating them with the Chinese realities that students observe daily. Classic theoretical exploration in international finance often uses the combination of independent monetary policy, flexible exchange rate, and free capital flow as a benchmark for economic and policy analysis. This benchmark deviates from the realities in China and many other developing countries. As a result, students often doubt the applicability of these theories in understanding and analyzing the realities in China.

Our aim is to show that the classic theoretical framework of international finance remains useful for understanding Chinese data and that of other developing countries. The textbook does not deviate from the classic theoretical framework. Instead, it emphasizes the analysis of fixed exchange rate regimes and capital controls as much as the classic paradigm that often characterizes regime choices in advanced economies. Students will find that, with slight modifications to assumptions, the unified and coherent framework provided by classic theories can be readily applied to countries with diverse policy regimes.

In addition to the main text, the companion website provides a collection of online digital resources, including reference slides for teachers, extended readings for readers, exercises for practice, and videos that explain the most important and difficult materials of each chapter.

In writing this textbook, we benefited from numerous sources of help. First and foremost, we want to thank our Ph.D. advisor, Professor Charles Engel. His research and teaching have greatly inspired us, and we believe his influence will continue to benefit generations of future students.

We also want to thank our excellent research assistants, including Wang Yiren, He Hemin, He Jiahao, Shi Yu, and Xu Hecong. Furthermore, our editors, Pei Lei and Gao Yuan, should be thanked for their patient and careful work that improved this book significantly.

Mistakes and errors are inevitable and remain our own responsibilities. We appreciate readers' feedback, which will surely help us improve the book in the future.

This book is supported by the National Science Foundation Grants 72003181, 72173111, 72133005, and the Excellent Textbook Project of Anhui Province (project number: sztsjh-2022-10-14). We extend our sincere thanks for this support.

Features

· Focusing on issues faced by developing countries, this book explores three key aspects:

(i) Theoretical Framework: It provides an equally detailed analysis of each policy choice within the "impossible trinity" (trilemma) framework, with particular attention to the policy combinations of fixed exchange rates and capital controls in developing countries.

(ii) Data and Case Studies: The book emphasizes, using data from developing countries, particularly China, to test and apply international finance theories.

(iii) Dedicated Chapters: Special chapters review the opportunities and risks that international capital markets present to developing countries from both theoretical and practical perspectives.

· Integration of Economic Facts and Models: Adhering to the established research norms in international finance, this book combines economic facts with models and incorporates the latest research findings. While it remains grounded in classic models, it contributes by adapting assumptions to fit the national contexts of different countries, without diverging from the insights of classic theories on global capital flows.

· Extensive Data Analysis Cases: The book includes numerous data analysis cases, guiding readers in using statistical and econometric tools to extract key international finance facts from data and to understand the underlying theories.

The book is accompanied by a variety of digital resources, including curated course videos, extended readings, problem sets, and teaching slides. Readers can access these resources through the instructions provided at the end of the book.

Contents

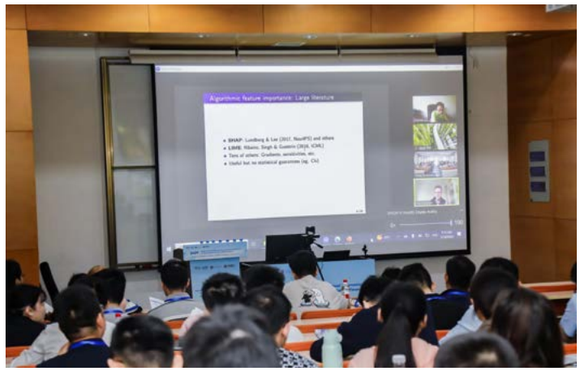
- A group photo of participants

The 8th PKU-NUS Quantitative Finance and Economics International Conference Held in Suzhou

By Annie Jin, Liu Yifu, Zhan Xingyi, and Xu Weixi

In his speech, Professor Chen Yi-Chun reviewed the history of the PKU-NUS Conference and welcomed the participants, expressing hope for continued cooperation between PKU and NUS. Professor Cheng Xue introduced the research trends of the Key Laboratory of Quantitative Economics and Mathematical Finance, hoping that this conference could promote more in-depth and extensive exchanges and cooperation. Professor Peng Xianhua expressed his gratitude to the co-organizers, reviewed the academic achievements of PHBS in 2023, and hoped that this event could enhance the communication and friendship between the scholars.

> The 8th PKU-NUS Annual International Conference on Quantitative Finance and Economics was held at the Suzhou Research Institute of National University of Singapore (NUS) from May 18 to 19, 2024. Jointly organized by the Risk Management Institute (RMI) of the National University of Singapore (NUS), Peking University HSBC Business School (PHBS), and the Key Laboratory of Mathematical Economics and Quantitative Finance of the Ministry of Education at Peking University (PKU), this year's conference attracted nearly 200 scholars to attend online and onsite, sharing the latest research findings in the field of quantitative finance and economics.



Professor Kay Giesecke gave a keynote speech online

- From left to right, Professor Chen Yi-Chun, director of RMI at NUS , Associate Professor Cheng Xue from the Department of Financial Mathematics of the School of Mathematical Sciences at PKU, and PHBS tenured Associate Professor Peng Xianhua.

This year's keynote speakers included Kay Giesecke, the founder of the Advanced Financial Technology Lab at Stanford University, director of the Mathematical and Computational Finance Program, and Professor at the Institute for Computational and Mathematical Engineering; Wang Neng, chair professor of finance at Columbia Business School, and Ciamac C. Moallemi, chair professor in the Department of Decision, Risk, and Operations at Columbia Business School.

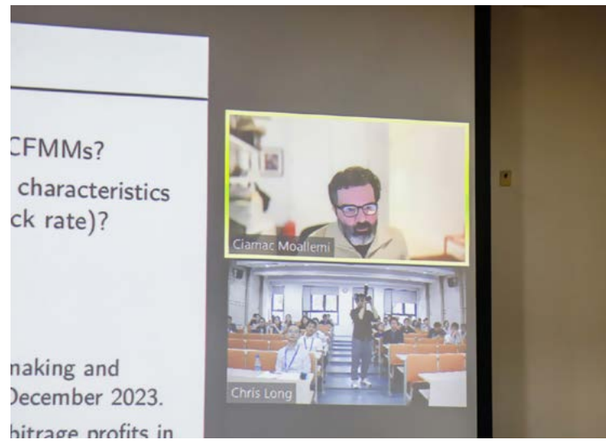
Professor Kay Giesecke delivered a keynote on "AICO: Model-Agnostic Feature Significance Testing for Supervised Learning." Although machine learning has been increasingly used for screening and decision making in many fields, the opaqueness of machine learning limited its adoption in highly regulted fields requiring transparency such as healthcare and financial services. To address this, he introduced AICO (Add In Covariates), a new model-agnostic hypothesis testing framework. AICO defines the baseline sample as the sample with all features being equal to their mean values respectively and then defines the effect of a feature as the improvement of score value when the feature in the baseline sample is changed to the true feature value. Based on the defined feature effect, AICO provides interpretable measures of feature importance with confidence intervals. Its advantages include flexibility in model specifications and scalability to high-dimensional features. He illustrated AICO's effectiveness in handling discrete, non-normal, correlated features and classification tasks, comparing it to Shapley value, deep model-X knockoffs, and holdout randomization tests. He emphasized AICO's low computational requirements and broad applicability, including in mortgage risk, real estate pricing, and climate financial risk assessments.

-Professor Wang Neng presented his study

Professor Wang Neng presented his study on the "Economics of Dynamic Capital Structure," focusing on the core of finance: capital structure comprising project, debt, and equity. Despite extensive research, capital structure literature often overestimates leverage ratios compared to actual data. Drawing from Graham's survey, firms link financial flexibility to debt decisions. Professor Wang proposed an integrated dynamic framework that combines the Tradeoff Theory and the Pecking-Order Hypothesis into a financial-flexibility model. Specifically, he developed a time-variant dynamic tradeoff theory, simulating debt prices through Markov Subgame Perfect Equilibrium. Incorporating costly external equity, he explained the origin of adverse selection. Treating debt as a state variable, he highlighted firms' need for financial flexibility, justifying the value of equity issuance delays. Lastly, he revealed that higher equity financing costs paradoxically lead to lower leverage due to the higher value of financial flexibility.

> **Initiated in 2016, the PKU-NUS Annual International Conference on Quantitative Finance and Economics has been held to provide a platform for researchers and practitioners from academia and industry to discuss and exchange ideas on the new developments in quantitative economics and finance.**

Professor Ciamac C. Moallemi gave a keynote speech on "The Economics of Automated Market Making and Decentralized Exchanges." The automated market making (AMM) protocols, such as Uniswap have emerged as an efficient alternative to traditional central limit order books, eliminating the need for active intermediaries. Consequently, AMMs become the dominant market mechanism for trust-less decentralized exchanges (DEXs) on blockchain platforms like Ethereum, with Uniswap's trading volume surpassing that of Coinbase. Professor Moallemi and his co-authors developed a model exploring AMMs' economics from the perspective of passive liquidity providers (LPs), introducing a "Black-Scholes formula for AMMs." They considered LP returns post-market risk hedging and identified the main adverse selection cost, 'loss-versus-rebalancing' (LVR). In a Black-Scholes framework, they derived the closed-form expression for this cost. Their model highlights factors driving AMM LP returns, including asset characteristics (volatility), AMM characteristics (curvature/marginal liquidity), and blockchain characteristics. Their model's expressions accurately match Uniswap v2 WETH-USDC trading pair's LP returns, providing insights into AMM LP investment decisions.



-Professor Ciamac C. Moallemi shared his insights with participants

-Scholars at the annual conference

Other scholars presenting papers came from world-renowned universities and institutions, including the University of Texas at Dallas, the National University of Singapore, Peking University, the Hong Kong University of Science and Technology, the Chinese University of Hong Kong, the City University of Hong Kong, Hong Kong Polytechnic University, the Renmin University of China, Fudan University, Wuhan University, Tongji University, and Soochow University. Eight faculty members and students from PHBS, including Peng Xianhua, Seungjoon Oh, Yang Aoxiang, Zhao Lingxiao, Shen Chao, Liu Yifu, Zhan Xingyi, and Xu Weixi, presented their papers and shared their recent research findings with attendees.

The 8th PHBS Workshop in Macroeconomics and Finance Held at PHBS

By: Annie Jin, Shu Danyi, Sun Bo, Yang Zijun, Zhao Shijie, and Zhang Jiayu

PHBS

The 8th PHBS International Workshop in Macroeconomics and Finance was held at Peking University HSBC Business School (PHBS) on June 16 to 17, 2024. More than 60 distinguished and emerging scholars in the field of macroeconomics and finance participated in the event to exchange their research findings and stay updated on the latest developments in the field. Among them were renowned scholars from Duke University, Princeton University, Boston University, Washington University in St. Louis, the University of Notre Dame, European University Institute, the University of Melbourne, National University of Singapore, Singapore Management University, The University of Hong Kong, The Chinese University of Hong Kong, Peking University, Tsinghua University, Renmin University of China, Shanghai Jiao Tong University, Shanghai University of Finance and Economics, and The Chinese University of Hong Kong, Shenzhen.

Thomas Sargent

Thomas Sargent, Nobel laureate in economics and honorary director of Sargent Institute of Quantitative Economics and Finance (SIQEF) at PHBS

Professor Thomas Sargent delivered the opening remarks at the workshop, underscoring the dual nature of machine learning and ChatGPT advancements — both a groundbreaking opportunity and a significant challenge for macroeconomics. He expressed optimism, citing the collective expertise of the scholars in attendance, and asserted that while machine learning has the potential to achieve remarkable feats, the continued efforts of macroeconomists on the analysis of structural models are as important as ever. Professor Sargent eagerly anticipated the presentation of insightful papers that would further advance the field.

The 8th PHBS Workshop in Macroeconomics and Finance Held at PHBS

Joseph Kaboski

Professor Joseph Kaboski from Notre Dame University delivers a keynote speech

Professor Joseph Kaboski delivered a keynote speech on his co-authored paper "Outsourcing Policy and Worker Outcomes: Causal Evidence from a Mexican Ban". Using confidential Mexican economic census data from 1994 to 2019, as well as the manufacturing panel survey data from 2013 to 2023 and the natural experiment of Mexico's domestic outsourcing ban in 2021, the author investigated the effects of the outsourcing ban on wages, output, and employment. The research showed that the outsourcing firms evaded taxes and underpaid their employees, a term authors called “wage discounts”. The outsourcing ban implemented by Mexican government has increased workers' wages, did not decrease firm output or employment, but led to reductions in capital investment and to increased market exit. Consistent with the existence of monopoly power, the largest companies had largest wage discounts, and the reduction in discounts was mainly concentrated in companies with high discounts.

Professor Xu Yi shed light on his collaborative paper titled "Adverse Selection in Carbon Offset Markets: Evidence from the Clean Development Mechanism in China"(CDM). He argued that carbon offsets could address climate inequity and inefficient carbon regulation, but warned of the risk of adverse selection, or "additionality.” Using the panel data of CDM offset projects matched with Chinese firm and the staggered DID method, the study found that participation in CDM has led to reductions in CO2, although not as much as promised in initial projects' applications. To address endogeneity issues, the authors proposed a structural model that considered firms' investment decisions and separated emissions growth into scale and selection effects. The paper concluded that although they found evidence of adverse selection taking place in CDM, the UN's internal screening of potential non-additional projects has contributed to a relatively high institutionalss efficiency. The authors proposed exploring alternative registration criteria using richer data to improve the per dollar “additional” emission reduction.

Xu Yi

Professor Xu Yi from Duke University delivers a keynote speech

Zhang Donghai and
Jia Dun

Assistant Professor Zhang Donghai from the National University of Singapore introduced his co-authored paper titled "Lumpy R&D and the Great Twins: The Great Moderation and Great Recession." The paper found that the share of firms with R&D spikes' is pro-cyclical and could account for 75% of the aggregate R&D pro-cyclicality. This finding motivated authors to study the relationship between heterogeneous innovative firms and lumpy R&D investment under fixed adjustment costs by utilizing firm-level data and a medium-run business cycle model, givin rise to a novel "Great Twins" hypothesis. PHBS Assistant Professor Jia Dun commented on the paper, discussing ideas' persistence, physical capital adjustments, innovation's wealth effects, and the Great Twins' role, along with financial frictions.

Yongseok Shin and
Xu Sichuang

Professor Yongseok Shin from the Washington University in St. Louis presented the collaborative paper titled "Is Software Eating the World?" The paper examined the steady decline in labor income share in most advanced economies since the 1980s, which could be attributed to capital-labor substitution, intangible capital, and reallocation. Using the data of Korean firms, the study highlighted the rise of software as a common thread, revealing that software substitution for labor could explain over 60% of the labor share decline. Assistant Professor Xu Sichuang from the Chinese University of Hong Kong, Shenzhen discussed topics such as the introduction of software capital in the model, production equipment and ICT equipment (hardware), software purchase versus internal development, and extensive margin.

PHBS Assistant Professor Xie Jin presented the paper titled “Nominal Rigidities, Earnings Manipulation, and Securities Regulation.” Motivated by quasi-experimental evidence from the US, he argued in a new keynesian model with financial accelerator that managers of sticky-price firms have incentives to manipulate profits. Using PPI microdata from 2002-2012, results showed sticky-price firms would be more prone to misreporting and sensitive to punishment, increasing auditing costs and loan spreads. Assistant Professor Luo Dan from the Chinese University of Hong Kong pointed out that Bayesian models rely heavily on strong assumptions about commitments, and it may be a better choice to use more natural models to formulate hypotheses.

Xie Jin and
Luo Dan

Assistant Professor Ernest Liu from Princeton University presented a collaborative paper titled "Neoclassical Growth in an Interdependent World," which explored a more generalized framework of an open economy across nations by incorporating trade and capital market frictions as well as imperfect substitutability between goods and capital. Assistant Professor Xu Le from Shanghai Jiao Tong University pointed out that further discussion could be needed on whether exchange rate adjustments would mitigate or exacerbate the impact of market frictions on convergence.

Ernest Liu and
Xu Le

Chris Edmond and
Jake Zhao

Professor Chris Edmond from the University of Melbourne presented the paper "Local Concentration, National Concentration, and the Spatial Distribution of Markups," which explored the national and local market concentration and its impact on market competition and markups. Jake Zhao, a tenured associate professor at PHBS, suggested that the model should incorporate more detailed data to enhance its explanatory power and proposed fruitful directions for future extensions.

Alexander Monge-Naranjo and
Zhang Lichen

Professor Alexander Monge-Naranjo from the European University Institute presented the paper titled "Alumni as Assets: Legacy Preferences, Expected Donations, and Selective Admissions in Elite Colleges," which explored a dynamic model of alumni preferences and donations in elite universities. Assistant Professor Zhang Lichen from the University of Hong Kong suggested that the model could further investigate the impact of talent mismatch resulting from alumni preferences and how these preferences hinder high-ability non-alumni students from gaining access to elite education opportunities.

Ma Lin and
Xu Mingzhi

Assistant Professor Ma Lin from the School of Economics, Singapore Management University, presented the paper titled "Educational Migration." The article established a general equilibrium dynamic spatial model that incorporates lifecycle factors to analyze the impact of educational resources. Assistant Professor Xu Mingzhi from the Institute for New Structural Economics, Peking University, discussed issues such as the inconsistencies between individual migration and teacher resource migration, the relationship between inequality and welfare, and the measurement of educational quality.

Associate Professor Liu Zehao from the School of Finance, Renmin University of China presented the paper "Borrowing like China? A Theory of Guarantee Multipliers." His paper developed a model analyzing collateralized lending and private information to rationalize this, shedding light on the prevalence of such guarantees in China and loan guarantee programs in advanced economies. Assistant Professor Su Dongling from the School of Business, Shanghai University of Finance and Economics discussed potential extensions of the paper in terms of government fiscal capacity, land finance, and land banking.

Liu Zehao and
Su Dongling

Professor Wang Pengfei
delivers closing remarks

At the closing ceremony, Professor Wang Pengfei, dean of PHBS and executive director of SIQEF, expressed his gratitude to Professor Sargent and all the scholars in attendance on behalf of the organizers, and introduced the school's recent academic achievements. He pointed out that this year marked the 20th anniversary of the school's establishment, which was a milestone symbolizing two decades of dedication, innovation, and development. "He aspired for the school's research to leap forward, maintaining its leading position in macroeconomics, financial innovation, and education, thereby contributing to the global economy.

Since its inception in 2018, the PHBS Workshop in Macroeconomics and Finance has served as a powerful platform for eminent scholars and emerging young researchers to exchange ideas, deepen their understanding of China's macroeconomic and financial challenges, and translate research insights into practical contributions to China's reform and development. In addition, this workshop not only highlights PHBS's dedication to becoming a world-class academic institution, but also lays a solid foundation for future collaborations between PHBS and distinguished scholars both domestically and internationally, thus strengthening the academic community in this crucial field.

Featured Articles

SARGENT INSTITUTE OF QUANTITATIVE ECONOMICS AND FINANCE

FEATURED ARTICLES

Thomas Sargent: An Empiricist in the Age of Artificial Intelligence

Source: PKU Financial Review

By: Du Wenxin, Liu Baixiao, Yang Jingwen

Professor Thomas Sargent, a Nobel laureate in Economics in 2011, has long been fascinated by empirical research on causes and their effects in macroeconomics. With teaching experiences at globally renowned universities such as Harvard and New York University, Professor Sargent joined Peking University's HSBC Business School in 2017, serving as Director of Sargent Institute of Quantitative Economics and Finance. According to him, "This way, I can learn about the latest developments in China and continuously correct my misunderstandings about the country during communication."

As rapidly developing technology sweeps the globe, claims that generative AI like ChatGPT "will reshape the economy" are widespread. In an interview with the *Peking University Finance Review*, Professor Sargent stated that ChatGPT is a product of the Big Data era and is very helpful in tasks like editing documents, assisting in writing code, and reviewing reports. Regarding whether AI will completely replace some people's jobs, Professor Sargent believes, "ChatGPT is like an assistant that can help with basic, repetitive tasks, but the final creation, revision, proofreading, and judgment still need to be done by humans."

This article was originally published in the 19th issue of *Peking University Finance Review*.

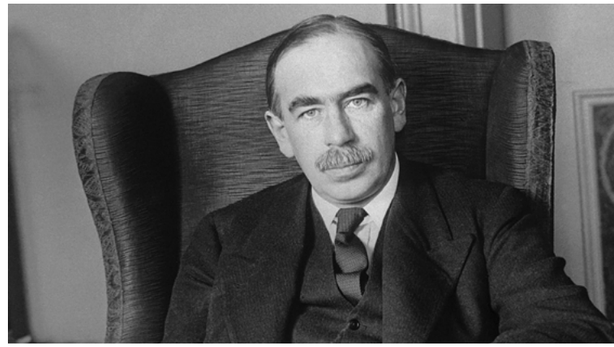
Thomas Sargent

Thomas Sargent, Nobel laureate in economics and honorary director of Sargent Institute of Quantitative Economics and Finance (SIQEF) at PHBS

Compared to the title of economist, Thomas Sargent prefers to position himself as an economic scientist, an empiricist who likes to speak with numbers. To better explain the economic issues he studied, Sargent invested a lot of time in learning mathematics, sometimes even auditing undergraduate and graduate courses in the mathematics department. He said, "We are just people who are observing, trying to figure out what's going on by looking at the numbers."

On the morning of the day when the highly anticipated Nobel Prize in Economics was awarded in 2011, Sargent took the train to Princeton University as usual to give a lecture. It is said that the Nobel Prize Committee called Sargent multiple times that morning, but he did not answer because the numbers were unfamiliar. When informed of winning the Nobel Prize, he remained very calm. In fact, as early as 1995, Thomas Sargent had once missed out on the Nobel Prize in Economics. As a major representative of the rational expectations school and a long-term collaborator, Thomas Sargent was expected by the academic community to win the Nobel Prize in Economics together with Robert Lucas, but unexpectedly, in 1995, the Nobel Prize was awarded only to Robert Lucas. One reason for this was that Sargent's "policy ineffectiveness proposition" and related theories were questioned by many scholars.

When Sargent was still a graduate student, he was very interested in how to parametrize distributed lags, an important topic in macroeconomics. At that time, many famous economists, such as Solow, Jorgenson, and Griliches, tried various methods, but Sargent was not satisfied with these studies. While studying at Carnegie Mellon University, Sargent was recommended to read a paper by John Muth (known as the father of rational expectations). In that paper, Muth rationalized Friedman's adaptive expectations model by reversing Philip Cagan's expectations equation. Muth's conclusion was that predictions of random processes should also include distributed lags and people's expectations for the future. Sargent said, "This laid the foundation for guiding my subsequent research and made me realize that I should delve into this direction. I believe that in the rational expectations model, people's expectations should not be inputs in the theoretical model but should be outputs, part of the results." The significant impact of the rational expectations approach is acknowledged not only by its proponents but also by its critics. Nobel laureate in economics James Tobin once pointed out: "This idea is too different, too persuasive, to become a fleeting visitor on the theoretical stage. Whatever orthodoxy emerges, this idea is destined to develop. This enduring idea, beyond economic theory itself, is more methodological in nature—it derives rational expectations and rational behavior that are contained in the structural equations of general equilibrium macroeconomic models with inherent consistency. This idea has been mobilized not only to elevate the status of the 'invisible hand' but also to explain the causes and consequences of many well-known phenomena, such as information imperfections, long-term contracts and other agreements, capital market imperfections, and many other phenomena. Due to the application of this approach, Keynes's questions must be reinterpreted from a new height."



John Maynard Keynes, an English economist and philosopher.

From a Keynesian Believer to a Rational Expectations Revolutionary

In his early economic research, Sargent was a staunch believer in Keynesian economics. During this stage, he fully endorsed the Keynesian view of using monetary and fiscal policy to address economic cycles, convinced that fiscal and monetary policy could solve macroeconomic problems. However, the idea of rational expectations gradually shook Sargent's faith in Keynesianism. He realized that introducing rational expectations into macroeconomic research could change his previous understanding and perception of economics. The book "Macroeconomic Theory" fully demonstrates Sargent's transformation from a devout Keynesian to a rational expectations economist.

Starting with John Muth's groundbreaking 1961 paper "Rational Expectations and the Theory of Price Movements," the rational expectations hypothesis has come a long way. In the 1970s, Sargent, along with Lucas, Barro, and Wallace, reconstructed macroeconomic theory based on previous research, including basic assumptions, micro-foundations, model predictions, and policy implications. This later became known as the "rational expectations revolution." Regarding this revolution, Thomas Sargent believes it was based on Keynesian economics, representing an important result of the continued advancement of Keynesianism—a continuous and inevitable evolution.

Rational expectations refer to the idea that when predicting an economic phenomenon (such as market prices), if people are rational, they will act by making the most of

the information available to them. This means that many measures taken by policymakers will be counteracted by people's rational expectations, making such policies ineffective. This idea delivered a severe blow to the then-popular Western advocacy of government intervention in the economy and was criticized by older Keynesian economists. Although it is not the only possible, reasonable, or even 'rational' choice, it is a method that has been proven in the internal development of economics and has already become a common basis for independent research in many fields.

For example, under the assumption of an efficient market, the rational expectations hypothesis has been widely used in financial market research. The efficient market model asserts that security prices are free and flexible and reflect all available information. In other words, prices are related to conditional expectations. The theory holds that price changes always follow a random pattern. If past prices or quantities play a role in predicting future price changes, Wall Street's technical experts will soon discover these patterns. When technical experts begin to act on their findings, prices will adjust, causing these patterns to disappear. For example, if people predict that stock prices will rise by 5% over the weekend, investors will rush to buy securities until their prices rise by 5%. Prices will then rise immediately rather than waiting until the weekend. As a result, there will be no ready-made patterns from past data to predict future price changes, and price changes will inevitably be random.

In practical reality, the rational expectations model once played an important political role in promoting Reagan's economic plan. Republicans developed a massive policy agenda of tax cuts for individuals and businesses. They predicted that their policy would reduce inflation and stimulate economic growth. Traditional macroeconomic models suggested that higher economic growth meant higher inflation and that lower inflation could only be achieved with lower economic growth. The simple rational expectations model responded to this dilemma by suggesting that by relying on a policy announcement of reducing the rate of monetary growth, inflation could be reduced without sacrificing real growth. Thus, the simple rational expectations model made the economic propositions in the Republican agenda seem feasible.

However, this new economic plan did not convince public opinion or most economic sectors. The creators and users of existing econometric models believed that the ideas on which the forecast was based were merely untested speculations. As Thomas Sargent pointed out, "Economists do not currently have reliable, empirically usable rigorous models that allow us to accurately predict how long it will take and what losses, in terms of output and employment, will have to be borne before such an institutional change can take effect."

Sargent realized that further evidence must still support the examples of the direction of change in inflation rates immediately reversing after a policy regime change. In his view, the several episodes of hyperinflation during the 1920s (in Austria, Hungary, Poland, and Germany) provided rare experiences for studying regime changes. A striking feature of these cases was that, following drastic monetary and fiscal reforms, price levels and exchange rates stabilized rapidly and suddenly. These inflationary processes did not gradually end but abruptly stopped; the apparent driving forces of the inflationary processes disappeared entirely.

The important historical role of Sargent's economic thinking lies in his relatively systematic improvement of a more precise formulation of the rational expectations theory from

an empiricist perspective. For example, Sargent constructed a series of mathematical models, incorporating the rational expectations hypothesis as a significant economic factor into the mathematical models, enriching the development of structural macroeconometric economics. At the same time, he conducted stability analysis through empirical tests, proposed robust control theory, and put forward the adaptive expectations theory. This series of economic research constructed a relatively systematic rational expectations analysis framework, triggering the rational expectations revolution in macroeconomic theory.

Are Government Policies Ineffective?

Sargent once said in an interview: "There are two Chinese proverbs that aptly illustrate the essence of rational expectations. The first is 'There are policies from above, and countermeasures from below', and the second is 'If a man has no long-term considerations, he will have immediate worries'. Before knowing rational expectations, my researches and that of some other scholars were based on the assumption that governments could predict the future better than people. This type of theoretical model applied to economic policy gave the government a basis for systematically and continuously 'deceiving the people' to change policy. The rational expectations hypothesis is relatively more democratic, suggesting that governments and individuals predict future benefits based on the same foundations, thereby eliminating the means for the government to influence policy."

In the late 1960s and early 1970s, many countries around the world experienced stagflation, leading to skepticism and declining influence of Keynesian economic theory. Keynesian macroeconomics emphasized the central role of government and focused on analyzing a series of economic aggregates but lacked an analysis of microeconomic behaviors. This resulted in a lack of necessary microeconomic foundations for Keynesian macroeconomic theory. As Keynesian macroeconomics faced theoretical and practical difficulties, the theory of rational expectations gradually developed through reflection on Keynesianism and absorbing parts of monetarism.

After introducing the rational expectations hypothesis into macroeconomic policy analysis, Sargent first proposed the 'policy ineffectiveness' proposition in 1975, sparking the rational expectations revolution. Before Sargent proposed the 'policy ineffectiveness' proposition, Keynesianism maintained that the government could intervene in macroeconomic operations through fiscal and monetary policy, while monetarist economists advocated the role of

monetary policy and denied that the government's use of fiscal policy could bring positive effects. Sargent's rational expectations theory was built on a long series of practices, positing that over a longer period, the causal effects of rational expectations would render government policies ineffective. For example, economic agents' expectations of the future macroeconomy will influence their current investment, consumption, and savings decisions, and government policymakers' expectations of economic agents' activities will affect current policy formulation. When a government lowers the reserve requirement ratio to implement an expansionary policy, people predict that the future money supply will increase, leading to higher prices for goods. As a result, the price increase for goods will match the level of money supply increase, ultimately only changing nominal prices and making the expansionary policy ineffective.

Sargent also suggested that if monetary authority secretly increases the money supply, people will not make any anticipatory judgments, leading to a short-term sustained rise in price levels due to information asymmetry, causing short-term hidden inflation. This inflation makes manufacturers and consumers mistakenly believe that the demand for products and labor has increased, thus increasing the supply of corresponding products and labor, leading to an output level deviating from the natural rate level. Sargent believed that this output level could only be temporarily maintained. Manufacturers and laborers will soon realize that this demand increase is just an 'illusion', and actual demand has not changed: the price increase is mainly due to short-term inflation. They will then re-adjust their expectations, reduce the supply of products and labor, and return the output level to the natural rate condition. Consequently, monetary policy ultimately only brings inflation without any help to the sustained level of real output.

Although this proposition has been widely disputed in economic research, the discussion around it has profoundly influenced the development of macroeconomics, promoting economists' thinking about the role of macroeconomic policy and revolutionizing macroeconomic research methods.

New Research in the Age of Artificial Intelligence

> If it is creative destruction, it must produce something new. Given the current functionality of ChatGPT, I don't think it meets the standard of 'creative destruction' because it only replaces part of our basic work and does not produce new inventions.

In 1964, Sargent received a Bachelor of Arts degree from Berkeley and later a Ph.D. in philosophy from Harvard University in 1970. He has taught at several globally renowned universities, including the University of Minnesota, the University of Pennsylvania, the University of Chicago, Harvard University, and New York University. In 2017, Professor Sargent joined the Peking University HSBC Business School and became the director of the Sargent Institute of Quantitative Economics and Finance. He believes, "In this way, I can learn about the latest developments in China and constantly correct my misunderstandings about China through communication".

Since the late 1980s, Thomas Sargent has participated in research at the Santa Fe Institute, exploring new topics such as complexity, unpredictability, and adaptability. During this period, the focus was on how economic agents consider specific future issues when making decisions. Sargent's research on rational expectations theory gradually shifted to related research on 'learning theory'. At this stage, Sargent began studying the application of bounded rationality in the field of artificial intelligence. Sargent admitted that during this stage, he still encountered a sense of frustration as neither adaptive expectation learning nor artificial intelligence learning could establish the symmetry he sought.

Currently, Sargent is striving to study the latest achievements in scientific and technological fields, such as artificial intelligence. He said that, like technology, economics is closely related to human development, and intelligence is characterized by pattern recognition and generalization. From an economic perspective, the application of artificial intelligence is conducive to reducing global trade barriers and building trust, thereby creating more value. As he pointed out in an interview at Xiamen University: "Some outstanding entrepreneurs already know how to combine these tools and make new attempts while also integrating existing things innovatively. As more computers are connected to the same network, we can use competition to eliminate monopolists. We need to gradually decentralize and share information, and everyone will have a ledger. We will use economic incentives to build trust."

PKU Financial Review: People generally believe that generative artificial intelligence like ChatGPT will reshape the economy. In your article "The Artificial Intelligence Frontier of Economic Theory", you mentioned, "With big data, faster computers, and better algorithms, we might see patterns where once we heard only noise." Since ChatGPT's surge in popularity, has its development matched your observation? What do you think will be the ultimate form of ChatGPT application?

Thomas Sargent: Historically, scientists like Galileo and Kepler collected or observed data in various ways and then simplified it into a few equations to generalize it, forming models. In the early stages, the amount of data collected by humans was limited, so it had to adapt to small models. But as the available data grew exponentially, the adaptable models also grew larger, and ChatGPT is a product of the big data era.

ChatGPT is very helpful in editing manuscripts, assisting in writing code, reviewing reports, and so on. For example, in my workplace in the United States, I need to submit various reports. Once, I had ChatGPT write a report on how to make research work more diverse and inclusive, and it did a great job. It can also do interesting things, like writing a Shakespearean-style love poem to my wife. However, if I ask it to summarize relevant information and materials in a certain field to aid my in-depth analysis and understanding, ChatGPT will disappoint me because it cannot judge the truthfulness of information, so the information it provides may not be accurate.

Some say ChatGPT might replace some people's jobs, but I don't think so. ChatGPT is like our assistant, helping with basic and repetitive tasks, but the final creation, modification, review, and judgment still need to be done by humans.

PKU Financial Review: According to Schumpeter's theory of creative destruction, in a market model, innovation as a force of creatively destroying market equilibrium will continuously innovate the economic structure from within, making dynamic disequilibrium the 'norm' of economic development. How do you view the 'destructive' nature of future innovation? What challenges will it bring to our social development, and how should we respond?

Thomas Sargent: Creative destruction has always been happening. For example, the invention of smartphones is one, making young people addicted to mobile games and social media, but you can't stop its development. In the United States, there are countless startups, and of course, many fail. Almost all startups fail, but the entrepreneurial spirit remains unstoppable. Years ago, the U.S. government tried to save failing companies, but practice proved it was not wise.

If it is creative destruction, it must produce something new. Given the current functionality of ChatGPT, I don't think it meets the standard of 'creative destruction' because it only replaces part of our basic work and does not produce new inventions.

Currently, there is a geek team doing things that I think fall into the category of 'creative destruction'. They use machine learning tools to overlay complex mathematical models, creating 'geometric deep learning', and are doing things on this structure, such as advancing the frontiers of biology, which may help us live longer.

My father just passed away, and the work he used to do has now been replaced by computers. I feel that one day, my work as an economist and professor may also be replaced by machines. So, our work cannot be just about transmitting existing knowledge and skills but about continuously creating new knowledge and skills.

My understanding of creativity is a mode of creative thinking, in other words, it can make predictions more accurate.

Hai Wen: The Key to High-Quality Economic Growth in China is to Strengthen Private Enterprises

Source: Hong Kong 01

On March 18th, the Hong Kong 01 hosted the 2023 Economic Summit Forum with the theme *Hong Kong Economy in the Context of a Century of Major Changes*. During the discussion on *Understanding High-Quality Development in China and Exploring Solutions for Hong Kong's Challenges*, Hai Wen, vice chairman of the Peking University Council and founding dean of Peking University HSBC Business School, pointed out that the current mismatch in China's economic development lies between the people's demand for high-quality life and the insufficient supply. Whether high-quality development can be achieved depends crucially on whether private enterprises can grow stronger.

-Hai Wen (second from left in the front row) took a group photo with the guests

Hai Wen discussed the current situation of China's economy from three aspects: the characteristics of the new stage of China's economy, the main problems at this stage, and how to overcome these problems to achieve high-quality growth.

He pointed out that since the reform and opening up in 1978, China's economy has undergone three major changes. First, the economy has shifted from poverty to middle income, with significant changes in economic dynamics and structure. Second, the transition from material shortage to relative surplus. Previously, business operations were relatively easy, and products produced could easily achieve desired sales volumes, but now consumers' material pursuits have changed, and China has transitioned from a shortage to a surplus. Third, the shift from supply-driven to demand-driven.

The main problem at present, according to Hai Wen, is the mismatch between people's pursuit of life quality and the inadequacy on the supply side. To meet people's needs, first, there must be high-quality products and services, so supply-side reforms are necessary. Supply-side reforms require technological development and innovation, as well as adjustments in industrial structure, such as developments in healthcare, cultural industry, education, and environmental protection.

> **Hai Wen, vice chairman of the Peking University Council and founding dean of Peking University HSBC Business School, pointed out that the current mismatch in China's economic development lies between the people's demand for high-quality life and the insufficient supply. Whether high-quality development can be achieved depends crucially on whether private enterprises can grow stronger.**

He further pointed out that achieving high-quality development depends on whether private enterprises can be strengthened. In order to meet the needs of the people, development requires investment, and private enterprises are in a better position to receive such investments. The pressure of competition and the desire for profits prompt private enterprises to focus more on innovation and whether products meet customer needs. Another aspect lies in how to deepen market economic reforms, including the protection of intellectual property rights and the reform and development of the service industry. Additionally, international cooperation is essential, as no single country can produce products that meet all consumer needs. Furthermore, more investment in research and talent is needed to cultivate more talents that promote high-quality economic development.

Hai Wen

Chair Professor in Economics, Former Vice President of Peking University, Vice Chairman of Peking University Council, Founding Dean of Peking University HSBC Business School

Wang Pengfei: The Experience of Developing the Private Economy in Quanzhou is Worth Emulating Nationwide

Source: Quanzhou Institute for Private Economy Research

Wang Pengfei

Dean of Peking University HSBC Business School and Expert at the Quanzhou Institute for Private Economy Research

> Regarding technological research and development, Wang believes that technological innovation is typically market-driven. Although Quanzhou's enterprises still lag behind many international brands in terms of technology, he believes that by innovating based on market demand, they can achieve breakthroughs that propel their industries and sectors to new heights.

Recently, Wang Pengfei, Dean of Peking University HSBC Business School and expert at the Quanzhou Institute for Private Economy Research, provided suggestions on the inheritance, promotion, and innovative development of the 'Jinjiang Experience' as well as the development of Quanzhou's private economy, based on the laws of socioeconomic development.

Guiding Innovation by Market Demand to Boost Enterprise Growth

Wang Pengfei is deeply impressed by the development of Quanzhou's private economy and its significant contribution to the socio-economic landscape. He believes that Quanzhou hosts numerous leading enterprises whose development paths and experiences offer valuable insights for industries, sectors, and businesses across the country, serving as models for other private enterprises nationwide.

Wang emphasizes that businesses must be adept at identifying and seizing market demand to keep pace with market changes and adjust strategies accordingly.

Using Anta's development as an example, he illustrates how the company evolved from meeting basic needs for clothing to later emphasizing brand value and eventually pursuing product specialization, trends, and environmental sustainability. These changes were driven by the shifts in market demand resulting from the gradual improvement in the standard of living among the Chinese population, rather than by prior government planning. Such transformations reflect broader societal changes and align with the natural laws of market economy development.

Regarding technological research and development, Wang believes that technological innovation is typically market-driven. Although Quanzhou's enterprises still lag behind many international brands in terms of technology, he believes that by innovating based on market demand, they can achieve breakthroughs that propel their industries and sectors to new heights.

Wang also noted during his investigation of companies that many Quanzhou enterprises place a strong emphasis on brand value. He highlights Anta's strategy of enhancing its main brand while acquiring numerous well-known international brands, which aligns with market dynamics. Branding requires long-term accumulation, and Anta has leveraged capital operations through acquisitions to achieve brand synergy and complementarity. These brands have become intangible assets for the company, significantly boosting Anta's revenue.

Renew the 'Jinjiang Experience' and Materialize Policy Benefits

Reviewing the region's historical development, Wang observed that despite resource shortages, Fujian has carved out its own development path, emerging as a powerhouse of private economy. During his visits to Quanzhou enterprises, Wang was deeply impressed by the local atmosphere of respect and support for commerce.

Wang pointed out that Quanzhou, as a region with a thriving private economy, has accumulated valuable development experiences, such as the 'Jinjiang Experience', which are worth inheriting, promoting, and renewing. He specifically highlighted the philosophy of Quanzhou's service-oriented government, characterized by its proactive and responsive approach, which helps foster a healthy relationship between government and business, creating a favorable business environment for the continued development of the private economy.

Last month, the Opinions of the Central Committee of the Communist Party of China and the State Council on Promoting the Development and Strengthening of the Private Economy were issued. Wang believes that this is a moment when the entire nation is placing high importance on the development of the private economy, and local governments should seize this policy opportunity to fully realize its benefits. He suggested that, in addition to integrating the innovative development of the 'Jinjiang Experience"'into the policy framework, the Opinions also emphasize the establishment of a monitoring mechanism. Wang proposed that local governments, under this guidance, should detail specific implementation measures to ensure that the policy benefits are realized in practice. For example, setting up and improving a system that enables effective communication channels between private enterprises and the government, helping private enterprises protect their rights, and providing timely feedback and solutions to their issues. Particularly for Quanzhou, in its efforts to build a service-oriented government, establishing a comprehensive supervision mechanism can ensure that policy benefits reach private enterprises, thereby providing tangible support for their development.

Regarding industrial transformation and upgrading, Wang believes that these processes are dictated by the natural course of socio-economic development. Enterprises, as the entities closest to the market, do not require excessive guidance; they are capable of keenly perceiving market demands and engaging in controlled trial and error at various levels, thereby finding better development paths.

He argues that the government should also respect the natural laws of market development. While government guidance in market competition should be moderate, there is considerable scope for it to play a supporting role. For example, when enterprises need it, the government can help coordinate external issues, provide platforms for production chain integration, organize learning opportunities for entrepreneurs, and assist them in improving their management, cognition, and other capabilities.

Local governments should focus on providing supporting services and creating a favorable social environment. Wang contends that this part of the work cannot be resolved by individual enterprises alone, requiring government investment and planning. For example, retaining talent necessitates not only policies for attracting and retaining talent but also comprehensive support in areas like education and healthcare. Increasing investment in public welfare, ensuring that citizens live without worries, can help boost consumer confidence, thereby promoting business operations.

Market-Driven Approach to Economic Development

A Series of Brief Paragraphs on Economics and Finance

By: William Silber

William L. Silber is the Marcus Nadler Professor of Finance and Economics at the Stern School of Business, New York University. He is also a member of the New York Mercantile Exchange and has also been a Senior Economist with the President's Council of Economic Advisors, a member of the Economic Advisory Panel of the Federal Reserve Bank of New York, and a member of the investment committee of the SSRC endowment fund. He holds an M.A. (1965) and Ph.D. (1966) from Princeton University and is a graduate of Yeshiva College (1963).

Prof. Silber has consulted for various government agencies, including the Federal Reserve Board, the U.S. Senate Committee on the Budget, the House Committee on Banking and Financial Services, and the President's Commission on Financial Structure and Regulation. In 1980 he received the Excellence in Teaching Award at NYU's Stern School of Business and was voted Professor of the Year by MBA students in 1990, 1997, and 2018. In 1999 he was awarded NYU's Distinguished Teaching Medal.

William Silber

NYU Stern School of Business
Professor of Economics and Finance

Here is a collection of the most popular 200-word paragraphs from my Linkedin posts for the first half of 2024. All are verbatim as they appeared on Linkedin on the date that appears below each paragraph.

Inflation Is Down, but It Wasn't 'Transitory'.

This is the citation to my op-ed "Inflation Is Down, but It Wasn't 'Transitory'" from this past Friday's Wall Street Journal https://www.wsj.com/articles/inflation-is-down-but-it-wasnt-transitory-federal-reserve-government-debt-soft-landing-8b648048?page=1 Here is a brief summary. Nobel Prize winning economist Joseph Stiglitz declared victory for the view that the post-pandemic inflationary surge was transitory. He writes, "Disinflation has confirmed that the earlier price increases were 'transitory,' driven largely by supply disruptions and sectoral shifts in demand...Of course, central bankers will pat themselves on the back. But they had little role in the recent disinflation." It is still too early to declare inflation dead. But even if it were that would not confirm it was transitory in the sense of not requiring monetary restraint to offset the expansionary pandemic policies. A credible tightening of monetary policy can reduce inflation without causing recession in the rational expectations world of Nobel prize winners Thomas Sargent and Robert Lucas. Sargent showed, for example, that the great inflations in Austria, Germany, Hungary, and Poland, after World War I disappeared almost overnight with fiscal restraint that encouraged credible anti-inflationary policies. The decline in inflation during 2023 can be explained in a similar way. The Fed announced that it would raise interest rates as high as necessary to reduce upward price pressures and backed it up by doing just that. This evidently convinced business firms to curtail price increases to prevent an anticipated loss of business. For example, in November 2022 the Wall Street Journal reported that America's big retailers -- Walmart, Target, and Amazon -- have experienced unwanted inventory increases, and told their suppliers "We're not going to pay higher prices anymore." This anticipatory cutback in inflationary price increases by retailers attracted customers and avoided the decline in economic activity. But there is a difference between the recent disinflation and the post-World War I experience. The Fed's credibility today did not come from fiscal restraint as in Sargent's historical examples, but from 40 years of inflation targeting. Going forward, however, the Fed's credibility to raise rates as high as necessary may crumble under political pressure to lower government interest expense. Congress should use this opportunity to put our fiscal house in order or the decline in inflation will turn out transitory.

Good Luck,
Bill Silber,
January 21, 2024, 4pm.

Deadly UNRWA Textbooks.

Paul Samuelson was one of the greatest economists of the twentieth century. He was the first American to win the Nobel Prize in economics (1970), he trained Nobel prize winners while teaching at MIT, and made theoretical contributions to numerous areas, including international trade, mathematical economics, and finance. But for all his professional accomplishments he reserved his greatest praise for the pedestrian activity of textbook writing. He famously said, "Let those who will - write the nation's laws - if I can write its textbooks." Which he did. His "Economics," first published in 1948, was the leading undergraduate textbook in the field, shaping the minds of college students for nearly half a century. And that is why last week's CNN news report (https://www.cnn.com/videos/world/2024/01/29/tl-marcus-sheff.cnn) on the textbooks used in Gaza schools run by the United Nations Relief and Works Agency (UNRWA) is so disturbing. UNRWA, which fired 12 employees accused of participating in the October 7 massacre, teaches almost 300,000 students a year in Gaza and incites violence by glorifying martyrs in its curriculum. For example, CNN described a subtle call-to-arms promoted in the textbooks. A third-grade math exercise asks students to read a phrase containing the number of martyrs in the First Intifada and then to write the correct number in a list of other numbers. Peace in the Middle East needs textbooks that glorify tolerance rather than martyrdom. History shows the power of textbooks. The United States occupied Japan for seven years after WW II and did not leave until the textbooks from grade school and up no longer encouraged militarism. Israel cannot leave Gaza with an educational time bomb in place.

The United States, along with other countries, including the UK, Germany, Italy, the Netherlands, Switzerland, Japan, France, Finland, Australia and Canada, have suspended contributions to UNRWA after the recent disclosure about its employees and the October massacre. These countries should use their financial backing to create an independent supervisory board to implement educational reform in Gaza, with the Japanese example as the guideline. Israel should join that supervisory group as part of its "Day After" planning for Gaza. A new set of textbooks could make a profound difference in the long-run. Just ask Paul Samuelson.

Good Luck,
Bill Silber,
February 11, 2024, 4pm.

Worry About Foreigners Financing the Deficit.

Financing government spending by borrowing, and ignoring the increased government debt, has been championed by politicians such as Alexandria Ocasio-Cortez and Bernie Sanders, and has been popularized under the doctrine called Modern Monetary Theory (MMT). There is, in fact, nothing modern about this theory that has not been said before, except for MMT's failure to recognize a key limitation. In 1944, Abba Lerner, a well-known economist, argued that government spending financed by borrowing was superior to taxation as long as there was unemployment. A deficit using unemployed resources incurred no real costs, even with high interest rates, because "we owe the interest and principal to ourselves." This worked, however, only if the bonds were domestically held, which was true in Lerner's day, but not now. About 35% of public government debt belongs to foreigners, so we definitely do not owe it all to ourselves. China and Japan, the largest foreign holders of U.S. obligations, receive interest payments that will eventually require increased taxes, especially in the new era of higher interest rates. The budget deficit will grow as current government bonds mature and are replaced with higher rates. Moreover, foreigners can stop investing in U.S. government debt whenever they please, and that would either drive down the value of the dollar in the foreign exchange market, raise U.S. interest rates, or both. Those unpleasant outcomes are unlikely to occur as long as the dollar remains international money, the world's medium of exchange, but history shows that needs a commitment to fiscal discipline. The pound sterling was once the world's reserve currency but lost its "exorbitant privilege" to the American dollar during World War I as Britain turned from creditor nation to debtor. It is not easy to replace the established medium of exchange, but it has happened before. America should tighten its belt when it can, not when it has to.

Good Luck,
Bill Silber,
February 25, 2024, 4pm.

Trump's Scariest Default.

Here is the citation to my op-ed just published by Project Syndicate (https://www.project-syndicate.org/commentary/trump-second-term-less-risk-averse-could-try-to-default-on-us-debt-by-william-l-silber-2024-04) entitled, "Trump and the Risk of a US Debt Default." I argue that if Donald Trump is elected in November, he might try to solve America's growing indebtedness the same way he did for his businesses – by defaulting. This is a low probability event, but with catastrophic consequences, that could help explain the rising gold price this year as Trump's presidential prospects have grown.

Here is a brief summary.

There is no provision in the current bankruptcy laws for the federal government to seek protection the way a business can. But President Trump could order his Treasury Secretary to abstain from paying interest and/or repaying principal on the federal debt. Missing a payment would put the United States in default.

Donald Trump could do it. In my book "The Power of Nothing to Lose: The Hail Mary Effect in Politics, War, and Business" (http://bit.ly/TPONTLB), I show that second-term presidents become reckless because they are lame ducks no longer restrained by the ballot box. They have "downside protection." The first example is Woodrow Wilson, first elected president in 1912, reelected in 1916, and facing the problem of World War I during both terms. Wilson avoided entering the Great War in his first term, but on April 6, 1917, five months after his reelection, he signed the declaration of war against Germany. The second example is Franklin D. Roosevelt, first elected in 1932, and a presumptive lame duck when reelected to a second term in 1936. FDR had discussed with his cabinet an aggressive move to pack the Supreme Court in 1935 after the Court had struck down key parts of his New Deal legislation. But his advisors considered the upcoming 1936 election too close to call, so Roosevelt delayed his plans. And then, on February 5, 1937, three months after his landslide victory, FDR proposed legislation to expand the Supreme Court to fifteen judges.

Downside protection encourages risk taking. If elected to a second term, Donald Trump could join the list of reckless lame-duck presidents by putting the United States into default. U.S. debt would lose its exalted position in the financial world and the accompanying privileges, but Trump could blame it all on excess spending by the Democrats to mitigate the hit to his legacy.

Good Luck,
Bill Silber,
April 28, 2024, 4pm.

Don't Fight Central Banks Buying Gold.

Gold is up about 16% this year compared with about 12% for the S&P500, pleasing those who followed my advice last December to hold the precious metal in your portfolio. But what about gold prices going forward? As always, supply-and-demand explains EVERYTHING, so here is a thumbnail sketch of what has happened and what we can expect for gold.

On the demand side, the bad inflation numbers in the first quarter of 2024 encouraged gold buyers, but that normally would be offset by the spike in interest rates on the 10-year Treasury bond. Rising rates make it more expensive to hold precious metals and that dampens demand, which lowers the price. But there is a source of demand that is especially responsive to geopolitical risks, namely central banks accumulating gold as international reserves. Central banks throughout the world have been diversifying into gold for years but this has gained momentum recently because the world's main reserve asset, the U.S. dollar, has become suspect. America and other countries froze Russian dollar holdings when Putin invaded the Ukraine. No matter how displeased you are about Russian aggression, this weaponization of the dollar undermines its role as international reserves and enhances that of gold. In addition, recent news reports that President Donald Trump could compromise the independence of the Federal Reserve, as well as the suggestion in my op-ed that he could engineer a U.S. default, are both unlikely events but encourage foreign central banks to own gold. It is no surprise that China was the biggest buyer early in 2024 as Trump's presidential prospects grew.

Gold supply often expands in the short run when individuals turn jewelry into cash. For example, a Bloomberg news article recently reported a gold dealer saying: "People are using gold as an ATM they never had." It then quoted a 30-year-old IT specialist who sold a gold necklace and a gold ring: "Prices are high, and I need cash." It's a cute story with potential to keep gold prices from rising.

So, which will dominate going forward, supply or demand? A famous Wall Street adage on the stock market, "Don't Fight the Fed," suggests holding stocks when the Federal Reserve eases credit. An appropriate corollary for gold is: "Don't Fight Central Banks" when they are buying.

Good Luck,
Bill Silber,
May 19, 2024, 4pm.

Trump Versus the Fed.

I have pointed out in this space the errors by the Federal Reserve in combating the recent inflation. Here is a brief review. First, the central bank sowed the seeds of inflationary bias by its ill-conceived policy change in 2020 to target average inflation rather than an unambiguous annual number. Second, it then waited too long to tighten by labeling inflation as transitory rather than recognizing the price pressures of overly expansionary monetary and fiscal stimulus during the pandemic. And now it may be promoting inflation by failing to raise real interest rates high enough to restrain spending. The Federal Reserve is clearly guilty of mismanaging the recent inflation, but the proposals leaked from Donald Trump's reelection team to make the Fed subservient to the president would institutionalize this misstep into a long-run inflationary bias.

An executive branch of government that controls the central bank can fund spending the easy way, by printing money, rather than by taxing its citizens. Moreover, the next four years will be especially dangerous from that perspective. I have shown in my book, The Power of Nothing to Lose: The Hail Mary Effect in Politics, War, and Business (http://bit.ly/TPONTLB), that second term U.S. presidents are reckless decisionmakers because they no longer have to face voters. They take risks that can cause collateral damage which they often ignore. At a rally in South Carolina before last week's felony conviction in New York, Trump said, "I will make the Trump Cuts permanent ... and we will cut your taxes even more." The proposals to control the Federal Reserve will enable a more reckless Donald Trump to print money to pay for that expenditure – fueling more inflation.

The Constitution gives Congress the right to coin money and regulate its value. Congress created the Federal Reserve to carry out that responsibility, and Congress should keep it that way no matter who is the next president.

Good Luck,
Bill Silber,
June 3, 2024, 4pm.

Even 2% Inflation is Too Much.

Two prominent economists, Olivier Blanchard, former chief economist of the International Monetary Fund, and Johns Hopkins professor Laurence Ball, have suggested that 4% inflation should eventually replace the Federal Reserve's current 2% target. A recent Wall Street Journal article explains their view: "A higher inflation rate would, over time, allow the Fed to set interest rates higher. Then, when the economy ran into trouble, the central bank would have more scope to cut rates before hitting zero."

Professional economists understand that inflation distorts economic relationships. It redistributes income from lenders to borrowers and motivates consumers to spend time avoiding high prices rather than being productive. But many argue that if inflation were stable at ANY rate, then it would not matter because everyone would have adjusted their behavior accordingly. Professor Ball says, "I think if people were used to a world of 4% inflation and that was the norm, they would not be especially unhappy about it."

Paul Volcker, the Federal Reserve Chair who tamed the 1970s runaway inflation, gave a more nuanced argument against inflation: "Price stability belongs in the social contract. We give the government the right to print money because we trust our elected officials not to abuse that right, not to debase the currency by inflating. Foreigners hold our dollars because they trust our pledge that those dollars are equivalent to gold. Failure to maintain those promises undermines trust in America. And trust is everything."

Volcker is right. Trust is the key and it is easy to cause harm by inflating. Prices will double in less than twenty years with 4% inflation, so that a $100 bill would lose half its value in a generation. Elected officials who debase paper money erode our trust, and trust is nothing more than a belief, so it is easy to shatter and hard to restore.

Moreover, Volcker never liked the current 2% inflation target. He preferred the standard of price stability of his successor as Fed chair, Alan Greenspan: "That state in which expected changes in the general price level do not effectively alter business or household decisions." Volcker accepted 2% as an approximation to that, but his suspicion of tolerating even a little inflation, creating a little mistrust, goes back to his graduate school days at Harvard. When a distinguished professor lectured that "A little inflation is good for the economy," Volcker recalls one word passing through his brain: "Bulls**t."

Good Luck,
Bill Silber,
June 23, 2024, 4pm.

Is Gold a Good Long-term Investment?

Gold gets a bad name because it pays no dividends or interest, so only price appreciation gives investors a return on their money. And that makes gold hard to value because there are no expected future cash flows to calculate a fair price.

So why hold gold? Some say it protects against inflation – gold prices rise along with other commodities. Others claim that gold works when nothing else does, when the world is about to implode (although it hasn't, so far). Gold works when investors worry. It rose about 250% between the Lehman Brothers bankruptcy in 2008 and the European debt crisis in 2011. But there are many historical episodes when gold fell short. For example, from 1934 through 1968 the United States Treasury fixed the price of gold at $35 an ounce, buying a few pennies below that price and selling a few pennies above. An American investor who bought gold in 1934 earned nothing for more than 30 years. Perhaps that was punishment for violating the law. U.S. citizens were not permitted to own gold as an investment from 1934 through 1974 (although it could fill cavities in your teeth).

In March 1968 the U.S. Treasury announced that it would stop fixing the world gold price at $35 an ounce. Two months later, May 1968, private investors bid up the free-market price to $40.70. Since then, traders throughout the world set the price of gold, providing a fair test of its investment value for those who stashed it away in Swiss banks. So, did gold protect against inflation since then? And how did holding gold compare with the stock market, which we know is a great long-term investment.

Here are the results: The consumer price index rose at a compound annual rate of 4% since May 1968. The annual rate of increase in the S&P500 since then is 7.4%. And an investor who bought gold at $40.70 earned a compound annual return of 7.5%. Gold clearly dominated inflation and looks like it outperformed the S&P500, which would be astonishing. But do not forget that stocks pay dividends, adding about 2½% to the annual return on the stock market. So, gold does not return as much as stocks but it doesn't have to. It earns its way into investor portfolios as an asset that pays off when nothing else does.

Good Luck,
Bill Silber,
July 28, 2024, 4pm.

Climate Change Activists Should Support Restraining Protesters.

Government regulation prevents individuals from driving a car without a catalytic converter, an expensive device that reduces harmful toxins in the air. Climate change activists support such restrictions on individual liberties, so they should also favor restrictions on expected protests of the Gaza War from students returning shortly to college campuses. Economists of all stripes support constraining behavior that causes negative externalities, an uncompensated cost imposed on others, such as driving old time gas guzzlers. The same logic applies to restricting the scope of public protests, although students at our elite universities seem to have missed that lecture, perhaps because last spring they were too busy pitching tents where they shouldn't have.

Protesting the war in Gaza without simultaneously demanding the return of Israeli hostages reeks of hypocrisy and should be criticized by all. Nevertheless, it is protected by the First Amendment right to free speech as long as that does not disrupt others from their normal activities. Protesters may want to disrupt others, of course, which is why they are protesting, but free speech condones using words to denounce your opponent, not to erecting barricades of intimidation. And even speech must not create a "clear and present danger" to others. The classic restriction against yelling fire in a crowded theater calls for punishment to the instigators even though the offending phrase is not directed against an individual. Protesters on campus do not have the right to interfere with other students' fair use of university facilities. Nor do protesters have the right, more generally, to block traffic at tunnels and bridges, or even sidewalks. They must apply for a permit to march or to demonstrate so they do not infringe unfairly on the public's welfare.

Protesters who ignore the negative externalities they create should be held accountable, just like a business that pollutes the air with harmful gases or releases dangerous chemicals into a local river. They should be arrested if that is what it takes to stop their vandalism and then fined for the damage they have caused. They could even be charged with a felony if their acts lead to grievous bodily injury or extreme psychological harm.

Curb the Protesters,

Good Luck,
Bill Silber,
August 25, 2024, 4pm..

No Tax on Tips is Dumb.

Kamala Harris disagrees with Donald Trump on just about everything except for Trump's proposal to exempt tips from tax, which she has adopted as though it were an anti-poverty program. This is unfortunate. At the very least, the No Tax on Tips idea violates the equity principle of taxation – that people with similar incomes should be taxed the same. For example, the dishwasher and server in a restaurant should pay the same tax on the same amount of income, which would not be the case if the server's tips were exempt from taxation. And if the objective is to raise the take-home pay of the poor then it is more equitable to lower the tax rate for all.

But there's more. Economists on the left and right agree that taxes and / or subsidies should be imposed without creating an "excess burden," without distorting decisions that reduce economic welfare. For example, high marginal income tax rates create an excess burden by lowering the incentive to work and cutting the production of goods and services enjoyed by consumers. The Tax Reform Act of 1986 lowered the marginal income tax rate from 50% to 28%, among other changes, to reduce the excess burden of the tax.

The excess burden of No Tax on Tips has a wide footprint. Individuals will try to shift income into tips, no matter how hard the Internal Revenue Service tries to segregate this favored compensation. It would not take a lawyer long to change the payment due a stock broker or real estate agent from commissions to tips. The legal resources devoted to such activities, as well as the IRS agents' efforts to prevent it, is an excess burden of the program. But that is just the beginning. Investment bankers have relatively low salaries compared with the discretionary bonuses they get from their employers. Did I say bonuses? Surely those discretionary payments were tips, which stands for "To Insure Prompt Service." Sports agents representing NFL star linebackers will no longer brag about negotiating guaranteed payments for their clients, but will focus instead on tips that team owners will pay for each quarterback sack. And lawyers could rewrite NBA star Steph Curry's contract to include tips for extra-long three-pointers.

I am sure you can add to the list.

Good Luck,
Bill Silber,
September 1, 2024, 4pm.

Bob Litterman on Quantitative Investing, Liquidity Crises and Climate Policy

Source: Podcast Interview Transcript

Podcast Interview Transcript

Bob Litterman on Quantitative Investing, Liquidity Crises and Climate Policy

Aug 30, 2024

Jon Hartley

Bob Litterman

Bob Litterman (Kepos Capital) joins the podcast to discuss his career, the history of the development of quantitative finance at Goldman Sachs, including his seminal work with Fischer Black. We also discuss the carry trade liquidity crisis of August 2024, comparing it to the quant meltdown of 2007, the case for quantitative investing and its ability to ride out risky environments, a risk management approach to climate policy, Bob's E-Z climate carbon pricing model, and Bob's advocacy for carbon taxes.

Listen to or watch the full Capitalism and Freedom in the 21st Century Podcast episode with Bob, which hosted at the Hoover Institution Economic Policy Working Group.

Jon Hartley: This is the Capitalism and Freedom in the 21st Century Podcast, an official podcast of the Hoover Institution Economic Policy working group where we talk about economics, markets and public policy.

I'm Jon Hartley, your host. Today my guest is Bob Litterman, who is a founding partner at Kepos Capital where he's also chairman of the risk committee. Prior to Kepos Capital, Bob spent 23 years at Goldman Sachs where he was head of the Quantitative Resources group in Goldman Sachs Asset Management for eleven years starting in 1998.

Prior to that position, Bob headed the firm-wide risk department from 1994 to 1998. And prior to that, he was the co-head of the model development group in the research department of the Goldman Sachs Fixed Income Division where Bob developed the famous Black-Litterman model of portfolio optimization together with Fischer Black in 1990.

Prior to that, Bob did his PhD in economics at the University of Minnesota under the supervision of Tom Sargent, graduating in 1990. Bob is also a prominent climate policy expert and advocate of carbon taxes. Bob developed the EZ climate-carbon pricing model with Columbia's Kent Daniel and Gernot Wagner and led the climate-related market risk subcommittee of the CFTC.

Thank you so much for joining us today, Bob.

Bob Litterman: It's my pleasure. Thank you, Jon.

Jon Hartley: Bob, I want to first sort of get into your background here. You grew up in Phoenix, Arizona. How did you first get into economics and decide you want to do a PhD? Was it during your undergraduate studies at Stanford?

Were there any particular influences that stood out?

Bob Litterman: No, actually my interest in economics was really a bit of a course correction that came later. My undergraduate degree at Stanford was in human biology, which by the way was itself a bit of a course correction because I started as a physics major.

But in the spring of 1970, the Vietnam War protests reached a crescendo and that was my freshman year at Stanford and the entire student body kind of went on strike that spring and I thought I needed some more flexibility in my program. So I dropped out of physics and I joined about a third of my freshman class in this new major and in an interdisciplinary program called human biology, which to this day is still one of the most popular majors at Stanford.

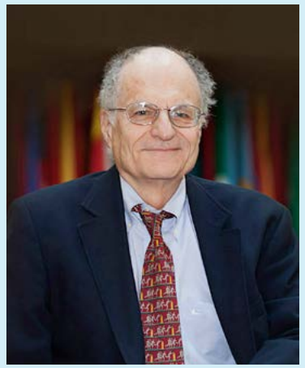
But my original career choice was actually journalism, which was an interest that I began in high school, following in the footsteps of my older brother. And I've always appreciated the basic writing skills that I honed as a young journalist. My first real job after spending four years at the Stanford Daily was as a general assignment reporter for the San Diego Union.

But after only three months on the job, they moved me from San Diego County out to El Centro in Imperial County, which is kind of rural Central Valley, California, best known for something called the Salton Sea, which was a bit of a man-made disaster. But anyway, I was reporting from the El Centro office, and in fact, I was the El Centro office, and I had to fill a page every day of whatever was going on in the valley.

And that was kind of fun. But like I said, it was a little bit out in the boonies. There were no computers in the Central Valley of California at that time. And more important, it just wasn't a very attractive location for a single Jewish male looking to meet members of the opposite sex.

So I thought about going back to graduate school, and I guess I assumed that economics training would help me become a business writer. But it turned out I went to the University of California, San Diego, which had a very mathematical program. And when my first micro course, I had a textbook theory of value by Debreu, it's kind of a very mathematical text, it became clear that it wasn't really gonna help me as a business writer, but I enjoyed the math, and I had unlimited access to computer time there.

And I met my wife Mary there. So it was all good.



Thomas Sargent

Professor of Economics, New York University,Honorary Director of Sargent Institute of Quantitative Economics and Finance at Peking University HSBC Business School

Jon Hartley: Wonderful. It's funny, you wouldn't be the only economist out there to go from physics to economics. Hoover's very own John Cochrane was in a physics PhD program before moving to economics and many others. A lot of the same mathematical tools like solving partial differential equations can be very useful in economic theory as well.

I want to get a little more into what graduate school. What was graduate school like for you? I think you graduated from the University of Minnesota. You were a Tom Sargent student, if that's correct? Minnesota is a very famous and distinctive place for macroeconomics, and not to mention you were there when the rational expectations revolution was going on, being led by luminaries like Sargent, Lucas, Prescott, who revolutionized macroeconomic theory and modeling. I think you might have even overlapped, let's say, Lars Hansen as students and I'm sure many others.

What was that time like, doing a PhD in the late 1970s?

Bob Litterman: Yeah I mean, it was incredible. You have to appreciate that. I ended up at Minnesota because I followed my wife, who was my girlfriend at the time, from San Diego to Minnesota because that's where she was from, and she was going back there and going to.

So after a year, she transferred back to Minnesota. And I went out there during the summer, I guess it was in August, and just decided kind of spur the moment, to see if I could get into the Minnesota program. So I went to the graduate department and said, “any chance I could start here in a few weeks?”

And they were very nice. In fact, they said, sure, we don't have any money for you, but they got me a job. They actually had some contacts at the computer center. And so I went and applied for a job there, which, to be honest, I wasn't at all qualified for, but I became a consultant.

Consultant, and those were the days when computer centers were offsite and you'd go there with cards. And I just sat at a desk and answered questions and supported some computer packages for statistical analysis, all of which were terrific skills to put together. But anyway, yeah, the department at Minnesota that I got into was unbelievable.

And of course, at the time, I didn't appreciate that. So I showed up and, yeah, Sargent was there, Sims was there, I worked closely with them. You mentioned Lars Hansen. I mean, he was one year ahead of me. And you can imagine I didn't really have the background to appreciate what was going on around me.

I thought when I met Lars, wow, this guy's amazingly smart. But I just thought, well, if they're this smart at Minnesota, can you imagine what they must be like at Harvard and Stanford and all? And of course, that wasn't the case. Lars was the best economist of our generation.

And so I had kind of a warped view. In fact, I ended up working with both Sargent and Sims. But I didn't think I was going to be an academic even from the beginning I was there, I thought, you know, I'll pick up some useful tools and especially the computer tools and, you know, forecasting tools and a lot of things.

Anyway, after a few years and I had a very nice dissertation on forecasting with Bayesian vector autoregressions, Tom asked me, where do you want to teach? I said I'm planning to go into business. And he was like, you can't do that. I didn't appreciate how he would react, but of course, he made a good argument.

He said, you can always go from academia to business, but if you don't go on the market and start in academia, you can never do it later. And so he convinced me to go on the market. And to be honest, Lars had just gone on the market a year before from Minnesota and ended up at Carnegie Mellon.

But a year later there was a feeling that, boy, these Minnesota students were really good. And so I kind of rode that wave and got a lot of good offers, including one from MIT. So I ended up going to MIT. But even after four years at Minnesota, I just thought these rational expectations thing is kind of interesting, almost religion here.

And I assume that that was sort of freshwater economics at saltwater economics at Harvard and Yale and so on and would have their own ideas. But when I got out, what I discovered is, no, actually, Minnesota was kind of special. And the folks at MIT and Harvard were very interested in learning about the tools and techniques and so on that we were developing, the rational expectations tools.

So it's really when I got to MIT, I realized, wow, Minnesota was incredibly special, yeah.

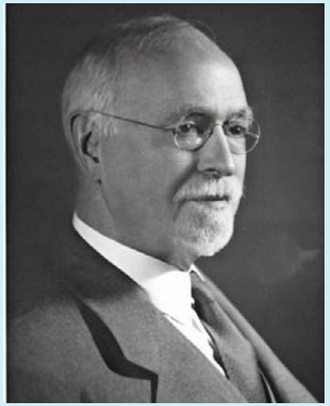
Jon Hartley: Absolutely, well, yeah, it's absolutely right. I'd imagine that all the RBC machinery started there in those freshwater schools, places like Chicago, Minnesota. And that was very much a response to the great inflation era and the inability of traditional IS-LM Keynesian models to really be able to explain, I guess you could call it stagflation, high unemployment, and high inflation at the same time.

And just this sort of general criticism or things like the Lucas critique that really there was a need for micro models or a model that has individual agents in it. And then over time, I guess, through the 80s and the 90s, places like Harvard, MIT, and scholars there developed the various sort of new Keynesian models that are based on those DSGE models and include things like sticky wages, sticky prices, and I'm sure it creates more room for policy for central banks and so forth.

I'm curious, I mean, what was that time at MIT like? And I'm curious, I also want to get into your time at Goldman Sachs, how you got your first job at Goldman Sachs in the Goldman Sachs fixed income division research department, how you met Fischer Black. I mean, really one of the great financial economists of the 20th century.

And I'm curious, how did the famous Black-Litterman model of portfolio optimization came about?

- Robert Litterman and Fischer Black, 1994. Source: Goldman Sachs (Asset Allocation Model Is Developed at Goldman Sachs,)



Irving Fisher

American Economist

Bob Litterman: Sure. Well, interestingly, I first met Fischer when I was in Minnesota as a graduate student. And I was working at the Federal Reserve Bank there as a research assistant for Tom.

And Fischer more or less called the folks at Minnesota up and said, can I come give a seminar on rational expectations? And so they said, sure. And he came actually to the Fed. And I remember it well, it was a very bizarre seminar. And later I learned that this was very typical of Fischer.

But you can imagine, I was just a graduate student. And he shows up and starts talking about some Robinson Crusoe economy and put some things on the board. And after about ten minutes, I think it was Tom who said, Fischer, can you talk a little bit more about the production function in this economy?

And Fisher was like, hmm, long pause, which turns out was typical of Fischer. And he says, yeah, that's a very good question. And then he sits down, pulls out a notebook, and starts writing. And basically, that was the end of the seminar. At that point, it just became a back-and-forth.

But I thought, wow, that is very strange. Well, then later I accepted a job at MIT, and MIT was also a pretty incredible place. I mean, Paul Samuelson was there and he used to hold- Stan Fischer, and- Stan Fischer was there, Larry Summers was an assistant professor along with me.

We had offices next to each other and an awful lot of really good graduate students. And, you know, but Fischer was there in the business school and so I got to interact with him again there. And after two years at MIT, I decided that really, academia wasn't for me.

I enjoyed the research. I really enjoyed my time at the Minneapolis Fed when I was there working as a graduate student. And so I called up Tom and said, any chance I could come back to Minnesota? And the next day I got a call from the head of the research department at the Minneapolis fed, Art Rolnick, saying, Bob, I hear you want to come back.

When do you want to start? And so I went back to the Minneapolis Fed for about five years. And I was kind of in charge of forecasting, and I was really quite happy working for the president of the Minneapolis Fed, Gerry Corrigan, who was kind of Volcker's right-hand man at the time.

So it was very interesting times.

Jon Hartley: Later Gerry became the president of the New York Fed.

Bob Litterman: Later Gerry became the president of New York Fed. And then after that, came to Goldman Sachs.

Jon Hartley: Right, right.

Bob Litterman: Yes, I worked with him there. So Gerry and I overlap quite a bit.

But at some point, I got a call from a headhunter. I didn't even know what a headhunter was. And you can imagine my fed compensation at that time. I think it was $35,000. Quite a bump up from MIT, by the way, where I think when I left, I was making $20,000.

But anyway, Goldman Sachs offered me a base salary of $200,000. And they kind of said there was a bonus. But what I didn't realize was that the bonus was the bigger part of the total compensation. And. But anyway, it was kind of an offer I couldn't refuse. Mary, I moved to New York, and I started at Goldman in 1986.

Well, Fisher Black was at Goldman. He was there.

Jon Hartley: Was he part of hiring you there?

Bob Litterman: He was indeed. And it's funny. If it was up to Fischer, I don't think I would have gotten the job. He was one of the first Ph.D.s hired on Wall Street.

They called him a rocket scientist, I think. And the position he took, they kind of said, Fischer, what do you wanna do? And he said, well, there's this arbitrage out there between the S&P futures and the value line futures. And I've been talking about it for years at MIT, but it's still there, so let's try and take advantage of it.

And sure enough, there was a research assistant there who programmed up the trades that you'd have to do, and they did them. And sure enough, made about $20 million for Goldman Sachs, killed the value line index, and it was considered a big success. So I was maybe the next round of PhDs that they hired.

And, well, I was interviewed by Fischer, even though he was in the [Goldman Sachs] Equities Division, and I was going to come into the Fixed Income division, but he, he was the academic there. And so I came in for the interview, and he said to me, Bob, you're an econometrician, right?

I said, yeah, I'm an econometrician. I thought, this is great. He says, so what makes you think an econometrician can add any value on Wall Street? I was like, I don't know, maybe we can estimate some parameters or something. He was very skeptical. And so then he asked me, he says, so tell me, what's the difference between a first moment and a second moment?

And I was like, well, the first moment is like a mean, and the second moment is like a variance. I had no idea what he was asking, but he was a very practical guy, and he had this idea that expected returns, which you can estimate by taking the mean return, are basically unknowable and inestimable.

You can't really get a lot of information about it. And whereas variances, if you chop the data finely enough, you can get more and more information. So he felt like you might as well treat those as observable. Well, I flunked that question, and I don't know if Fischer would have hired me if that was coming into equity research, but it was Fixed Income research.

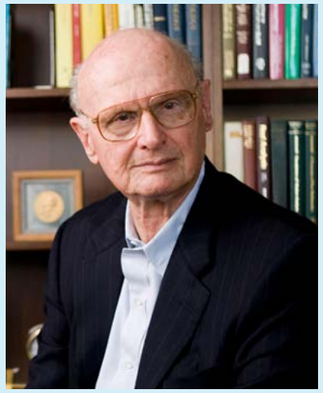
I got the job, and then it wasn't too many years later, maybe three years after I joined Goldman. And I had a great time there. It was a time when markets weren't as efficient as they are today. And if you came in with some computer skills, there were just a lot of things that had never been done.

Estimating factor models, fitting yield curves, and valuing embedded options. We were doing all kinds of fun things. And at some point, my boss said to me, our clients in Japan, so this is in the late 80s, and the Japanese stock market had gone crazy, and they had all this wealth that they wanted to invest globally in fixed income markets.

And so my boss said, Bob, we need an asset allocation model for our Japanese clients, but I don't want to have a separate model and Tokyo and a different one in New York. So why don't you build us an asset allocation model that we can use everywhere? And so he said, and why don't you talk to Fischer about it?

So I went to Fischer. I'd never used or played with an asset allocation model. I said, so what are these models? What do you suggest, Fischer? And he said well, I always start simple, and then if it doesn't work we can get more complicated. But the simplest approach here is mean-variance optimization.

Jon Hartley: Just like Markowitz mean-variance optimization starting from here. And I think it's solving the problem that expected returns aren't really a stable quantity.



Harry Markowitz

Professor of Finance at the Rady School of Management at the University of California, San Diego, received Nobel Memorial Prize in Economic Sciences in 1990.

Bob Litterman: Right, right. So I looked up the mean-variance model. I'd never, like I said, never played with it, programmed it up. It was pretty simple.

And I was only using bonds. So I had, I think, 20 bond markets and then 19 currencies to play with. And so we put that into a covariance matrix. Well, you can imagine it was nearly singular with all the high correlations among those currencies and bonds. And so I then put in the expected returns that came from Goldman Sachs's economists.

It was a nice place to be because there were plenty of forecasts around, so I didn't have to worry about coming up with the forecast. Well, you can imagine without any constraints, the model went crazy and long, 400% here and short 300% there and so on. And so I went back to Fischer.

Well, and by the way, if you then change those expected returns a little bit, maybe change the forecasted yield six months out by five basis points, the whole thing would change completely.

Jon Hartley: Very unstable. So I guess just to give our listeners a bit of sort of a history of some of these models and just really how important your contributions with Fischer Black are, and those, I really can't overstate how seminal these contributions have been.

So Fischer Black came up with Black-Scholes model in the 70s and that became a widespread options pricing model. Black-Litterman model is based on Markowitz's mean-variance approach, where. You're trying to maximize your expected returns, so that's taking the percentage returns or just percentage changes on prices.

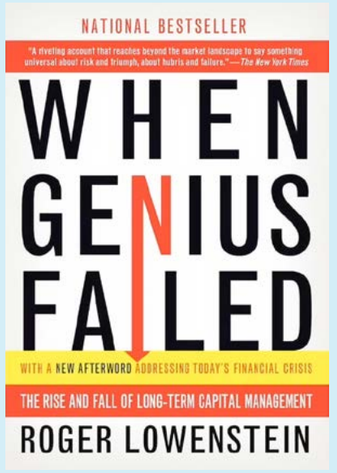
And we're trying to maximize returns subject to some level of volatility or standard deviation of those returns. And the problem with the original sort of Markowitz mean-variance optimization, which came in the 1960s. And Harry Markowitz, who's now passed, famously came up with, I think, maybe in the 50s or 60s.

But the problem, as you've illustrated, is that it's not very practically useful to investors. Because the recommended weights will change very quickly depending on how you, say, update or change your expected returns. And then, many investors have various constraints. They can't short, or they can't use derivatives or things like that.

How do you make a model useful to those sorts of investors? That's exactly what Black-Litterman does, and it's been used certainly by quantitative investors and many others very pervasively. And so the success of that approach can't be overstated, and I think, tragically it's also worth pointing out, too Fischer Black passed away in the mid-1990s.

That was life cut short, very young, from cancer, and it's amazing I've heard stories from my time at Goldman Sachs that Fischer was a very kind of eccentric guy. He was one of the first people to get computers and sort of would be in his office and close his blinds, all sorts of things, but like a true genius in many respects.

And the work that both yourselves have done and contributed to and being pioneers in financial economics really can't be overstated. I wonder whether maybe Bob Rubin was part of that hiring. I mean, Bob Rubin, who later became Secretary of the Treasury, he sort of made his name in that fixed-income division.



When Genius Failed

And there was a lot going on at that time in terms of PhDs, adding value to financial economics. You think about those that aren't familiar with the book, When Genius Failed, which talks a lot about Long Term Capital Management. That firm was founded by Salomon Brothers alumni. They were

doing a lot of fixed-income arbitrage, they famously blew up in the late 1990s.

They also had Myron Scholes involved with their firm, along with Bob Merton. Whereas yourself and Fischer Black were at Goldman Sachs. Goldman Sachs survived that era of the late 1990s that featured the Asian financial crisis. Which sort of blew out some spreads like the on-and-off Treasury trade, that those fixed income arbitrages kinda blew up temporarily and firms like LTCM were taking a lot of risk.

I sort of want to move on to your later Goldman years, investing in GSAM and using tools in that group, which I worked in after your time, after you had left in 2009, I actually joined that group in 2011. You were really one of the great pioneers of quantitative investing.

And on top of developing Black-Litterman portfolio optimization model, you were really one of the first to really build and run systematic quantitative portfolios based on factors and ideas like momentum and value. The idea in the case of momentum, if a stock's gone up, say a lot over the past twelve months, that it's going to continue to go up over the next few months or so.

Value investing being sort of almost diametrically opposite of that, but somewhat different. The idea that companies that have high book-to-market ratios or good fundamentals should outperform in the future. And you've done, I think, a lot of this in the macro space as well, so thinking about time series momentum and various macro assets.

Mark Carhart

Finance Researcher, Market Statistician and Quantitative Investment Manager

Goldman Sachs

It's worth noting that in this era, you moved to Goldman Sachs Asset Management in 1998. It's worth noting that there are a lot of economics PhDs working in those quant groups as well within GSAM, Goldman Sachs Asset Management. A good number of Eugene Fama students in that era, you had folks like Cliff Asness, who left to start AQR, Mark Carhart, these are all University of Chicago economics PhD students, students of Eugene Fama. You also co-authored with many of the people in the Goldman quant group, the investment classic modern investment management equilibrium approach, which talks about things like Black-Litterman and related concepts. And you really helped build that quant business at Goldman, at its peak in the mid two thousands, became one of the largest quantitative hedge funds in the world.

And since leaving GSAM, you also co-founded Kepos Capital, which is a quantitative asset management firm that you run along with Mark Carhart, many others from the old GSAM team. The firm now manages over $2 billion, again, each serve as chair of the risk committee. What do you think is the best case for systematic quantitative investing today?

So, using factors, thinking about things in expected returns and volatilities, using portfolio optimization tools like Black-Litterman, I mean, what is the best case for that approach today? As opposed to, say, a more discretionary or concentrated types of investing that many others still use today.

Bob Litterman: Yeah, well, your brief history there is very accurate.

And you're right that when Fischer and I first started with that mean-variance model, it was incredibly badly behaved. And I remember going to Fischer and saying to him, I don't know how people can use this. And he said, yeah, no, they put constraints on everything, maximums and minimums.

And I said, well, then there's no value added, and he said, yeah, no, there's no value added. And he was right, and so he suggested, why don't we put this equilibrium in there? It was a very academic-sounding idea, but it turned out to work really well. And so we started trying to market the model, actually, at first.

And we discovered that there weren't too many people out there, first of all, who were quants, and then secondly, who actually used a model. There was a little bit of quant marketing, but not a lot of really depending on models, because people didn't trust him and they didn't work that well.

But I was very lucky at Goldman Sachs to come in and have Fischer there and develop that model with him. And we first started using it internally to understand that the risks that Goldman was taking. And then we started using it at Goldman Sachs Asset Management to build portfolios.

In fact, Cliff Asness, who was at Goldman Sachs Asset Management before I arrived, developed this quantitative team and started using Black Litterman. And he also used a computer program that I had a hand in creating. Called RATS (regression analysis of time series). And he was incredibly successful the first year of the hedge fund he ran at GSAM.

I think it had like 80 or 90% returns. And as a young quant I was like, wow, that's pretty good.

Jon Hartley: Was that Global Alpha?

Bob Litterman: Yeah, that was, Global Alpha it was called. And then Cliff decided he was going to leave and form his own firm, which obviously AQR became very successful.

And I was lucky that Goldman asked me to come in and take over the business that he was running. And that's when I saw these incredible returns and the use of Black Litterman and RATS. And then Mark Carhart and Ray Iwanowski were there. And so it was a great time.

In fact, very lucky for me, the timing, because that was right before LTCM blew up. And as you may know, the broker-dealer side of Goldman Sachs had a lot of the same trades on that LTCM had. So having left the risk management position right before all of that happened was good timing.

And then arriving in GSAM and heading this quantitative group when markets were very disrupted also created an awful lot of opportunities. Volatility, which not a lot of people thought of as an asset class, but we did was trading long-term. Volatility was trading at unbelievable levels, and you'd have to think that the market would be disrupted and three times normal volatility for the next five years to make these prices make sense.

So we decided, all right, we can do this. Everyone was afraid of touching it because it had just gone up and up and up as LTCM and others were covering their positions and they had shorted the volatility and now it was just going crazy. We came in and we started selling volatility at the peak and it turned out to be a very, very profitable trade.

So that was lucky. And then the markets weren't as efficient in those days. And so you're right, we started investing in factors and it seemed like this just was almost like magic. You could create these factors that would work and be uncorrelated with the market and you put together a bunch of these factors that are uncorrelated and you can get very, very good returns.

And there are a couple of lessons here that we discovered. One of them is that you have to worry about crowded trades, and that's kind of obvious.

Jon Hartley: And I'm going to get to that in just one second, I mean, before we get to the quant crisis of 2007.

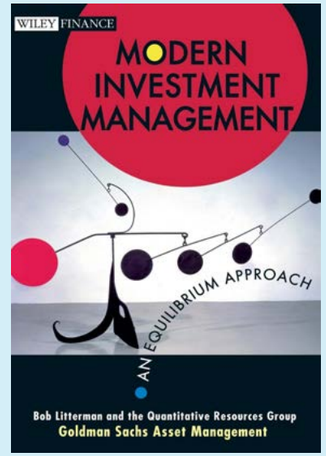
Bob Litterman: Yeah, sure.

Jon Hartley: It's so worth highlighting just how successful the Goldman Sachs Asset Management quant business was during the 2000s. So we were talking about the late 90s, LTCM blowing up, you coming into GSAM in 1998. There was a stretch from roughly that 90s period to really 2006, 2007 or so, where Goldman Sachs Asset Management was running the largest quantitative hedge funds in the world.

And it was so successful that I know some of the Global Alpha heads Mark Carhart and Ray Iwanowski, they had special comp deals. They were getting paid more than the CEO of Goldman Sachs, Lloyd Blankfein at the time, in certain years. Also, some of the returns on the Global Alpha fund were, I think there was maybe even a three-digit return year.

I mean, it was so successful, you guys were pioneers in using factors when factors maybe weren't quite being priced in, or markets weren't quite as efficient. But it's amazing. And there were these famous ski trips to Colorado. Ray and Mark and yourself were so important, critical to the business, that the firm made you guys ride on different private planes because if you lost one, it would be such a critical loss to Goldman Sachs and the firm at that time.

So you really can't stress enough, one, how successful these academic ideas were. You're coming up with expected returns using factor models and putting those expected returns into a portfolio optimization model like Black-Litterman, super successful. And really, I think a case study of really just how academic thinking can be very, very useful in the real world, especially in finance.



In 2003, Bob Litterman and the Goldman Sachs Asset Management Quantitative Resources Group published Modern Investment Management: An Equilibrium Approach detailing some of the group's philosophy and approach to investing.

So then we hit 2007, and for the non-quants out there, we'll explain a little bit about what happened there. But for quants, the quant crisis of 2007 is a distant but still very important memory. And Global Alpha, one of the many quant funds that Goldman ran at the time, was caught very heavily in it.

And I think part of the explanation there, kind of what happened was that there were a lot of crowded trades, a lot of quant investing was becoming so popular that it was causing crowding within certain names or certain trades. Everybody was sort of doing similar things with leverage.

And then what happened was in August of 2007, a lot of people tried to get out of those trades very quickly. And it sort of bears some similarities to, for example, maybe the Treasury liquidity crisis of 2020, or perhaps even more appropriately, that the recent yen carry trade liquidity crisis that we've seen recently in the summer of 2024 here.

I'm curious, what do you think the main lessons of the quant crisis of 2007 are as it applies today?

Bob Litterman: Yeah, well, you've described it, right. But I would say, first of all, avoiding crowded trades. That's pretty obvious. And people understand that.

Jon Hartley: And you can monitor that, too, I suppose, with things like 13-F filings and things like that.

Bob Litterman: Right. How do you identify a crowded trade? It's not always obvious and in particular for us quants. And really, the crisis started in quant equities, and we had small positions in lots of hundreds of thousands, really, of individual equities. And none of those positions were large relative to the liquidity of that stock.

And that was metric that we use. We had limits on how big a position we could have, such that if we traded small pieces every day so that we didn't have any significant market impact, how quickly could we get out? And we said, we have to be able to get out within a couple of months.

Well, it turned out we were thinking about crowding in the wrong way. It wasn't the individual equities that were crowded. It was the factors that were crowded. And what had happened was not obvious to us. But as you describe it, over a period of years, quantitative asset managers had really quite good returns.

We were one of them, but there were many others. There was now at Blackrock. At the time it was BGI, and then you had, of course, Jim Simons and others. We were one of many, and we didn't see the crowding. But what had happened is, as more and more people started investing using these approaches, the price pressure would push these stocks to the, to line up along the quant factors.

You can imagine. You mentioned momentum, value factors. There's various factors.

Jon Hartley: Carry, too. Carry where you invest in a high-interest rate currency and borrow at low-interest rate currencies, kind of like the popular dollar-yen trade where you invest in the US dollar because it has had historically higher interest rates than Japan, which has been at 0% for a long time.

Bob Litterman: It started to unwind, and when that started, all of a sudden all of these factors at once started to go the wrong way. And so a lot of people tried to get out. People called us and said, are you doing this? We were like trying to figure out who's doing this.

I don't know that there was ever someone who started it. I certainly don't know. All of a sudden, those limits that we had that said you can't have too big of position were meaningless because we were losing five standard deviations every day for several days in a row.

We had limits on the amount of borrowing we could do against the portfolio, and we were coming up against that. Avoiding crowded trades is one lesson. And the fact that the quants themselves can actually cause these prices to go beyond where they should be was another lesson. Now, these days, I would say you talked about the yen carry trade. I guess it was Treasuries that became very disrupted during COVID. I think systematic quantitative investing is certainly evolving. And with access to huge new data sets, I would say that's one of the differences today versus a decade or two back, is the amount of data that we have.

And then computers and computer power, machine learning, AI. In some ways I have to laugh because we used to use regressions, and those quantitative tools that I was talking about back in the 80s were very valuable. Well, it's really a progression of the same idea, except that obviously with natural language processing and so on, we've come a long way and markets are becoming more efficient.

But I think the discipline to follow a systematic approach is always an advantage. And with so much going on these days, geopolitically in the monetary and fiscal policy, that discipline is really valuable and we think provides an advantage in this latest yen trade. Managers making discretionary decisions often are whipsawed by the volatility in the markets.

And with systematic managers, when you have a disciplined process, you tend not to overreact. You have processes that were set up to react appropriately and you have a much better chance of riding out the volatility, I would say, with portfolios and performance intact. That's certainly what we have experienced at Kepos recently.

Jon Hartley: That's a great point. When that August drawdown was going on and I think at one point maybe the Global Alpha fund lost about 40% or so of its market value in 2007. And it came back very quickly, like what we've seen with the yen USD trade, carry trade in its subsequent reversal.

One concern was that what was about solvency too, and whether or not certain broker-dealers would even take trades from Goldman Sachs Asset Management or Global Alpha fund. And I know Gary Cohn, then the COO of Goldman at the time, chief operating officer, famously was stationed out in the GSAM floor for a while and say, Deutsche bank wouldn't take a trade from Goldman because of solvency fears, he would get on the phone with a much senior person at Deutsche and would get them to take the trade and exert that pressure speaking on behalf of the entire firm. Never heard something quite like that in terms of just how crazy that was.

Yet, Goldman Sachs Asset Management survived and lived to tell a tale and still running quantitative portfolios today.

Pierre Poilievre

Canadian Politician, leader of the Conservative Party of Canada and leader of the Official Opposition

I want to shift the conversation a bit to climate because you've been a long-time climate policy expert and defender of Pigouvian taxation, carbon taxes as the appropriate policy response to climate change.

How worried in your mind should we be about climate? What do you think needs to be done? What is the best case for, say, policy solutions to climate in your mind? Also wondering if you could maybe explain to us a little bit about what the EZ climate carbon pricing model is.

And I think it's fair to say that carbon taxes have had a number of challenging political economy issues, whether it be the yellow vest protests (gilets jeunes protests) in France, the unpopularity of carbon taxes in Canada, where 'axe the tax' is a central piece of the current Canadian Conservative leader Pierre Polievre's platform. And he's currently leading Trudeau by 20 percentage points or so in the polls ahead of the 2025 Canadian federal election.

I'm curious, how do you see carbon tax policy battles going in the future, especially when we're talking about solving a challenge, which is sort of a global one, and you have some of the largest polluters out there like China, that maybe don't want to take climate policy to curb emissions all that seriously.

How does one get beyond the global coordination problem? Or could it be the case that say, various technological solutions like carbon capture or electric vehicles or cheaper wind and solar may play a larger role in curbing climate emissions, say than policies? What would you say to those sorts of arguments in making?

What is the best case for a carbon tax regime?

Bob Litterman: Okay, well, there's a lot there, I would say. First of all, you're correct to start by asking about how risky is this? How much should we be worried? Because that's the heart of the problem. We don't know what the future is going to bring, and there's many possible scenarios.

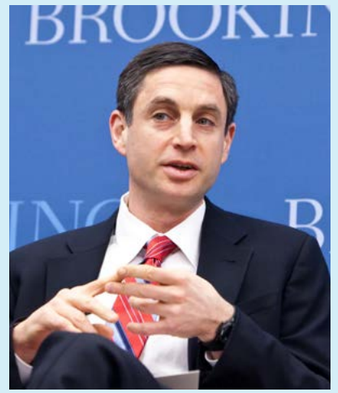
It's a risk management problem ultimately. And the answer is we should be very worried about the potential impacts because we're making these slow but potentially unstoppable impacts from warming the planet. And the basic problem is that we're not pricing the risk. That's the essence of it. It's an obvious mistake.

It's a simple mistake. It's easy to understand. But I would say something that people don't appreciate is that it's an urgent problem when you're managing risk. Time itself is a scarce resource and we're wasting time when you're managing risk, if you have enough time, you can solve almost any problem.

But it's when you run out of time that a risk management problem can become an unstoppable catastrophe. We should immediately price climate risk. I've been talking about, it's time to slam on the brakes now for almost a decade. And what it means is we have to create appropriate incentives to reduce emissions.

It could be a carbon tax, it could be a cap and trade system, it can be fossil fuel taxes. There's all kinds of policies. What most people don't understand is, I would say, the magnitude of this problem. The International Monetary Fund has been for many years estimating how big is the subsidy to fossil fuels that's created by not imposing the tax, the appropriate incentive to reduce emissions.

Well, in the most recent year, they estimated it was $7 trillion. Not billions, trillions. When you look at how they did this estimate, it's pretty rigorous, although I would say a little bit conservative, because at the heart of it is something called the social cost of carbon, which is the damages, the present value of the ex-



Michael Greenstone

American Economist, the Milton Friedman Distinguished Service Professor in Economics, the College, and the Harris School of Public Policy at the University of Chicago

pected marginal damages that are done by emitting a ton of CO2.

They at the IMF use a social cost of carbon of about $70 a ton. Whereas the most recent work that's been done by the EPA in the US, Michael Greenstone, a University of Chicago economist, I think probably has done the best work, they're now estimating the social cost of carbon is over $200 a ton.

Jon Hartley: I wonder how how big those standard error bars are on there.

Bob Litterman: Yeah, the standard error bars are huge. No one knows what this is, but if you come at it from a risk management perspective like I do. And you say, well, we think the social cost of carbon is about $200, but it could be anywhere from $50 to 500.

And you say, where do you want me to set it? I say to you, well, how confident do you want to be that you're going to solve the problem? And the suggestion being that you probably want to be above the mean or the median. You want to be at the upper end of that distribution because it's uncertain, as you point out.

And that's the real problem, the fundamental uncertainty. So, yeah, I got involved in this, actually, when I was retiring from Goldman Sachs. One of my other partners, Larry Linden, who was head of the World Wildlife Fund board for a while, and resources for the future. He invited me to lunch and we were talking and he said, are you interested in the environment?

And I said, well, Larry, this climate change seems to me to be a risk management problem that's not being addressed. We're not pricing the risk. And Larry said to me, well, Bob, a brilliant insight from an economist like yourself, but the problem is no one knows where to price it.

And I took that as a bit of a challenge. I thought, well, hell, I can read the literature, you know, let's see what it says. And so I did. And actually, you know, Bill Nordhaus, who is, you know, the leading economist on this and won a Nobel Prize.

Jon Hartley: Bill Nordhaus who created the DICE model.

Bob Litterman: Yeah, DICE model. He and I were the same generation. We used to both be macroeconomists. So I know Bill, and I was reading his stuff, and it didn't take into account what we do in pricing risk on Wall Street, where we worry about beta, the correlation of assets with the market.

And in the climate literature, they never worried about beta, they never worried about correlation. And they were really doing some pretty old-fashioned risk analysis. And so that kind of drew me in. I started working, as you mentioned, with a couple of other economists, Gernot Wagner and Kent Daniel.

And the three of us wrote a paper where we tried to take seriously the uncertainty about climate. We thought of the fragility of the planet as being an unknown about which information would be revealed over time. And so you form an optimal policy today and then you revise it.

If you get good news, you can lower the price. If you get bad news, you can raise the price. And in that context, we found something very interesting, which is that the optimal policy is to immediately create a very strong incentive to reduce emissions, strong enough that you're very confident that you're going to solve the problem, that the emissions are going to come down, you're not going to cross the tipping point, you're not going to have any of these disasters.

And in fact, one of the surprises to me was how hard it was to actually get a model where there would be catastrophes. You were always conservative enough that you would never go off the cliff. That was interesting. And something else we did which was interesting is we were able to ask the following question, what's the cost of delay?

Yes, the optimal policy is to immediately price emissions appropriately at a high level. But what happens if we wait a year? And we could answer that as economists, you can set it up and say, how much would you have to pay the current generation to wait a year before they start pricing carbon?

And the answer was pretty shocking and pretty incredible. It was basically that the cost of delay grows quadratically. Obviously it starts at zero and then as you move forward, you're no longer pricing carbon and so you're emitting more into the atmosphere. Well, that has two impacts. One is the amount of carbon in the atmosphere is going up.

That's essentially linearly. But the other thing that's happening is that the damage that's created by each ton of carbon is also going up because that's a function of the amount of carbon in the atmosphere. And so when you then quantify how much does it costs, it's about 2% of consumption times t squared.

And so one year is about 2% of consumption and five years is like 25% times 2. So 50% of consumption. So you can see it's just a massive cost of not pricing climate risk.

Jon Hartley: What about the political economy kind of challenge?

Bob Litterman: And you mentioned that, you know, the politics of this are tough, tough, and they are tough not just in this country, but as you point out around the world, we understand why the politics are tough. It's because the cost is immediate and it's in your face. Every time you fill up your car with gasoline, you experience the cost.

The benefit is far into the future and very uncertain. And so it makes it easy for opponents. And obviously, not everyone benefits from this. Fossil fuel interests are not going to benefit from a rapid transition away from fossil fuels. And so this has made it very difficult to get the politics right.

And then the other problem is it's a global problem. And so you have a bunch of countries that are saying, hey, you guys caused this. The US, historically, we've been by far the biggest emitter. Today, of course, China is the biggest emitter, and China's pointing the finger at us, and we're pointing the finger at China.

And meanwhile, the emissions pricing right now around the globe is pathetic. The global average we estimate is about $4 a ton. It should be two orders of magnitude higher than that. And you've got this hurricane-force wind, $7 trillion subsidizing fossil fuels, and you're trying to move in the other direction.

It just doesn't work. So, yeah, it's a huge problem and we've got to address it. We should have addressed it just two decades ago and we wouldn't have this problem, but now it's really quite late and there's inevitable impacts now. And the only thing is how bad are they going to be?

So we still should be slamming on the brakes. I tend to be optimistic that we will soon because it's just so insane that we're not doing it. And it's so simple and so obvious, we need to have a price on carbon. And until we do, the costs are just growing quadratically, and they're huge already.

Jon Hartley: Well, it's a good question. I know in the sense that as these sort of changes evolve, people also adapt as well and say certain coastal real estate becomes less valuable or inhabitable. It is a slow-changing process, and people can adapt these things. And that has a pretty significant impact.

Really, this has been an amazing conversation, Bob. And hearing about your risk management approach to climate policy, I think it's very enlightening. And your amazing career and ideas in quantitative finance, really amazing. You're a true pioneer in quantitative finance, and it's a real honor to be able to interview you here.

Really want to thank you so much for joining us.

Bob Litterman: Thank you, Jon.

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Learning and the Capital Age Premium

Li Kai

Li Kai is an Associate Professor of Peking University HSBC Business School, Associate Editor of the China Economic Quarterly, Ph.D of Economics from Duke University in the United States, and mainly focuses on asset pricing, macro-finance, financial economics, and Chinese financial markets. His research focuses on constructing, verifying, and applying a set of asset pricing theories based on financing constraints, and applying them to the Chinese financial market. He has published many papers in important domestic and foreign journals such as the *Journal of Finance, Review of Financial Studies, Journal of Financial Economics, Journal of Monetary Economics, Review of Finance, Journal of Corporate Finance, Financial Management,* and *Comparison.*

The Journal of Monetary Economics is one of the core journals in the field of economics, publishing ten times a year, and its articles cover significant research contributions to a wide range of modern macroeconomic themes, including empirical, methodological, and theoretical research findings. The journal has an impact factor of 4.63.

A class of asset pricing models that link production and investment to the cross-sectional stock returns typically assumes that market participants can directly observe firm-specific productivity and can distinguish its systematic component from the idiosyncratic component. Although this paradigm provides a starting point and an important analytical benchmark, the authors adopt a more realistic paradigm - the imperfect information paradigm: that is, the management of individual firms has imperfect information about their productivity. Specifically, the authors assume firms with newly installed capitals (i.e. young capital vintages) have limited information about their exposure to aggregate productivity shocks, but over time, they receive noisy signals and update their information through parameter learning. The study shows that the imperfect information paradigm can more consistently explain a series of empirical facts about the connection between capital age, resource allocation efficiency, cash flow duration, and stock expected returns.

Under the model setting of the imperfect information paradigm, the investment and expenditure of enterprises have an endogenous response to future productivity shocks, which explains the relationship between the enterprise level of capital age, stock returns, and cash flow duration. The first implication of the model is the positive relationship between capital age and average stock returns. Compared with young firms, firms with older capital have more accurate information about the overall productivity shock, so they can make better use of overall technological progress. This high information precision is like a risk exposure amplification mechanism, making older assets more sensitive to overall productivity shocks (i.e., higher risk exposure), thereby bringing higher stock risk premium returns. The second implication of the model is the inverse relationship between capital age and cash flow duration. Due to imperfect information, young capital firms have lower resource reallocation efficiency and lower current cash flows. As the age of capital increases, information continues to update, and future cash flows grow. Therefore, young firms have a higher proportion of future cash flows compared to current cash flows, that is, they have a longer cash flow duration; in contrast, the cash flow duration of older firms is shorter.

These model implications are strongly supported by empirical evidence. To study the empirical connection between capital age, cash flow duration, and cross-sectional expected returns, the authors divided firms into five portfolios based on capital age in the 30 industries divided by Fama-French. The annualized return rate of the long-short portfolio of old minus young assets (known as the "capital age premium") is 5.79%. This result is statistically significant, and its Sharpe ratio is 0.44. The relationship between capital age and expected returns is consistent with the model's implication, that is, older firms have more accurate information, which is transformed into a higher risk exposure, leading to a higher stock risk premium return compared to young firms. In addition, the paper also empirically tested the negative correlation between capital age and cash flow duration, which is consistent with the second implication of the model.

In numerical analysis, the calibrated model can match the traditional macroeconomic quantity dynamics and asset pricing while generating a significant capital age premium, as well as a negative correlation between capital age and cash flow duration. The model reproduces the joint empirical relationship between capital age, expected returns, and cash flow duration in the data.

This paper innovatively introduces parameter learning and the imperfect information paradigm into the general equilibrium asset pricing model, focusing on the impact of parameter learning on the cross-sectional stock returns. The research results deepen the understanding of the behavior of the capital market and the formation mechanism of stock returns, which is of guiding significance to investors, business managers, and policymakers, providing new perspectives and tools for the effective operation and risk management of the capital market.

“This paper innovatively introduces parameter learning and the imperfect information paradigm into the general equilibrium asset pricing model, focusing on the impact of parameter learning on the cross-sectional stock returns. The research results deepen the understanding of the behavior of the capital market and the formation mechanism of stock returns, which is of guiding significance to investors, business managers, and policymakers, providing new perspectives and tools for the effective operation and risk management of the capital market.”

Information Acquisition, Uncertainty Reduction, and Pre-announcement Premium in China

Jia Dun

Jia Dun is an Assistant Professor at Peking University HSBC Business School, a doctoral supervisor at Peking University, and holds a Ph.D. in Economics from the University of Maryland. His research fields include macroeconomics, monetary economics, macro-finance, quantitative model algorithms, and the Chinese economy. His current research work focuses on the micro-foundation of macro-finance models and the related applications of market structure, and information frictions in the fields of monetary policy and macro finance. His research work has been published in high-impact journals in the fields of economics and finance, such as *American Economic Review, Review of Finance, Journal of Economic Dynamics and Control, Financial Research,* and *World Economy*. His series work has been funded by National Natural Science Foundation of China, and he has been actively advising policy and financial institutions including the State Council, the China Development Bank and the Agricultural Development Bank of China.

Review of Finance is the official journal of the European Finance Association and is recognized as a top international journal in finance. It mainly publishes high-quality academic papers on theory and empirical research in the field of finance. The impact factor in the past five years is 5.071. The article acceptance rate is 7.88%.

The People's Bank of China releases various financial statistics to the market each month, including data on money supply and total social financing. These statistics are critical for market participants to assess the macroeconomic states and the direction of monetary policy. Unlike other countries or agencies like the National Bureau of Statistics of China or the General Administration of Customs, the People's Bank of China does not have a fixed and pre-scheduled release date for its financial statistics each month, and the release date exhibits some randomness.

Assistant Professor Jia Dun and his co-authors discovered that during the sample period from 2010 to 2019, in the days preceding the release of key financial statistics by the People's Bank of China, the A-share market in China delivers a significantly positive return premium when the data release was relatively late. This premium was not related to the the released data but was correlated with the timing of the data release. Furthermore, during the pre-announcement window, the forecast errors among professional forecasters regarding M2 were declining, indicating a reduction in market uncertainty before the announcement.

To further explain these phenomena, Assistant Professor Jia and his co-authors used a theoretical framework based on endogenous information acquisition, discussing how market investors acquire information in anticipation of the impending release of public information when the central bank does not pre-announce the exact date of data release. The research found that if there is a delay in data release within an announcement cycle, uninformed investors optimally increase their information acquisition efforts in advance, which leads to an overall reduction in market uncertainty, thereby pushing up asset prices and exhibiting a pre-announcement premium. The paper also uses Baidu Search Index data to capture the information search intensity of uninformed investors to validate the theoretical hypothesis. The empirical results indicate that the later the data is released, the higher the search intensity for related financial statistics before the announcement.

This paper contributes to a better understanding of the monetary policy announcement effect and macroeconomic data premium in the stock market. The research demonstrates that the pre-announcement premium driven by of the anticipation of central bank's data release is quite pronounced in China's market. The study by Assistant Professor Jia and his co-authors extends the boundaries of the related literature, emphasizing the importance of studying China's market and effectively identifying the 'universal' mechanism behind pre-announcement premiums by looking into Chinese market dynamics. The findings provide valuable insights related to the improvement of the effectiveness of central bank communication for reducing market uncertainty.

Information Design for Selling Search Goods and the Effect of Competition

Lyu Chen

Lyu Chen is an Assistant Professor at Peking University HSBC Business School. He holds a Ph.D. in Economics from the University of Wisconsin-Madison. His primary research areas include microeconomic theory, information design, digital economy, and financial market design.

Journal of Economic Theory (JET), established in 1969, is one of the most prestigious international journals in the field of theoretical economics. Recognized as one of the nine core journals in the global economics community, it publishes papers on topics including mechanism design, decision theory, macroeconomics, and monetary economics. According to the 2022 Journal Citation Reports (JCR) released by Clarivate Analytics, JET has an Impact Factor of 1.6.

In shopping processes, sellers (manufacturers or shopping intermediary websites) can provide product information to consumers in various ways. For instance, they can selectively highlight product features on their websites, or make personalized recommendations via emails and mobile pushes. These information influences different consumers' perceptions about their matches with the product, and thereby affects the purchasing outcome and final consumer welfare. It is thus economically important to understand what and how much information profit-maximizing sellers will find optimal to provide.

Most existing studies on this topic have focused on "experience goods" rather than "search goods". By definition, when shopping for experience goods, consumers cannot observe their true match values before purchase and must solely rely on the information provided by the seller to make decisions. However, many real-world products, such as clothing, furniture and home decorations, are better described as search goods, whose match values will be naturally revealed to the consumer after a costly "search" step (e.g., visiting a local store in off-line shopping or ordering a returnable product in online shopping). For these products, while the seller controls a consumer's pre-search information, it has no control over her post-search information. The goal of the seller's information provision is hence not to directly persuade consumers into purchase, but to attract as many as possible consumers who will buy the product once having sunk their search costs into searching. In this case, what does the seller's optimal information provision strategy look like? How is it shaped by the market details? To what extent is it similar to that for experience goods and how are they different? These are the central questions the paper considers.

Assistant professor Lyu studies aforementioned questions within an information design framework. Given the complexity arising from the nature of search goods, the paper introduces a new relaxed-problem approach to solving the seller's optimization problem. Under certain regularity condition, this enables a full characterization for the seller's optimal design while accommodating non-binary match values and ex-ante heterogeneous consumers. The optimal design is shown to crucially depend on the consumers' outside option value distribution, and can be implemented by a simple upper-censorship signal under certain regularity conditions. Based on this characterization, the paper further considers several applications, including comparing information designs for search goods and experience goods, and studying the effect of competition with a large number of sellers. One interesting finding of the paper is that under certain conditions, policies that can transform experience goods into search goods (such as no-question-asked return policies) may reduce the seller's incentive in providing pre-search information and therefore harm the efficiency of consumer search, while the opposite can be true under other conditions.

Undisclosed Material Inflation Risk

Xie Jin

Xie Jin is an Assistant Professor at HSBC Business School, Peking University, and holds a PhD in Accounting from the Hong Kong University of Science and Technology. His research interests include financial accounting, international accounting standards, corporate finance, macroeconomics, macrofinance, antitrust, and China's economy. He has published papers in international academic journals such as *Journal of Monetary Economics, Journal of Accounting Research, the American Economic Association Papers and Proceedings*. His research won the Best Paper Award at the 2018 China Finance Academic Conference, and his research results have been reported by Bloomberg and Chicago Booth Review, among others.

Journal of Monetary Economics is one of the core journals in the field of economics, published nine times a year, with articles covering important research contributions on a wide range of modern macroeconomic topics, including empirical, methodological, and theoretical findings, and the journal has an impact factor of 4.63.

Since 2021, inflation has risen as a result of new corona epidemics, geopolitical conflicts, and loose global fiscal and monetary policies. Prices of goods and services have risen at a rate not seen since the 1980s, hitting households, small businesses, corporations, and all levels of government hard.

Firms' inflationary expectations are the micro-foundation of the New Keynesian Phillips curve. An in-depth understanding of firms' perceptions of inflation is a top priority for managing market expectations and controlling inflation, as firms' inflation expectations directly determine their decisions on product pricing, hiring labor, investment and financing, which are taken very seriously by central banks. At the beginning of 2022, the People's Bank of China (PBOC) convened a regular meeting of the Monetary Policy Committee (MPC), which emphasized the scientific management of market expectations, efforts to serve the real economy, and the effective prevention and control of financial risks.

However, compared with consumers, company management is a special group. Therefore, there are three difficulties in market research as follows. First, the respondents' expectation of inflation may be changed by the research itself. Second, characteristics reflecting firm heterogeneity are difficult to obtain in research. Third, the research usually only obtains the inflation expectations of small firms, while it is the large firms that have significant impact on the economy.

The study by Assistant Professor Jin Xie and co-authors uses a new methodology that extracts firm management's attitudes toward inflation risk by analyzing more than 65,000 10-K annual reports filed with the U.S. Securities and Exchange Commission (SEC) between January 2005 and April 2021 by large U.S.-listed firms. Each month, the U.S. Department of Labor's Bureau of Labor Statistics releases an inflation index. By analyzing analysts' inflation expectations, the authors calculate the response of company stock prices to changes in inflation that are not anticipated by the market and, in turn, estimate the loss of investor wealth due to inflation. The study found that despite SEC regulations requiring public companies to disclose material risk factors to investors, more than 61 percent of companies facing high inflation risk never mentioned inflation in the risk disclosure section of these reports or used inflation-related terms in their risk tips. Interestingly, companies facing inflation risk disclosed inflation risk to investors immediately after experiencing investor class action lawsuits.

Why don't companies discuss inflation risk in their annual reports? The authors do not believe that executives are trying to deceive investors. After all, failing to provide adequate disclosure puts executives and their companies at risk of lawsuits and regulatory sanctions. The authors suggest that the most likely explanation is 'Rational Inattention' - an economic theory that suggests that decision makers with limited resources can't process all the information available to them and can only selectively focus on certain information. Since many corporate executives have never experienced high inflation, they don't pay much attention to the damage it can do to shareholder wealth. Because inflation was relatively low in past decades, or because determining the damage caused by inflation may have been too costly, executives did not focus on it. However, in the wake of the class-action lawsuits, executives drew attention to it and reevaluated all potential risks to their companies, including the risk of inflation. The authors predict that in the coming years, executives will be more accountable, and therefore will pay more attention to inflation if they wish to reduce their legal liabilities.

Can Blockchain Technology Help Overcome Contractual Incompleteness? Evidence from State Laws

Wang Xiaoyu

Wang Xiaoyu is an Assistant Professor at Peking University HSBC Business School. She holds a Ph.D. in Finance from Georgia State University in the United States. Her main research areas include corporate finance (corporate governance, mergers and acquisitions, innovation), financial technology (blockchain, machine learning, text analysis), and labor and finance. She has published multiple research reviews on the Columbia University Blue Sky Blog.

Management Science is one of the top journals in the fields of management and operations research, enjoying extremely high academic reputation. Founded in 1954 and hosted by the Institute for Operations Research and the Management Sciences (INFORMS), it is included in the list of 24 top academic journals in business schools selected by the University of Texas at Dallas (known as UTD 24) and is also one of the 50 top journals in business schools rated by the Financial Times (known as FT 50). Its impact factor was 5.4 in 2022, and 7.1 over the past five years.

In real-world markets, contract agreements between suppliers and downstream enterprises are often incomplete due to reasons such as transaction costs, unforeseen contingencies, information asymmetry, and limited verifiability of contract breaches. This contractual incompleteness can lead to hold up problems, underinvestment, and value loss in supply chain relationships. Extensive literature has explored the role of changing company structures, property rights, and long-term agreements in mitigating underinvestment issues. However, there is a lack of research regarding how emerging digital technologies can alleviate contractual incompleteness. To fill this gap, this paper investigates how emerging digital technologies, such as blockchain, affect effective contracts between suppliers and customers.

To delve deeply into the impact of blockchain technology on enterprises, the authors constructed a quasi-natural experimental design using relevant laws passed by various U.S. states, which incentivized local enterprises to develop and utilize blockchain related technologies, including blockchain platform, smart contract, digital tracing and tracking. They investigate the causal effects of changes in these relevant laws on enterprise market value, innovation activities, vertical integration, strategic alliance formation, and the geographical relationship between suppliers and customers. Additionally, the authors use textual-based asset specificity measure as a proxy for firms' vulnerability to contractual incompleteness to capture their sensitivity to changes in blockchain-related laws.

This research found that the introduction of blockchain-related laws had a significant positive impact on enterprise market value, particularly for those vulnerable to contractual incompleteness. Enterprises which are highly exposed to incomplete contract issues (those with high asset specificity) were more inclined to increase their R&D intensity and the number of blockchain-related patents after the introduction of new blockchain laws. The introduction of these new laws also reduced vertical integration for enterprises with high asset specificity and increased the number and quality of strategic alliances. This indicates that enterprises with high asset specificity can significantly benefit from this new technology and tend to leverage the introduction of blockchain-related laws to invest more resources in blockchain-related innovation.

This paper provides new empirical evidence and valuable insights into how blockchain technology affects business and contracts. It highlights the importance of asset specificity for enterprises to benefit from blockchain technology, emphasizing the differences in contractual environments among individual enterprises. Furthermore, it offers decision-making guidance for enterprises in responding to technological changes regarding vertical integration, strategic alliances, and supplier-customer relationships.

Delayed Crises and Slow Recoveries

Wang Pengfei

Wang Pengfei, Dean of Peking University HSBC Business School, Chair Professor of Economics. His main research fields are macroeconomics, financial economics and monetary economics. At present, Professor Wang Pengfei has published over forty papers in top international journals such as *Econometrica, American Economic Review, Journal of Finance, Journal of Economic Theory, Journal of Monetary Economics, Journal of Financial Economics,* and *American Economic Journal: Macroeconomics*, and made remarkable research achievements in the fields of dynamic stochastic general equilibrium theory, asset bubble and financial crisis, multiple equilibria and endogenous economic fluctuation. He is an economist with international influence in the field of macroeconomics.

Why does credit expansion trigger a serious financial crisis and a slow economic recovery? This paper constructs a rational expectation model to explain this phenomenon from the perspective of 'asynchronous diffusion of information in the banking sector'. In this model, banks can invest in two sectors: speculative sector and traditional sector. With the negative information about the decline of economic fundamentals in speculative sectors gradually spreading in the banking sector, banks receiving this negative information need to decide whether to continue to provide credit to speculative sectors or withdraw funds from speculative sectors and invest them in traditional sectors.

However, due to the 'unsynchronized diffusion of information in the banking sector', a single bank that has received the negative information does not know whether other banks have also received the negative information, so the rational choice of a single bank is to continue to provide credit to the speculative sector. The consequence is, the competitive equilibrium of decentralized economy will produce more lasting credit expansion than the equilibrium of social planners, and further delay the occurrence of financial crisis. However, the decision of delaying the withdrawal of a single bank from the speculative sector will lead to more banks falling into crisis when the financial crisis breaks out, which will eventually make the financial crisis more serious and the economic recovery slower.

In addition, this paper further incorporates this mechanism into a standard macroeconomic growth model, and finds that the adjusted model is helpful to understand the whole dynamic process of economic 'prosperity-slowdown-collapse-recovery'.

Finally, this paper points out that the government can reduce the negative externalities of a single bank to the economy through tax policy and interest rate policy, thus improving social welfare.

The Journal of Financial Economics is a leading peer-reviewed academic journal in the field of finance, covering the theoretical and empirical topics of financial economics, focusing on high-quality analytical, empirical and applied research results in capital markets, financial institutions, corporate finance, corporate governance and organizational economics. Its latest impact factor is 8.9.

Beyond Dividing the Pie: Multi-Issue Bargaining in the Laboratory

Manshu Khanna

Manshu Khanna, Assistant Professor of Economics at Peking University HSBC Business School. He received his Ph.D. degree in Economics from Boston College.

The Review of Economic Studies (RES) was founded in 1933 by British and American economists to encourage economists to carry out research in theoretical and applied economics, and has always been committed to publishing outstanding research papers in various fields of economics. It is widely regarded as one of the leading academic journals in the field of economics, with an impact factor of 7.1 in the last five years.

The paper investigates through controlled experiments how negotiation mechanism (Item-by-Item and Bundling Sales) and information structure (No Information, Intermediate Information and Complete Information) affect negotiation outcomes in unstructured bargaining negotiations. Additionally, the paper further explores the situation of the bargaining parties in the Ultimatum Game and when faced with noisy information.

The empirical results suggest that allowing negotiating parties to bundle multiple issues for negotiation favors the achievement of a deal agreement. Besides, when the value generated by the transaction (the total surplus) is small, making both parties more aware of each other's valuations and costs, it is conducive to reaching an agreement. However, when the value is relatively large, doing so may bring about additional negative effects. Based on these findings, the paper suggests that establishing clear fairness norms is beneficial for reaching a deal.

The paper finds that agreements are most likely to be reached when bargainers adopt the practice of alternating offers, and that split-the-difference offers are particularly likely to create a cooperative atmosphere.

Finally, the authors raise several open questions based on multi-issue bargaining situations, such as how complementarities between issues affect negotiations, and how various factors influence negotiation outcomes when the parties' valuations are correlated and thus generate adverse selection problems. Overall, the paper provides important insights for decision-makers and practitioners involved in multi-issue bargaining games, as well as for research in the field of bargaining negotiations.

Winners from Winners: A Tale of Risk Factors

Zhao Lingxiao

Zhao Lingxiao is an Assistant Professor at Peking University HSBC Business School and an Economics Ph.D. graduated from Washington University in St. Louis, USA. Her research focuses on asset pricing, model comparison, Bayesian econometrics, high-frequency data econometrics, andother related topics. She has published numerous papers in internationally renowned journals, such as the *Journal of Finance*.

Management Science, established in 1954 and hosted by the Institute for Operations Research and the Management Sciences, is one of the most prestigious and historically significant journals in the fields of management and operations research. It is recognized as one of the 24 top business school academic journals by the University of Texas at Dallas (UTD 24), one of the 50 top business school journals by the Financial Times (FT 50), and one of the 50 core journals in the "Data Retrieval System of China International Research Publications in Economics and Management" (PHBS 50) published by Peking University HSBC Business School, with an impact factor of 7.1 over the past five years.

In both theoretical and empirical financial research, identifying risk factors that explain the expected returns of equity is a crucial question. Previous research has demonstrated that, beyond the market factor, there are hundreds of additional factors, with the number of potential risk factors continuously increasing.

In light of these circumstances, the authors propose an initial question: Is it possible to combine risk factor sets supported by recent literature to identify a new set of risk factors—selecting winners from winners—that is gathered more support from the data, on both statistical and financial perspective. To address this question, the authors begin with the risk factor sets most supported by the literature, originating from Fama and French (1993, 2015, 2018), Hou et al. (2015), Stambaugh and Yuan (2017), and Daniel et al. (2020). Each of these twelve initial factors could potentially serve as an element of the stochastic discount factor (SDF), that is, a risk factor, with the complement of the risk factor set automatically constituting the set of non-risk factors. By examining 4095 distinct combinations, the baseline analysis scan results indicate that a seven-factor asset pricing model, comprising the Mkt, SMB, MOM, ROE, MGMT, PERF, and PEAD, received the most substantial data support.

To further analyze this asset pricing model, the authors raise the second question: If the analysis includes not only the initial factors but also the 125 anomaly factors mentioned by Green et al. (2017) and Hou et al. (2020), could the baseline analysis be improved (and if so, by how much)? Based on this question, the authors identified 24 genuine anomaly factors—factors that cannot be priced by the initial factors—and transformed them into principal components (PCs), incorporating the first 12 PCs as additional factors.

Through Bayesian comparison of the marginal likelihood and posterior model probabilities of approximately 17 million models, the study finds that the risk factors mostly supported by data are the factors combined by the Mkt, MOM, IA, ROE, MGMT, PERF, PEAD, FIN, along with the non-continuous principal components PC1, PC5, and PC7. Pricing tests and annualized out-of-sample Sharpe ratios based on the tangency portfolio further confirm that this asset pricing model can be applied for calculating expected returns, evaluating investment strategies, and constructing investment portfolios.

Local Effects of Global Capital Flows: A China Shock in the U.S. Housing Market

Li Zhimin

Li Zhimin is an Associate Professor at Peking University HSBC Business School and a Ph.D. graduated from the University of California, Berkeley, focuses on the research of international economics and development economics. He has published numerous papers in internationally authoritative journals, including the *Review of Financial Studies, Journal of Development Economics, Journal of Management, Journal of Economic Behavior and Organization, Economic Development and Cultural Change, Journal of Corporate Finance,* and *Economics Letters*.

The Review of Financial Studies (RFS) is one of the three top international financial academic journals, published by Oxford University Press on behalf of the Society for Financial Studies. It is recognized as one of the 24 top business school academic journals by the University of Texas at Dallas (UTD 24), one of the 50 top business school journals by the Financial Times (FT 50), and one of the 50 core journals in the "Data Retrieval System of China International Research Publications in Economics and Management" (PHBS 50) published by Peking University HSBC Business School, with an impact factor of 9.7 over the past five years.

In recent years, international capital flows through the purchase of foreign residential properties have become increasingly prominent. Concerns have arisen that such capital flows may exacerbate housing affordability issues for residents in their home countries. Consequently, regions such as Singapore, Australia, New Zealand, Canada, and Hong Kong (China), have implemented or are considering regulations to restrict foreign capital inflows into their local housing markets, such as imposing stamp taxes or additional duties on foreign buyers. Despite the notable characteristics and significant policy implications of residential real estate capital flows, public understanding on their economic significance remains limited. Moreover, there is a lack of causal evidence confirming the actual impact of residential capital flows on the domestic economy.

The authors provide quantitative analysis of foreign real estate capital inflows using home purchase transaction data from California, USA, offering empirical evidence of their actual impact. Specifically, the study reveals two significant findings: (1) The U.S. real estate market has experienced a “China shock” since 2008, as the Chinese government's relaxation of capital regulation and implementation of home purchase restrictions have led to a substantial increase in Chinese home purchases in the United States; (2) These purchasing activities are often concentrated in neighborhoods historically populated by ethnic Chinese, exhibiting a ‘home bias’.

Furthermore, the authors construct a theoretical model and conduct empirical tests to analyze the impact of the “China shock” in real estate capital inflows on the local U.S. economy. The study indicates that these capital inflows have significantly increased local housing prices and housing wealth, thereby enhancing local economic employment, particularly in the non-trade sector. However, concurrently, these inflows have resulted in the displacement of low-income residents. Overall, while residential real estate capital inflows can stimulate the real economy, they may also lead to gentrification within communities.

College Expansion, Trade, and Innovation: Evidence from China

Ma Xiao

Ma Xiao is an Assistant Professor at Peking University's HSBC Business School, who holds a Ph.D. in Economics from the University of California, San Diego. His primary research interests include international trade, macroeconomic development, and economic growth. He has published numerous papers in journals such as the *International Economic Review, Journal of International Economics, Journal of Political Economy Macroeconomics (JPE Macro), Review of Economics and Statistics, Economic Research Journal,* and *World Economy*. He is the recipient of the 2023 WTO Essay Award for Young Economists.

This paper investigates the promoting impact of China's college expansion policy, initiated in 1999, on innovation within its manufacturing sector. The research focuses on two significant trends in the Chinese economy: First, the rapid growth in research and development (R&D) intensity among Chinese enterprises, with R&D expenditure as a percentage of GDP rising from 0.9% in 2000 to 2.4% in 2020, alongside a substantial increase in patent applications; second, the swift enhancement of the technological content of China's export products. According to WTO statistics, China's main export categories have shifted from "textiles and clothing" in the early 2000s to "communications equipment" at present.

The paper posits that the increase in skilled labor resulting from the 1999 expansion of Chinese universities can explain these phenomena. Based on empirical evidence and theoretical modeling, the paper suggests that the effects of college expansion on innovation and exports operate through three primary channels:

Firstly, innovation activities require skilled talent, and the expansion of colleges has produced a large number of skilled workers, directly reducing the labor costs associated with innovation.

Secondly, the increase in skilled labor following the expansion has led to a decline in wages, reducing production costs for high-tech enterprises and stimulating their sales expansion, particularly in foreign markets, where competitor firms did not benefit from similar production cost reductions.

Lastly, the expansion of high-tech enterprises in export markets has increased their scale, further stimulating their investment in innovation.

Quantitative analysis within the paper reveals that college expansion accounts for 72% of the increase in manufacturing innovation intensity in China from 2003 to 2018. It has significantly contributed to the rise in the technological content of China's export goods, highlighting the crucial role of higher education expansion in fostering corporate innovation and transforming trade structures. The paper notes that in the absence of international trade, the impact of college expansion on production and innovation would decrease by about 10%-30%, underscoring the key role of trade openness in enhancing the effectiveness of higher education policies on output and innovation.

The International Economic Review is renowned as "one of the leading journals in economics in the world." Established in 1960 by Professor Lawrence Robert Klein of the University of Pennsylvania, a Nobel laureate in economics, and Professor Michio Morishima of Osaka University, it is published by the University of Pennsylvania. Since its inception, the journal has advanced economic research worldwide by publishing cutting-edge papers in econometrics, economic theory, macroeconomics, applied economics, and other fields.

The Agricultural Wage Gap within Rural Villages

Li Zhimin

Li Zhimin is an Associate Professor at Peking University's HSBC Business School and holds a Ph.D. from the University of California, Berkeley. His primary research areas include international economics and development economics. He has published numerous papers in esteemed international journals such as the *Review of Financial Studies, Journal of Development Economics, Journal of Management, Journal of Economic Behavior and Organization, Economic Development and Cultural Change,* and *Journal of Corporate Finance.*

A significant number of economically disadvantaged individuals reside in rural areas and engage in agricultural labor, typically earning less than their counterparts in non-agricultural sectors. Consequently, theories and policy analyses concerning economic development often focus on the transition of labor from the less productive agricultural sector to the more productive non-agricultural sector. Although much of the literature has concentrated on the productivity disparities between urban and rural areas, non-agricultural activities have become an important employment channel in rural regions of many developing countries.

Two primary explanations currently exist for the agricultural wage gap between agricultural and non-agricultural sectors. The first hypothesis posits that the costs associated with urbanization and labor migration are key factors contributing to the wage differences between the two sectors. The second hypothesis highlights the role of worker self-selection: more skilled workers tend to migrate to urban areas and work in non-agricultural sectors. This suggests that merely promoting urbanization may not significantly reduce the wage gap. Due to the often scarce availability of labor market data in rural areas, these hypotheses are challenging to verify empirically.

To gain a deeper understanding of this issue, the authors utilize a unique dataset from the daily labor market of temporary workers in India to examine the flow of labor between the agricultural and non-agricultural sectors in rural areas. This data provides comprehensive records reflecting the daily movement of workers between sectors within rural regions. The study finds that even after accounting for labor migration costs and self-selection factors, workers who switch sectors across years or even weeks still earn higher wages by engaging in non-agricultural work. Additionally, the authors employ survey data and labor market information to estimate a discrete choice model of daily labor allocation, categorizing employment sector preferences into two types: those related to job characteristics and those related to location. This model reveals the mechanisms of labor allocation in developing countries during structural transformation processes. The study holds significant theoretical and practical implications for narrowing the wage gap between agricultural and non-agricultural sectors and formulating effective economic development policies.

The Journal of Development Economics is a leading international journal in the field of development economics, primarily publishing significant research contributions related to economic development, including empirical studies, methodological advancements, and theoretical insights. The journal is one of the 50 core journals included in the "PHBS 50," the China Research Publication Database for Economics and Management, released by Peking University's HSBC Business School, and it has an impact factor of 5.

Learning about the Consumption Risk Exposure of Firms

Li Kai

Li Kai is is an Associate Professor at Peking University HSBC Business School, Associate Editor of China Economic Quarterly. He holds a PhD in Economics from Duke University. His main research interests are in asset pricing, macro finance, financial economics, and China's financial market. His research focuses on constructing, validating and applying a set of asset pricing theories based on financing constraints to Chinese financial markets. He has published nearly twenty papers in prestigious domestic and international journals such as the *Journal of Finance, Review of Financial Studies, Journal of Financial Economics, Journal of Monetary Economics,* and *Review of Finance.*

Journal of Financial Economics is a leading peer-reviewed academic journal in the field of finance, and is one of the top 24 business school academic journals selected by the University of Texas at Dallas (UTD 24), one of the top 50 business school journals rated by the Financial Times (FT 50), and one of the 50 core journals in the "China's International Research Publication Data Retrieval System for Economics and Management Disciplines" (PHBS 50) published by Peking University HSBC Business School. The journal covers theoretical and empirical topics in financial economics, placing primary emphasis on the highest quality analytical, empirical, and clinical contributions in the following major areas: capital markets, financial institutions, corporate finance, corporate governance, and the economics of organizations, with the latest impact factor of 8.9.

The traditional consumption-based asset pricing paradigm states that risk premia arise from the co-movement between consumption growth and returns. Despite its intuitive appeal, many early empirical tests did not find support for this prediction. This study attempts to solve this puzzle from the perspective of incomplete information and parameter learning. Based on a neoclassical investment model with a consumption-based pricing kernel, the authors relax the assumption of perfect information considering uncertainty about firms' exposure to macroeconomic risk. They introduce a new mechanism of Bayesian learning about firms' productivity with respect to aggregate macroeconomic risk exposure. The mechanism is validated in empirical data, demonstrating how the updating of firms' beliefs about macroeconomic risk exposure affects their investment decisions and market valuations. It provides new empirical support for consumption-based equilibrium asset pricing theory.

The economic interpretation of the model is that firms' exposure to macro-economic risk is unknown. Bayesian beliefs about this parameter are updated from firms' and industry peers' co-movement between their productivity and consumption growth. The updating of beliefs generates an endogenous mechanism of time-varying discount rates that affects the firm's investment rates, valuation ratios, and risk premia. For example, discount rates rise endogenously with the perceived risk exposure of firms, thereby depressing investment and valuation ratios. The authors test these predictions in the data and find strong support for them. They also confirm that cross-sectional learning from peers is crucial and that alternative Bayesian risk estimates, which ignore peer observations, do not predict firm variables.

The author and his team test these predictions in the data by using panel regressions, and find strong support for them. Specifically, they find that capital investment rates and valuation ratios, as measured by Tobin's Q, respond strongly negatively to the posterior mean risk exposure. These links are also economically significant. A one-standard-deviation increase in the mean risk exposure leads to, on average, a 5.6% decrease in investment and a 4.6% decrease in Tobin's Q.

The paper innovatively introduces parametric learning and the incomplete information paradigm into general equilibrium asset pricing models, focusing on the endogenous mechanism about the uncertainty from macroeconomic risk exposure and its time-varying discount rate based on Bayesian learning. The mechanism deepens our understanding of how capital markets affect corporate investment decisions, market valuations, and stock returns, which is instructive for investors, corporate managers, and policymakers. It provides innovative perspectives and theoretical tools for the effective operation of capital markets and risk management.

EPS Sensitivity and Mergers

Ma Fangyuan

Ma Fangyuan is an Assistant Professor at Peking University HSBC Business School. She holds a PhD in Finance from the Hong Kong University of Science and Technology. Her main research areas include corporate finance, product market competition, CEO compensation, mergers and acquisitions. She has published multiple papers in journals such as the *Journal of Financial Economic.*

The Journal of Financial and Quantitative Analysis (JFQA) publishes the theoretical and empirical research outcomes in the field of financial economics. The topics include corporate finance, investment, capital and securities markets, as well as quantitative methods particularly relevant to financial researchers. JFQA only accepts less than 9% of the over 1000 manuscripts submitted each year. The intensive blind review process and strict editorial standards have earned JFQA a reputation as a top tier financial journal.

Market participants remain highly vigilant about how mergers and acquisitions (M&A) affect earnings per share (EPS). Transaction announcements often involve disclosure of the post-merger EPS performance, including whether the transaction immediately generates an appreciation or dilution effect on the acquirer's EPS, and if so, when it can be converted to appreciation. Investment banks often conduct EPS analysis when endorsing M&A transaction. Management tends to consider EPS appreciation as an important selling point of the transaction. However, the management rarely publicly discusses the synergies brought about by mergers and acquisitions. Financial theory suggests that changes in EPS do not directly reflect the value created by mergers and acquisitions, and that synergies truly reflect the impact of mergers and acquisitions on long-term shareholder returns. The difference between practice and theory prompts the author to explore how the excessive focus on EPS in the market affects merger and acquisition decisions, as well as the resource misallocation and value loss it brings.

Early research papers suggest that managers pay attention to EPS mainly because their salaries are closely linked to it (see review of Almeida (2018)). However, this article examines this phenomenon from different perspectives: in the context of mergers and acquisitions, managers tend to emphasize EPS because it is clearer, more intuitive, and easier to communicate to investors compared to transaction synergies. The prediction of synergistic effects has extremely high uncertainty and subjectivity, and its value realization often takes longer time. In this context, investors are more likely to overlook synergies and place more emphasis on the impact of mergers and acquisitions on EPS.

This paper explores how market attention to earnings per share shapes the structure, valuation, and success or failure of M&A transactions. The authors discuss that in the short term, the direct impact of mergers and acquisitions on EPS mainly comes from the issuance of new shares accompanied by stock payments. Compared to stock payments, using cash payments is usually more advantageous in maintaining EPS levels. But cash payments come with additional economic costs, such as immediate tax burdens and external financing costs. Therefore, the payment method for M&A transactions ultimately depends on the trade-off between the apparent benefits of EPS appreciation and the actual cost of paying cash. When stock issuance may lead to EPS dilution, cash is more likely to become the payment method for M&A transactions. This paper provides rich empirical evidence to test this hypothesis.

Financial Constraints, Cash Flow Timing Patterns, and Asset Prices

Li Kai

Li Kai, Associate Professor at Peking University HSBC Business School, Associate Editor of *China Economic Quarterly*. He holds a PhD in Economics from Duke University. His main research interests are in asset pricing, macro finance, financial economics, and China's financial market. His research focuses on constructing, validating and applying a set of asset pricing theories based on financing constraints to Chinese financial markets. He has published nearly twenty papers in prestigious domestic and international journals such as the *Journal of Finance, Review of Financial Studies, Journal of Financial Economics, Journal of Monetary Economics,* and *Review of Finance.*

The Journal of Financial Economics is a leading peer-reviewed academic journal in the field of finance, and is one of the top 24 business school academic journals selected by the University of Texas at Dallas (UTD 24), one of the top 50 business school journals rated by the Financial Times (FT 50), and one of the 50 core journals in the "China's International Research Publication Data Retrieval System for Economics and Management Disciplines" (PHBS 50) published by Peking University HSBC Business School. The journal covers theoretical and empirical topics in financial economics, placing primary emphasis on the highest quality analytical, empirical, and clinical contributions in the following major areas: capital markets, financial institutions, corporate finance, corporate governance, and the economics of organizations, with the latest impact factor of 8.9.

In the traditional literature on the impact of cash flow uncertainty and financial constraints on firms' investment and financing decisions, cash flow shocks are often considered exogenously. However, the authors point out that firms' cash flow collection policy is often endogenously determined in reality and has a strong link with the firm's financial constraint and the price of stock. The authors innovatively introduce the firm's optimal cash flow collection policy in a dynamic investment-based asset pricing model. When selling goods to customers, firms can receive cash or unpaid revenue, which can be converted into either immediate cash flow collection or delayed cash flow collection (stored as current assets). The mechanism is validated in empirical data, showing how a firm's cash flow collection policy is decided and how this policy affects the firm's financing decisions and market valuation. This paper provides a new mechanism of action and empirical support for investment-based dynamic asset pricing theory.

Specifically, the model assumes that supplier need to offer customers a substantial discount when choosing to recover cash flows immediately, but t the benefit is that it also reduces the information asymmetry problem in revenue. Year-end financial performance tends to attract more attention, and the information asymmetry problem of revenues can lead to high financing costs. As a result, the paper deduces that financially constrained firms, which have a greater incentive to collect cash flows by year-end, thereby reduce the cost of financing due to information asymmetry. However, firms with this incentive will also face an increased exposure to macroeconomic risk. This risk exposure gives such firms a higher average stock return (risk premium) from a market valuation perspective and a higher incentive to hold cash from an operational perspective.

To confirm the theoretical assumptions and implications of the model, the paper constructs a firm-level indicator of year-end cash collection (YCC) and finds the following strong empirical evidence. First, firms collect almost 70% of their cash flows in the second half of the fiscal year. Second, financially constrained firms tend to collect cash flows in the second half of the year and hold more cash. Third, financially constrained firms with higher year-end cash collection take on more macroeconomic risk exposure and have higher average stock returns (risk premium). Fourth, firms that tend to collect cash flows in the second half of the year have higher financing costs at year-end.

The paper takes a new perspective on the impact of endogenous cash flow collection volatility on firm operations and market valuation, which helps to deepen the understanding of corporate financing policy, capital market behavior and stock return formation mechanism. It's instructive for investors, corporate managers and policy makers. The study also suggests that corporate cash flow collection policy has an important impact on business risk management and the effective operation of the capital market, and should be a key concern for both business managers and policy makers.

Motivating Collusion

Ma Fangyuan

Ma Fangyuan, Assistant Professor at Peking University HSBC Business School, a PhD in Finance from the Hong Kong University of Science and Technology. Her main research areas include corporate finance, product market competition, CEO compensation, mergers and acquisitions. She has published multiple papers in journals such as the *Journal of Financial* and *Quantitative Analysis.*

The Journal of Financial Economics (JFE) was founded in 1974 and is sponsored by the University of Rochester in the United States. It is a peer-reviewed academic journal that covers both theoretical and empirical research topics in financial economics. This journal, along with the Journal of Finance (JF) and the Review of Financial Studies (RFS), is recognized as one of the top three global financial studies journals. According to the 2022 Journal Citation Reports (JCR) data released by Clarivate Analytics, the impact factor of the journal is 8.9.

In the product market, the term 'collusion' describes the activities of competitors who, through explicit or tacit agreements, jointly engage in activities that restrict competition, with the aim of maximizing producer profits. Collusive behavior may manifest in various ways such as price monopoly, market share division, and production restrictions. These practices can increase business profits, but often cause serious harm to consumer welfare, and are therefore classified as illegal business practices in most jurisdictions worldwide. Once the conspiracy is exposed, the company may face severe legal penalties. But in the case of weakened regulatory efforts, the potential economic benefits obtained through collusion may exceed the expected legal risk costs, which makes some companies consider collusion as the optimal market strategy.

Although corporate shareholders may consider participation in collusion as the best strategy, management may be hesitant about collusion due to personal legal responsibilities and concerns about reputation. In this case, shareholders can incentivize management to implement strategies that are more in line with shareholder interests by adjusting the compensation structure of executives. This raises a question worth exploring in depth: in order to motivate management to join and promote the implementation of conspiracy strategies, may shareholders design corresponding compensation mechanisms?

The paper focuses on the phenomenon of decreased enforcement of antitrust laws observed in the US market in recent years, particularly the closure of four regional offices located in Cleveland, Dallas, Atlanta, and Philadelphia by the US Department of Justice in 2013. The main responsibility of these offices is to collect and analyze potential collusion behaviors in the local market. Although the official reason for the closure is to cut expenses and shift focus to large enterprises, this measure undoubtedly weakens the supervision of enterprises around the office, creating a more conducive environment for them to achieve collaborative cooperation. After this policy adjustment, suppressing market competition or participating in collusion has become a more popular strategic choice for local corporate shareholders.

Based on the above policy changes, the author explores how weakened antitrust regulation affects the design of CEO compensation mechanisms. Incentive theory suggests that the motivation for managers to participate in competition or collusion is related to their compensation structure. When shareholders intend to reduce market competition, the ideal compensation mechanism is manifested as a non-negative correlation between compensation and competitors' performance, in order to encourage management to adopt a cooperative and win-win competitive strategy. The research results indicate that after policy changes, affected companies have indeed restructured their CEO compensation structure, significantly reducing the negative correlation between executive compensation returns and local competitor performance. This adjustment not only encourages more moderate competition methods, but also creates conditions for the formation of collusion in the market.

Intermediary-based Equity Term Structure

Li Kai

Li Kai, Associate Professor at Peking University HSBC Business School, Associate Editor of *China Economic Quarterly*. He holds a PhD in Economics from Duke University. His main research interests are in asset pricing, macro finance, financial economics, and China's financial market. His research focuses on constructing, validating and applying a set of asset pricing theories based on financing constraints to Chinese financial markets. He has published nearly twenty papers in prestigious domestic and international journals such as the *Journal of Finance, Review of Financial Studies, Journal of Financial Economics, Journal of Monetary Economics,* and *Review of Finance*.

The Journal of Financial Economics is a leading peer-reviewed academic journal in the field of finance. It is one of the 24 top business school journals selected by the University of Texas at Dallas (UTD 24), one of the 50 top business school journals rated by the Financial Times (FT 50), and one of the 50 core journals in the "PHBS 50" list published by Peking University HSBC Business School. The journal covers theoretical and empirical topics in financial economics, focusing on high-quality analytical, empirical, and applied research in areas such as capital markets, financial institutions, corporate finance, corporate governance, and organizational economics. Its latest impact factor is 8.9.

The equity term structure, analogous to the interest rate term structure, describes how the yield of dividend-paying rights varies with different maturities. The equity term structure is crucial for investors in predicting market trends, asset allocation, and investment strategy formulation. It reflects market expectations of future economic conditions, reveals the dynamic relationship between risk and return across different maturities, and provides important guidance for asset pricing models, helping them more accurately reflect market realities.

In this paper, the authors propose an asset pricing model based on financial intermediaries, providing the first comprehensive explanation of the dynamic changes in the equity term structure. The model's key mechanism is that the time-varying tightness of intermediaries' leverage constraints drives significant mean reversion in the price of risk. Through rigorous model calibration and new estimation methods, the authors not only demonstrate the reasonableness of financial intermediaries in explaining the dynamics of the equity term structure but also show how this model generates countercyclical convenience yields and accurately predicts bond risk premiums.

The authors also innovatively devise a novel empirical methodology to estimate the tightness of these constraints (i.e., the Relative Tightness Index) from cross-sectional returns of various asset classes. Their findings affirm that this measure significantly drives the dynamics of equity yield slope and convenience yields, both empirically and quantitatively. It successfully addresses a long-standing issue in the literature on financial intermediaries—accurately measuring and predicting the degree of financial intermediaries' leverage constraints. Through this innovative method, the authors construct a unified framework that bridges the gap between theoretical models and actual data, greatly enhancing the explanatory and predictive power of the model in empirical tests.

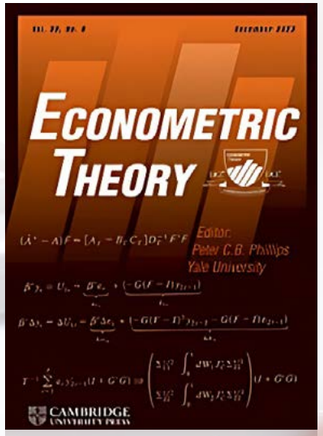
The paper reveals the unique cyclical changes in the equity term structure. The new findings show that the equity term structure is procyclical, exhibiting a positive slope during economic expansions and a negative slope during recessions, while the term premium is countercyclical. Using a new framework, the authors decompose the equity term structure into two parts: the term premium and the mean reversion component related to expected future returns. The research indicates that because the term premium is countercyclical, the procyclicality of the mean reversion component must be strong enough to drive the overall procyclicality of the equity term structure. This finding places strict requirements on the speed of mean reversion in asset pricing models. The mean reversion speeds in standard long-run risk and habit formation models are too slow to explain the procyclicality of the equity term slope.

The authors point out that incorporating financial intermediaries' leverage constraints into asset pricing models, innovatively measuring these constraints in the data, and deeply studying their impact on the equity term structure significantly enhance the understanding of financial market behavior and asset price formation mechanisms. This research provides new perspectives and powerful tools for investors, corporate managers, and policymakers, contributing to the efficient operation of capital markets and precise risk management.

Two-Step Estimation of Quantile Panel Data Models with Interactive Fixed Effects

Chen Liang

Chen Liang, Assistant Professor at PHBS and holds a Ph.D. in Economics from Universidad Carlos III de Madrid, Spain. His primary research areas are econometric theory and applied econometrics. He has published multiple papers in top international journals such as *Econometrica, Journal of Econometrics, Econometric Theory, The Econometrics Journal, Economica, and Economic Letters*. He has received many honors, including the "Outstanding" performance evaluation for his National Natural Science Foundation project and the Guangdong Provincial Philosophy and Social Sciences Outstanding Achievement Award.



Econometric Theory is one of the internationally recognized top journals in theoretical econometrics. Established in 1988 and published by Cambridge University Press, it is recognized as a four-star (ABS 4) journal by the Association of Business Schools (ABS) in the UK. The journal aims to publish cutting-edge theoretical research and is known for its rigorous peer-review process. It publishes only six issues per year.

In this paper, the author focuses on panel data models with interactive effects and proposes a two-step estimation method for quantile treatment effects in such models. Compared to existing estimation methods in the literature, the newly proposed estimator has significant computational advantages, providing empirical researchers with a new tool for studying policy heterogeneity using panel data. In terms of theoretical contributions, the author establishes the asymptotic properties of the estimator in large samples, providing a solid theoretical foundation for the application of this method.

Reviews

SARGENT INSTITUTE OF QUANTITATIVE ECONOMICS AND FINANCE

NATURAL RATE OF Interest

Reviews of Papers on Natural Rate of Interest

This section contains a selected subset of reviews of papers written down by Ph.D. students of quantitative economics in a study group devoted to study the concept of natural rate of interest in economics. Due to limited space, technical parts of the summaries are left out. The full version will be uploaded to the website of the Institute.

The Natural Rate of Interest and Its Usefulness for Monetary Policy

The paper: Barsky, R., Justiniano, A., & Melosi, L. (2014). The natural rate of interest and its usefulness for monetary policy. American Economic Review, 104(5), 37-43.
Authors of the summary: Wang Jiaxin, Yang Zijun

| Research Question |

This paper explores how the natural rate of interest can be defined and utilized for effective monetary policy, particularly in the context of achieving price stability and economic equilibrium. It begins by providing motivation and intuition for the natural rate and its determinants based on the canonical New Keynesian (NK) model, and then builds on the well-known framework by Smets and Wouters (2007) to analyze these concepts using a richer model.

> “It highlights the impact of various shocks, including risk shocks, on the natural rate and underscores the importance of forward guidance in monetary policy. The research also extends previous models by incorporating multiple indicators for price and wage inflation, enhancing the robustness of its findings.”

| Main Conclusions |

The article concludes that the natural rate of interest is a crucial benchmark for monetary policy, especially for stabilizing output and inflation.

· The natural rate is found to be highly volatile and procyclical, often turning negative during recessions, which poses challenges for its practical use due to the Zero Lower Bound (ZLB) on nominal interest rates.

· Tracking the natural rate[1] could significantly reduce the output gap and inflation variability, although real-time estimation and the ZLB are significant obstacles.

Some studies question the accuracy of the estimates and their applicability under the ZLB conditions, but in fact, these are not issues. As Figure 1 shows:

· The one-sided and two-sided estimates of the natural rate are reasonably close. The one-sided filtered estimate, which uses only past and current data, can be applied in real time with some lag. The two-sided smoothed estimate relies on data from both before and after the estimation period, resulting in a smoother estimate. Thus, real-time estimation is not a concern.

· The natural rate of interest drops to -4 percent or lower in each of the three recessions. Despite the ZLB constraints, this method remains valuable: (i) Understand the interest rate path needed to achieve desired output gap and inflation trajectories; (ii) Forecast how long the ZLB will constrain policy.

[1]Solve r_t and r_t^n, to $r_t - r_t^n \to 0$, where r_t and r_t^n denote the real interest rate and the natural rate respectively.

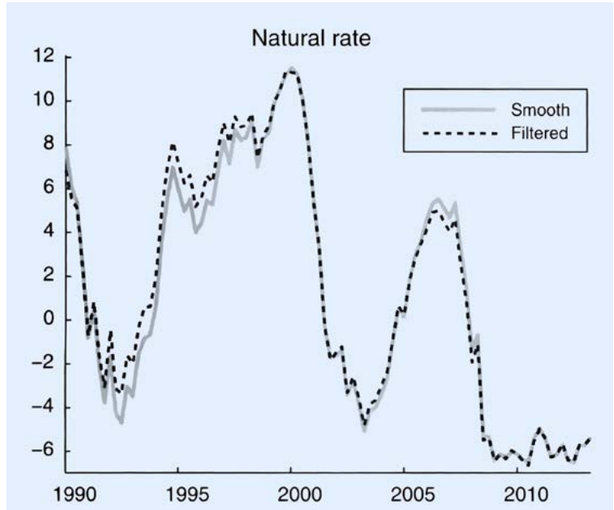


FIGURE 1. ONE-SIDED (*filtered*) AND TWO-SIDED (*smoothed*) ESTIMATES OF THE NATURAL RATE

| Contribution |

The study contributes to the existing literature by providing a robust theoretical and empirical framework for understanding the natural rate of interest within a state-of-the-art DSGE model.

It highlights the impact of various shocks, including risk shocks, on the natural rate and underscores the importance of forward guidance in monetary policy. The research also extends previous models by incorporating multiple indicators for price and wage inflation, enhancing the robustness of its findings.

| Discussion |

The discussion emphasizes the practical challenges of using the natural rate as a policy benchmark, particularly the difficulties in real-time estimation and the ZLB constraint. The authors suggest that forward guidance could mitigate some of these issues by influencing expectations and reducing uncertainty. They also propose that the natural rate remains a valuable tool for understanding the necessary path of interest rates to achieve desired macroeconomic outcomes, even if it does not perfectly align with optimal policy derived from the Ramsey problem.

There are lots of researches have employed a variety of approaches to measure natural interest rate. The methods used in the literature includes time series models such as in Crespo Cuaresma et al. (2004), Cour-Thimann et al. (2006), Lubik and Matthes (2015), and Hamilton et al. (2016). Besides, similar with this paper, some empirical researchers used full-fledged structural models like the estimated DSGE in Giammarioli and Valla (2003), Cúrdia et al. (2015), Del Negro et al. (2017), and more recently in Gerali and Neri (2019). Nowadays, investigating the natural rate within non-linear models could capture more complex dynamics and provide insights into the economy's behavior during extreme events, such as financial crises. Berger et al. (2023) integrated macroeconomic uncertainty into a regime-switching HLW-type model of the natural real interest rate for the US which allowing for nonlinearities.

In this paper, they only focused on a closed-economy. There has been some research progress in this field that extends the topic to an open economy setting. For example, Wynne et al. (2018a) linked the domestic natural rate to the trend rate of growth in both the home country and the foreign country. Zhang et al. (2021) estimated the natural rate of interest for six small open-economies. Besides the United States, many scholars have also applied methods for estimating the natural interest rate to other economies, such as the Eurozone (Fries et al., 2018), China (Wang, 2019), Turkish (Us, 2018), emerging market economies and even the whole world (Wynne et al., 2018b). Based on all the foundation, Wang and Kwan (2021) tried to measure and compare the natural rates of interest of eleven economies including six OECD economies and five emerging economies of BRICS in a coherent time varying parameter VAR framework.

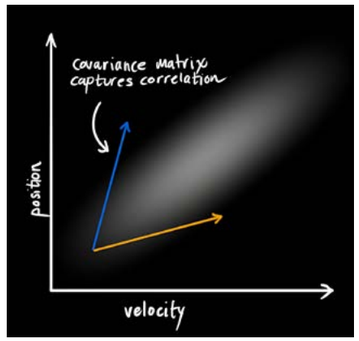
Measuring the Natural Rate of Interest: International Trends and Determinants

The paper: Holston, K., Laubach, T., & Williams, J. C. (2017). Measuring the natural rate of interest: International trends and determinants. Journal of International Economics, 108, S59-S75.

Authors of the summary: Yan Shuo, Zhao Shijie

| Research Question |

This paper applies the Laubach-Williams methodology to the United States and three other advanced economies-Canada, the Euro Area, and the United Kingdom to estimate the natural rates of interest and output and the trend growth rate of output. This model applies the Kalman filter to data on real GDP, inflation, and the short-term interest rate to extract highly persistent components of the natural rate of output, its trend growth rate, and the natural rate of interest. This approach contrasts with other research that has focused on short-term fluctuations in the natural rate of interest, assuming the longer-run value is constant, it views the shorter-term perspective in the existing studies to be complementary to longer-run approach.



| Main Conclusions |

This paper estimated the natural rates of interest and output and the trend growth rate of output in four economies - Canada, the Euro Area, the United Kingdom, and the United States - using a version of the Laubach and Williams (2003) model. The main conclusions of this paper are listed below:

(1) This paper found evidence of time-variation in the natural rate of interest in all four economies.

(2) There is a downward trend in estimated natural rates of interest: Toward the end of their sample, the estimated natural rates of interest in all four economies have fallen to historically low levels. This is in large part explained in their model by a significant decline in the estimated trend growth rates found in all four economies, but other highly-persistent factors also appear to be at work. The paper found no evidence that the natural rates were moving back up recently.

(3) Although estimation is done on an economy-by-economy basis, there is substantial comovement in the estimates of the natural rates of interest and trend GDP growth across economies. This suggests an important role for so-called global factors influencing the natural rates.

(4) The estimates of the natural rate of interest are highly imprecise, reinforcing a key finding of the original Laubach and Williams (2003) paper. In fact, the natural rate estimates for the other three economies are more imprecise than those for the United States.

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> This paper estimated the natural rates of interest and output and the trend growth rate of output in four economies - Canada, the Euro Area, the United Kingdom, and the United States - using a version of the Laubach and Williams (2003) model.

| Contribution |

This paper makes several key contributions to the understanding and estimation of the natural interest rate. The main contributions are:

(1) Comprehensive estimation across economies: Analysis based on U.S. data suggests that the natural rate of interest has moved significantly lower over the past quarter century, with a sharp drop occurring over the past decade (Williams, 2015; Hamilton et al,2015; Johannsen st al.,2016; Juselius et al., 2016; Kiley, 2015; Laubach et al., 2016; Lubik et al., 2015). Compared with these research, this paper extends to other advanced countries. It extends the Laubach-Williams (2003) model to estimate the natural rate of interest for four major economies: the United States, Canada, the Euro Area, and the United Kingdom. This extension allows for a consistent and comparative analysis across different economies, highlighting the variations and commonalities in natural interest rate across these regions. The authors use a state-space model with the Kalman filter, which accommodates time-varying parameters and captures dynamic changes in the natural rate of interest.

(2) Long-term perspective on natural rate decline: While previous studies, such as those by Andrés et al. (2009), Barsky et al. (2014), Neiss and Nelson (2003), and Woodford (2003), often assume a constant longer-run natural rate, this paper focuses on time-variation and the long-term decline in the natural rate since the global financial crisis. Furthermore, recent analyses using dynamic stochastic general equilibrium (DSGE) models, like those by Cúrdia (2015), Cúrdia et al. (2015), and Goldby et al. (2015), also observe a significant decrease in the natural rate post-crisis. The paper contributes by integrating these insights into a comprehensive framework that accounts for both short-term and long-term variations. This approach provides a more holistic understanding of the natural rate, making it complementary to the findings of short-term studies and offering valuable insights for long-term monetary policy planning.

(3) Global factors and interdependence: The research emphasizes the significant role of global factors in determining the natural rate of interest. The findings indicate substantial comovement in the estimates of natural interest rate across the studied economies, suggesting that global economic conditions and trends significantly influence these rates. This interdependence underscores the importance of considering international perspectives when analyzing natural rates of interest, as developments common to many countries drive the observed declines rather than isolated national factors.

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| Discussion |

(1) These findings in the paper suggest that declining natural rates of interest are an international phenomenon and therefore stem in large part from developments common to many countries, rather than idiosyncratic national factors. This argues for more research that takes an international perspective in analyzing natural rates, by including data from economies besides the United States and by examining structural changes that influence natural rates across the globe. In addition, research using alternative model specifications more suited for each economy's features may yield more precise estimates and insights into the robustness of the paper's results to alternative approaches.

(2) As discussed in Laubach and Williams (2016), very low natural rate of interest, if sustained into the future, have profound implications for monetary policy (see also Blanchard et al., 2010, Summers, 2014). All else equal, a lower average real interest rate in turn implies that episodes of monetary policy being constrained at the effective zero lower bound are likely to be more frequent and longer. Moreover, the paper's finding that natural rates have declined in a number of major advanced economies suggests that this is not a problem unique to the United States, but has broader consequences globally. For example, as discussed in Eggertsson et al. (2015), in an environment of a very low natural rate of interest, the effects of the lower bound on interest rates are amplified and international spillovers and the benefits from international policy coordination may increase.

Global Trends in Interest Rates

The paper: Del Negro, M., Giannone, D., Giannoni, M. P., & Tambalotti, A. (2019). Global trends in interest rates. Journal of International Economics, 118, 248-262.

Authors of the summary: Hu Die, Yin Huanyu

| Research Question |

The world economy has long remained mired in a low-interest-rate environment. It raises wide concern about the role global factors plays in depressing interest rates.

By using a flexible time-series model-a vector autoregression (VAR) with common trends, this paper studies the joint dynamics of short- and long-term interest rates, inflation, and consumption for seven now-advanced economies since 1870. It offers a comprehensive and insightful analysis of the long-term trends in global real interest rates and their potential drivers, which has important implications for policymakers and investors.

| Main Conclusions |

The main conclusions include: (i) The trend in the world real interest rate for safe and liquid assets fluctuated close to 2% through the 1940s. (ii) The U.S. trend in real interest rates has become the global trend over the past four decades, as idiosyncratic trends across countries have converged due to increasing integration in international asset markets. (iii) Demand for safe and liquid assets is the factor that pushes real interest rate lower. There is an increasing “convenience yield” for safe and liquid assets, which points to a growing imbalance between the global demand for safety and liquidity and its supply.

An important implication of these findings is that the persistent macroeconomic headwinds emanating from the financial crisis, including the effects of the extraordinary policies that were put in place to combat it, are far from being the only cause of the low-interest-rate environment. Longer-standing secular forces connected with a decline in economic growth since the early 1980s and the rise of convenience yield since the late 1990s also appear to be crucial culprits, even though these trends might have been exacerbated by the crisis.

| Contribution |

It helps to explain the steady decline in real interest rates over the past few decades. The existing literature has focused on global saving glut (Bernanke, 2005), secular stagnation (Summers, 2014), demographic factors (Lunsford and West, 2017; Fiorentini et al., 2018), natural rate of interest (Lauback and Williams, 2016; Del Negro et al., 2017), and this paper contribute from the “convenience yield” perspective. Furthermore, it takes into account the co-movement in interest rates across countries, and also significantly widens the scope of the analysis by including data dating back to 1870.

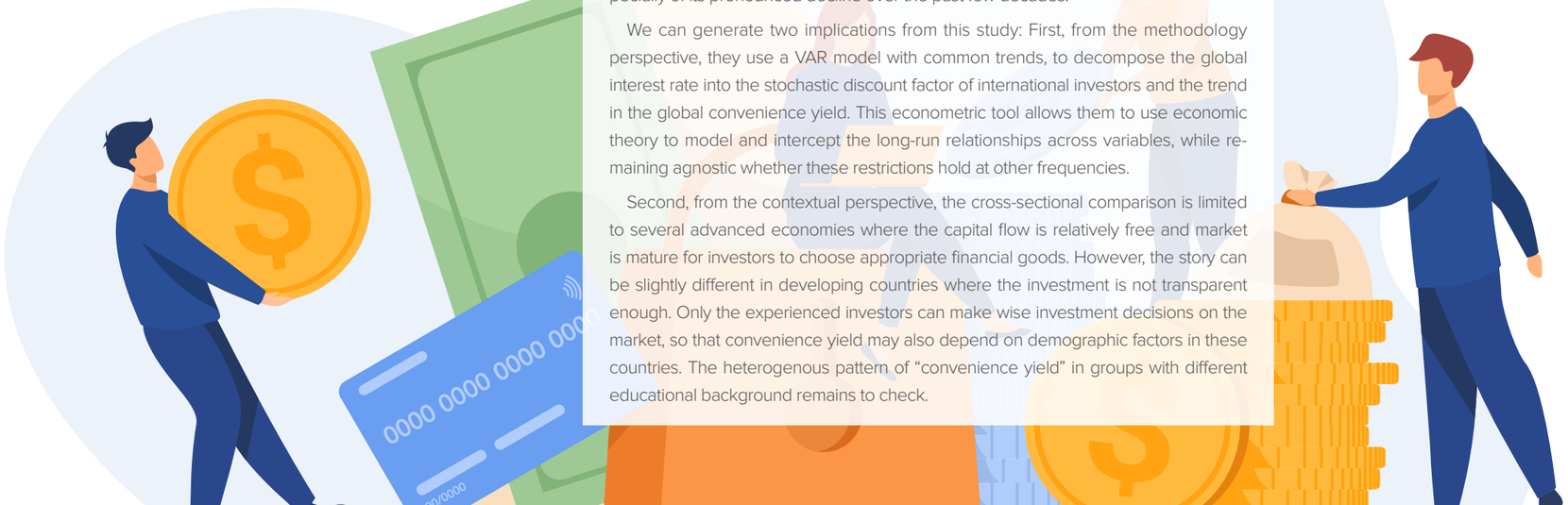
| Discussion |

The world economy has long remained mired in a low-interest-rate environment. Different from just crisis-related headwinds in shaping it, this paper offers a comprehensive and insightful analysis of the long-term trends in global real interest rates and their potential drivers. The result shows that low-frequency movements in the global convenience yield are a key driver of the trend in the world real interest rate and especially of its pronounced decline over the past few decades.

We can generate two implications from this study: First, from the methodology perspective, they use a VAR model with common trends, to decompose the global interest rate into the stochastic discount factor of international investors and the trend in the global convenience yield. This econometric tool allows them to use economic theory to model and intercept the long-run relationships across variables, while remaining agnostic whether these restrictions hold at other frequencies.

Second, from the contextual perspective, the cross-sectional comparison is limited to several advanced economies where the capital flow is relatively free and market is mature for investors to choose appropriate financial goods. However, the story can be slightly different in developing countries where the investment is not transparent enough. Only the experienced investors can make wise investment decisions on the market, so that convenience yield may also depend on demographic factors in these countries. The heterogenous pattern of “convenience yield” in groups with different educational background remains to check.

“The persistent macroeconomic headwinds emanating from the financial crisis, including the effects of the extraordinary policies that were put in place to combat it, are far from being the only cause of the low-interest-rate environment. Longer-standing secular forces connected with a decline in economic growth since the early 1980s and the rise of convenience yield since the late 1990s also appear to be crucial culprits, even though these trends might have been exacerbated by the crisis.”



Financial and Total Wealth Inequality with Declining Interest Rates

The paper: Greenwald, D. L., Leombroni, M., Lustig, H., & Van Nieuwerburgh, S. (2021). Financial and total wealth inequality with declining interest rates (No. w28613). National Bureau of Economic Research.

Authors of the summary: Chen Bixiao, Li Tuoda

| Research Question |

The primary research question of the paper is: How does a persistent decline in real interest rates impact financial wealth inequality and total wealth inequality?

| Main Conclusions |

(1) A persistent decline in real interest rates, as observed globally between the 1980s and 2010s, leads to a significant increase in financial wealth inequality. Households that rely more on financial wealth must increase savings to maintain their consumption plans in response to lower rates.

(2) The increase in financial wealth inequality is driven by the positive correlation between financial wealth and financial wealth duration. High financial-wealth households typically have portfolios with higher durations, amplifying the inequality.

(3) Despite the rise in financial wealth inequality, total wealth inequality increases much less and even declines at the top of the wealth distribution. Human wealth inequality, which is lower than financial wealth inequality, rises less sharply (human wealth refers to the present discounted value of an individual's future labor income. It represents the economic value of a person's ability to earn income over their remaining working life).

(4) The negative welfare impact of declining interest rates disproportionately affects young and low-wealth households due to their imperfectly hedged portfolios of human and financial wealth.

| Contribution |

The paper contributes to the existing literature by

(1) Building on the work of Piketty et al. (they documented the long-term trends in wealth and income inequality using extensive historical data. Piketty and collaborators highlight the link between high returns on capital and increasing wealth inequality), this paper delves deeper into the relationship between wealth inequality and declining interest rates. The authors demonstrate, both theoretically and empirically, that declining interest rates are a significant driver of financial wealth inequality. This relationship is shown to exist across multiple countries, including the U.S., U.K., and France, offering a more nuanced mechanism beyond capital returns alone.

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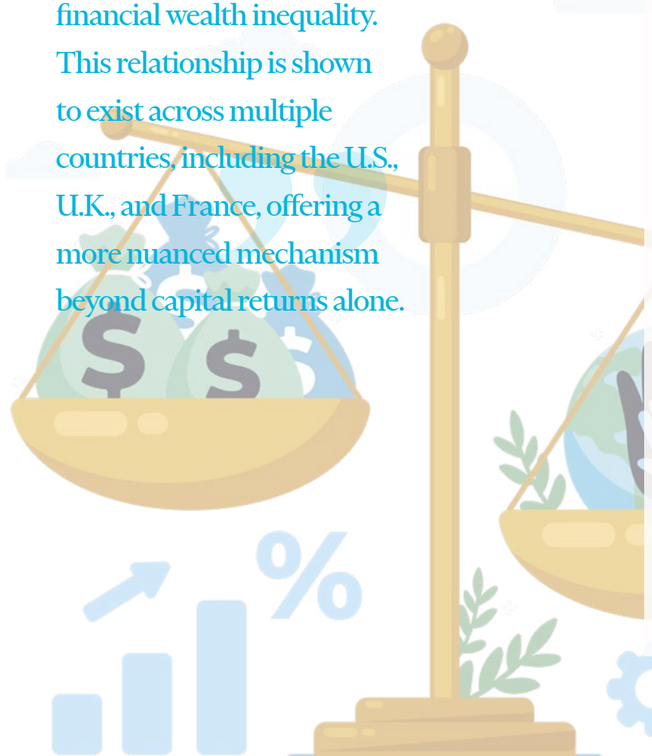

(2) This paper offers a different perspective by focusing on the impact of declining interest rates through an incomplete markets model. It expands Benhabib and Bisin's analysis (provided a comprehensive analysis of the economic theories behind wealth inequality, emphasizing factors such as saving behavior, return on investments, and inheritance) by demonstrating how interest rate changes can directly influence wealth inequality, and how different demographic groups (such as young vs. old) respond differently to these changes.

(3) While Zucman focuses on global capital flows as a key driver of wealth concentration, this paper focuses on how domestic financial markets respond to interest rate changes and how this influences wealth distribution. The analysis reveals that declining rates differentially impact wealth inequality across various demographic groups, adding to Zucman's discussion on global wealth distribution by incorporating national-level factors.

(4) This paper introduces a novel explanation for rising wealth inequality, suggesting that the decline in interest rates leads to an increase in financial wealth inequality, particularly due to the positive correlation between financial wealth and its duration. This theoretical contribution adds a new dimension to the discussion on how different households' wealth levels evolve due to interest rate changes.

| Discussion |

The findings presented in this paper shed light on the intricate relationship between financial wealth inequality and declining interest rates, offering a nuanced understanding of how these dynamics interact within the broader context of economic growth and household welfare. The study meticulously illustrates that while financial wealth inequality has significantly increased, particularly among the top wealth holders, the total wealth inequality, which includes human wealth, displays a much more subdued response to declining interest rates.

One of the core insights from this analysis is the disproportionate impact of declining real interest rates on households with varying compositions of financial and human wealth. The paper argues that households heavily reliant on financial wealth experience substantial capital gains as interest rates fall, necessitating a recalibration of wealth to maintain pre-existing consumption plans. This phenomenon underpins the observed rise in financial wealth inequality, as those with higher initial financial wealth are better positioned to benefit from these gains, thereby exacerbating inequality at the top of the wealth distribution.

However, the study also reveals a more complex picture when considering total wealth inequality. By incorporating human wealth into the analysis, it becomes evident that the rise in inequality is not as pronounced as it is when examining financial wealth alone. In fact, for some segments of the population, particularly those with substantial human wealth (such as younger households with many working years ahead), total wealth inequality may even decrease slightly. This finding challenges the conventional narrative that declining interest rates uniformly exacerbate wealth inequality, suggesting instead that the impact is more heterogeneous across different types of wealth and demographic groups.

The implications of these findings are significant for both economic theory and policy. From a theoretical perspective, the study highlights the importance of considering the duration and composition of household wealth when assessing the impact of macroeconomic changes. The positive correlation between financial wealth and the duration of excess consumption plans is particularly crucial, as it explains why wealth inequality increases more in environments with declining interest rates. This insight could inform future models that seek to predict the distributional effects of monetary policy changes.

On the policy front, the results suggest that measures aimed at mitigating financial wealth inequality may need to be more targeted, particularly towards those households that rely predominantly on financial wealth. Moreover, the study hints at the potential benefits of policies that enhance human capital, as human wealth plays a stabilizing role in overall wealth inequality. For policymakers concerned with the broader implications of inequality on social and economic stability, these findings underscore the need for a nuanced approach that considers both financial and human wealth.

Jess Benhabib

Paulette Goddard Professor of Political Economy
New York University

Alberto Bisin

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Professor of Economics
Elected Fellow of the Econometric Society

Demographics and the Natural Real Interest Rate: Historical and Projected Paths for the Euro Area

The paper: Papetti, A. (2021). Demographics and the natural real interest rate: historical and projected paths for the euro area. Journal of Economic Dynamics and Control, 132, 104209.
Authors of the summary: Lyu Zelin, Guo Wu

| Research Question |

The fact that real interest rates have been on a downward trend since the late 1980s across many countries leads to ask whether the natural interest rate has decreased as well and whether it will remain low in the years ahead, potentially hampering the effectiveness of monetary policy.

At the same time, developed economies are experiencing aging demographic changes, and demographic characteristics can be viewed as potential "slow-moving secular forces" as explanatory factors behind the downward trend in real interest rates, based on the fact that demographic characteristics have strong predictability and definite time- lags characteristics.

Papetti (2021) quantifies the impact of demographic change on the natural rate of interest in the euro area by employing a large-scale overlapping generation model in a closed economy, providing a mechanistic decomposition of the channels of influence.

| Main Conclusions |

Papetti (2021) structurally disentangles the mechanisms affecting demographics and the natural rate of interest. It finds that two opposing forces, the downward impact of labor scarcity and longer life expectancy, and the upward impact of a rising proportion of leavers and the crowding out effect of the pension system, play against each other, and that the downward force of the natural rate of interest is dominant in terms of the final result. Besides, it finds three ways to mitigate the negative effects of ageing and partially offset the downward pressure on the natural interest rate: (1) increasing the productive substitutability between labor and capital and the intertemporal elasticity of substitution of consumption, (2) the existence of a pay-as-you-go pension system through the crowding out of productive capital, and (3) the introduction of reforms to increase the relative productivity and participation of older age groups.

To simulate non-zero long-run economic growth, the authors introduce exogenous time-varying total factor productivity (TFP) growth as a new calibration, which is smoothed using the Hodrick-Prescott (HP) filter, and compares the simulation results of the model to the econometric estimation results, which are found to be consistent. After acknowledging that demographics and total factor productivity growth are the main drivers of the natural interest rate, the study finds that about two thirds of the decline in the natural interest rate in the euro area is attributable to demographics, providing evidence that demographics play a prominent role in explaining low-frequency variations in the natural interest rate and output.

| Contribution |

Prior to Papetti's paper, there have been a number of papers exploring the macroeconomic level implications of the demographic transition. Since the seminal contribution by Auerbach and Kotlikoff (1987), OLG models are considered the most reliable tool to evaluate the macroeconomic effect of demographic change as they allow to use the full empirical age distribution, in a context of a flexible life-cycle behavior.

Attanasio, Kitao and Violante (2007), Krueger and Ludwig (2007) examine the impact of the demographic transition on welfare, capital accumulation, and equilibrium factor prices in open economies. Studies similar to this paper focus on the relationship between demographics and real interest rates within a single closed economy, e.g., Gagnon, Johannsen and Lopez-Salido (2021) projections for the United States, Bielecki, Brzoza-Brzezina and Kolasa (2020) projections for Europe, and Sudo and Takizuka (2019) projections for Japan. The purpose here is not to further refine their theoretical structure. Rather, to offer a quantification (for the euro area) of the total effect of aging as well as of the different channels in isolation in a model where the full age-structure of the population is allowed.

The decline in the natural interest rate poses a major challenge to the conduct of monetary policy, especially in the context of the zero lower bound of monetary policy. This paper revisits the issue based on a demographic framework, measuring the role of measures such as reforms of the pension system and the structure of production and consumption in mitigating the negative impact of ageing on the natural interest rate, and providing more insights into understanding the relationship of them.

"After acknowledging that demographics and total factor productivity growth are the main drivers of the natural interest rate, the study finds that about two thirds of the decline in the natural interest rate in the euro area is attributable to demographics, providing evidence that demographics play a prominent role in explaining low-frequency variations in the natural interest rate and output."

Discussion

Papetti's analysis is based on a large-scale overlapping generation model in a neoclassical framework, where heterogeneous subjects have specific age profiles and demographics are used as a "secular force" (Eggertsson 2019) to explore the impact on the natural interest rate. This contrasts with other model-based approaches to studying the impact of population ageing on real interest rates, such as Ikeda and Saito (2014) and Ferrero, Gross and Neri (2019).

Papetti shows how the transmission of demographic factors to natural interest rates is affected by other elements of economic environment. For example, without considering the tax system and the social security system, the simulated time path of the natural interest rate will be biased downwards if the social security system is not appropriately modelled.

while the ongoing demographic transition has definite time-lags, that allow to have a relatively clear picture of demographics in the future, its macroeconomic impact going forward might be altered by fundamental changes in the underlying structure of the economy. Stähler (2021) Expands on this by introducing technological change in the nature of the production function, exploring the macroeconomic impact of an ageing population and robotic automation technology. In addition, changes in the endogenous growth process of human capital investment and issues related to public debt sustainability and social affordability could lead to distortions in the original impact relationship. All these potential changes are outside the scope of the model adopted in this paper, but provide interesting avenues for future research.

> While the ongoing demographic transition has definite time-lags, that allow to have a relatively clear picture of demographics in the future, its macroeconomic impact going forward might be altered by fundamental changes in the underlying structure of the economy.

A Goldilocks Theory of Fiscal Deficits

The paper: Mian, A. R., Straub, L., & Sufi, A. (2022). A goldilocks theory of fiscal deficits (No. w29707). National Bureau of Economic Research.
Authors of the summary: Sun Bo, Chen Man

Research Question

The research question of this paper is to systematically study the fiscal cost of borrowing and the joint dynamics of public debt and primary deficits. Specifically, it explores under what conditions a greater primary deficit can be sustained without causing explosive debt dynamics or even lead to a reduction in debt, especially in the context of very low interest rates and the possible binding zero lower bound (ZLB) constraint. It also examines the role of inequality and tax progressivity in fiscal space and the dynamics of debt and deficits, and calibrates the model to quantify the fiscal space for the United States and Japan.

> The research question of this paper is to systematically study the fiscal cost of borrowing and the joint dynamics of public debt and primary deficits.

Main Conclusions

The main conclusion of this paper is as follows: The traditional view of debt and deficits suggests that raising deficits leads to an explosive path for government debt unless deficits are reduced at some point in the future. However, this paper argues that debt may not explode when $R < G - \varphi$, where R is the interest rate, G is the growth rate, φ is the sensitivity of $R - G$ to the logarithm of public debt to GDP. Under this condition, the increase in deficits is modest, which is referred to as the "free lunch" scenario. Additionally, if the economy is at the zero lower bound (ZLB) and the nominal growth rate is sufficiently responsive to increased deficits, debt may not even rise.

The paper further demonstrates that inequality has different effects on fiscal space depending on the economic context. Outside the ZLB, rising income inequality increases fiscal space as it allows governments to borrow more cheaply from savers. However, at the ZLB, inequality reduces fiscal space as it reduces the nominal growth rate, rather than the nominal interest rate, thus having a negative impact on fiscal space.

This paper quantifies fiscal space in the United States and Japan in 2019. It suggests that the United States had very little room for free lunch policies at that time. In contrast, Japan had significant room for free lunch policies. The ZLB region in Japan is large and "backward bending," which implies that modestly raising the deficit may reduce the debt level in the long run.

In summary, the paper provides a more nuanced understanding of the relationship between debt, deficits, and fiscal space, taking into account factors such as the ZLB, inequality, and the specific economic conditions of different countries.

A Goldilocks Theory of Fiscal Deficits

| Contribution |

The paper has the following four contributions:

1. Proposing the correct condition for the "free lunch" policy: The paper points out that the condition for the existence of a "free lunch" policy is not $R < G$,but a stricter one, $R < G - \varphi$, where R is the interest rate, G is the growth rate , ϕ is the sensitivity of $R - G$ to the logarithm of public debt to GDP. Even in countries where $R < G$, increasing borrowing may not be free. For example, when the government decides to borrow one additional dollar and plans to roll it over forever, this fiscal choice will have two opposing effects on the government's budget constraint. On the one hand, rolling over the additional dollar produces a positive cash flow for the government equal to G-R On the other hand, the additional borrowing also tightens the budget constraint due to its impact on the interest rate of all infra-marginal outstanding debt positions, and φ precisely captures this effect. Combining these two effects leads to the "free lunch" condition $R < G - \varphi$.

2. Characterizing the dynamics of debt and deficits near the ZLB: In many economies that are close to the ZLB, deficits are an important instrument to increase aggregate demand. The paper shows that at the ZLB, greater deficits may reduce rather than increase debt. This is because greater deficits raise aggregate demand and inflation, which translates into higher nominal growth rates. This pushes debt down as it increases the speed at which debt is "inflated away". This indirect effect through the nominal growth rate can be strong enough to overwhelm the direct effect of greater deficits on debt.

3. Studying the role of inequality and tax progressivity: Inequality is crucial for government debt since up to 69% of US government debt is directly or indirectly held by households in the top 10% of the wealth distribution. By introducing saver and spender households, the paper shows that increased inequality, modeled as a greater share of income earned by savers, increases fiscal space outside the ZLB as it reduces R^*. However, at the ZLB, inequality reduces fiscal space as it reduces aggregate demand and nominal growth rates. Additionally, the paper points out that large redistributive programs may reduce fiscal space, limiting the extent to which such programs can be deficit-financed; regressive taxation can finance a higher level of government debt than progressive taxation; and financial repression reduces the resources of savers, requiring even more stringent financial repression.

4. Quantifying the fiscal space in the United States and Japan: By calibrating the model, the paper measures the shape of the deficit-debt locus for the United States and Japan, and determines the maximum permanent deficit, the associated debt level beyond which a free lunch policy ceases to be feasible, and the debt level at which R rises above G for both countries. For the United States, the calibration suggests that there was limited room for free lunch policies at the end of 2019; while for Japan, there was significant room for such policies. Furthermore, in the ZLB region of Japan, a modest increase in deficits may reduce the debt level, while regressive policies may increase the debt level, and redistribution increases fiscal space and allows the government to reduce its debt.

In summary, this paper provides a new perspective and important insights into understanding government debt and fiscal policy by deeply analyzing the fiscal space and the dynamics of debt and deficits.

| Discussion |

This subsection discusses two additional points related to the model. The first is the transversality condition, which is given by $e^{-\bar{r}t} c_t^{-1} b_t \to o$ and is clearly satisfied in the equilibria as $c_t = 1 - x$ and b_t always converges to a finite value.

The second is the usefulness of working with the government's flow budget constraint instead of the present value budget constraint. The flow budget constraint is more practical as it avoids the issue of the path of debt not being eliminable from the present value constraint, which defeats one of the main purposes of writing a present value constraint. Additionally, the paper compares the model to a money - in - the - utility model and shows that while both have a real asset entering the utility function directly, there are crucial differences in the price level determination and the ability to achieve a free lunch.

The final concern pertains to the generalization capability of the model. Currently, there is a dearth of research regarding the examination of whether the model is capable of explaining a wider range of regions and periods.

> This paper provides a new perspective and important insights into understanding government debt and fiscal policy by deeply analyzing the fiscal space and the dynamics of debt and deficits.

Demographics and Real Interest Rates Across Countries and Over Time

The paper: Carvalho, C., Ferrero, A., Mazin, F., & Nechio, F. (2023). Demographics and Real Interest Rates Across Countries and Over Time. Available at SSRN 4667307.
Authors of the summary: Cui Chang, Ren Hangdong

Research Question

The research question of this paper is motivated by a real-world observation that, real interest rates in advanced economies exhibited a pronounced and persistent decline between 1990 and the onset of the Covid-19 pandemic but increased meaningfully since 2022, both in long- and short-term as central banks worldwide had to tighten monetary policy to fight high inflation.

So, the real-world question that the paper raises is that whether advanced economies will return to an environment of low real interest rates once central banks manage to tame inflation and normalize monetary policy.

To answer to this question, we need to ultimately depend on the underlying trends behind interest rate movements, or the factors that are likely to be important drivers of equilibrium real rates (Rachel and Smith, 2017).

Thus, this paper tries to answer a more specific question that how, the demographics, as a low-frequency driver of real interest rates drive real rates across countries, with the existence of international capital mobility frictions. In this sense, this paper tries to explore whether demographical patterns in cross sectional and time-series data should align well with real interest rates across countries and over time.

However, this paper also has to carefully think about two challenging questions in pursuing the answer. First, in a world with international capital mobility, a country's real rate should depend also on global demographic developments. How to disentangle these two? Second, confounders may affect real rates, so how to uncover the relation we want? These are also important questions.

> First, in a world with international capital mobility, a country's real rate should depend also on global demographic developments. How to disentangle these two? Second, confounders may affect real rates, so how to uncover the relation we want? These are also important questions.

Main Conclusions

The primary conclusion of this paper is that the demographic trends that most are an explanation for the decline of global real interest rates across advanced economies between 1990 and 2020.

A calibrated three-country model highlights how low-frequency movements in a country's real interest rate depend on both its own and global demographic trends. The weight on global demographic variables is increasing in the degree of global financial integration. Conversely, domestic demographic developments matter less for the real interest rate of a highly financially integrated country.

Finally, this paper finds that world real interest rate, which summarizes global factors, is consistently significantly correlated with country-specific real interest rate in all specifications, while demographic variables remain important determinants of real interest rates, along with pension spending. This correlation becomes less robust when we fail to take the degree of financial integration into account.

Contribution

There are three primary contributions of this paper.

First, a key contribution of this paper is that it allows for investigating the demographics on real interest rates with imperfect capital mobility within an open economy. However, those previous literature considers only two extreme cases of either closed economies or fully-integrated capital markets.

Second, this paper expands on the paper Fiorentini et al. (2018) which highlight the importance of the share of young workers in accounting for the rise and fall of real rates between 1960 and 2016. This paper employs an econometric specification that is informed by the structural model and consider a number of additional candidate explanations.

Third, in the model of this paper, the real rate is the return on both government bonds, physical capital, and private claims. Abstracting from aggregate uncertainty and imperfect competition, this model fails to capture macroeconomic risk and markups which drives the wedge between the return on equity and the return on government bonds. Therefore, this paper focus on the comparison between the real interest rate in the model with the real yield on government bonds in the data.

> A key contribution of this paper is that it allows for investigating the demographics on real interest rates with imperfect capital mobility within an open economy. However, those previous literature considers only two extreme cases of either closed economies or fully-integrated capital markets.

Determinants of Global Neutral Interest Rates

The paper: Ferreira T R T, Shousha S. Determinants of global neutral interest rates[J]. Journal of International Economics, 2023, 145: 103833.
Authors of the summary: Li Kexin, Liu Haizhen

Research Question

This paper comprehensively studies the determinants of global long-term neutral interest rates. This paper establishes a transnational model including 11 developed economies, and considers several economic determinants, such as trend productivity, population structure, global security asset supply and demand, as well as the global spillover effects of productivity and population development from other parts of the world faced by each economy.

Specifically, the model has two characteristics that have not been explored before. First of all, it includes many potential determinants of neutral interest rate, and combines the statistical uncertainty of the correlation of these determinants. Secondly, the transnational model captures the theoretical prediction that in a financially open economy, interest rates are determined by global market forces, so foreign development can have a decisive impact on domestic neutral interest rates (Clarida, 2019, Obstfeld, 2020).

Main Conclusions

This paper provides a comprehensive account of the determinants of global longer-run neutral interest rates. Firstly, the paper finds that the supply of safe assets is an important determinant of longer-run neutral rates. The model estimates that fluctuations in the safe asset supply account for an average of 26% of the variance of neutral rates across countries. Moreover, the safe asset supply contributed to the path of neutral rates in important historical periods: a decline in the 1960s–70s, a rebound in the early 1980s, and the steady decline during the 2000s. Since 2008, the increasing supply of safe assets has prevented neutral rates from further declining because of other factors, such as transitioning demographics, and global spillovers from demographic and productivity developments.

The paper also finds that economies' longer-run neutral rates are subject to important global spillovers from developments in other economies. First, these spillovers play a significant role in explaining the trajectories of neutral rates. Secondly, the global spillover effect helps to explain the international coordinated movement of neutral interest rates. The model has three drivers, which contribute to the statistical global common factors of neutral interest rate estimated by other papers (Kiley, 2019; Del Negro et al., 2019): Synchronous behaviors of global determinants (supply and demand of safe assets and convenience income), specific economic determinants (productivity and population), and global spillover effects of these specific economic determinants.

> "First, in a world with international capital mobility, a country's real rate should depend also on global demographic developments. How to disentangle these two? Second, confounders may affect real rates, so how to uncover the relation we want? These are also important questions."

Contribution

Contrary to the previous research, this paper comprehensively expounds the driving factors of global neutral interest rate, and considers (i) the supply and demand factors of safe assets; (ii) Variables related to the savings and investment framework, such as productivity and demographic data; (iii) Global spillover effect in the determination of neutral exchange rate; (iv) Statistical uncertainty about the correlation of these previous economic drivers. Crucially, due to (i)-(iv), the paper establishes an independent framework to decompose the change of neutral interest rate into a wide list of economic driving factors, which is a work neglected by these papers.

This paper also contributes to a growing body of literature that researches the global scarcity of safe assets and its effects in the real economy (e.g., Caballero et al., 2016). Importantly, Caballero et al. (2021) argue that safe asset scarcity has global implications, as net safe asset producers export these assets to net safe asset absorbers until interest rates are equalized across countries, acting as a global factor on interest rates across countries. The finding of sovereign safe asset supply and demand factors as global determinants of neutral rates provides empirical support to these theoretical results.

Finally, this paper is also related to the literature on the determinants of the yield curve of US Treasury bonds, more specifically, the influence of foreign demand on the yield of US Treasury bonds. The conclusion is that since the mid-1990s, the policy-driven demand for safe assets (such as international foreign exchange reserves) has depressed the long-term neutral interest rate, which is consistent with the view that foreign official purchases have an impact on the yield of US Treasury bonds.

Discussion

In this paper, the authors deeply discuss the determinants of global long-term neutral interest rate, especially the supply of safe assets, demand factors, productivity, demographic factors and global spillover effects. Through the analysis of transnational models of 11 developed economies from 1960 to 2019, the study reveals how these factors work together to affect the neutral interest rate trajectory and co-mobility of each country.

First, the supply of safe assets is recognized as an important determinant of long-term neutral interest rates. The article points out that since the global financial crisis in 2008, the supply of safe assets has increased significantly, which has stabilized the neutral interest rate level to some extent. The increase in the supply of safe assets, especially the supply of US Treasury bonds, provides the liquidity and security needed by the market, which in turn affects the behavior of investors and the level of interest rates. This finding is consistent with previous studies and emphasizes the core position of safe assets in the global financial system.

Secondly, the global spillover effect plays an important role in the change of neutral interest rate. The article points out that the slowdown of productivity and demographic changes in other countries have had a significant impact on neutral interest rates in major economies such as the United States. This phenomenon shows that the global economy is increasingly interconnected, and national economic policy makers need to pay attention to the changes in the international economic environment in order to better understand and predict the trend of domestic interest rates. This view provides an important reference for policy makers and emphasizes the importance of considering global economic dynamics when formulating monetary policy.

In addition, the paper also discusses the influence of population aging on neutral interest rate. With the increase of the aging population, the saving behavior and investment preference have changed, which leads to an increase in the demand for safe assets. This change not only affects the level of neutral interest rate, but also has a far-reaching impact on economic growth and investment decision. Policymakers need to pay attention to this trend in order to make corresponding adjustments in future economic policies.

The paper also emphasizes the role of policy-driven demand for safe assets in the determination of neutral interest rate. After the financial crisis, various countries implemented a series of financial supervision measures, which led to an increase in the demand for safe assets. This phenomenon shows that when designing the financial regulatory framework, policymakers need to take into account the changes in the demand for safe assets to ensure the stability and liquidity of the financial market.

Generally speaking, this study provides a new perspective for understanding the determinants of global long-term neutral interest rates. By comprehensively considering the supply of safe assets, demand factors, productivity, demographic factors and global spillover effects, the authors reveal the complexity and diversity of neutral interest rate changes. This research not only enriches the economic theory, but also provides important empirical evidence for policy makers to help them make more informed decisions in the complex economic environment. Future research can further explore how to optimize the supply and demand structure of security assets in different economic environments in order to achieve more efficient resource allocation and economic growth.

Estimating the Effects of Demographics on Interest Rates: A Robust Bayesian Perspective

The paper: Ho, P. . (2020). Estimating the effects of demographics on interest rates: a robust Bayesian perspective. Journal of Economics and Control, 158, 104772.
Authors of the summary: Zhang Jiayu, Shu Danyi

Research Question

The main purpose of this paper is to explore the reason for the vast range of estimates for the impact of secular changes in demographics on interest rates. Based on overlapping generations (OLG) models, various studies estimate these effects but still not reach an agreement on the extent of the impact. One of the reasons is that different values of the structural parameters (β,σ,δ) (i.e. discount rate, intertemporal elasticity of substitution (IES), and capital depreciation rate) are used in the literature.

The author shows that the effect of demographics on interest rates is not well-identified with the data typically used in the literature even though other parameters are well-identified. Without additional data on capital and life-cycle consumption, the calibrations in the literature can produce misleading results.

Thomas Bayes
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> The author shows that the effect of demographics on interest rates is not well-identified with the data typically used in the literature even though other parameters are well-identified. Without additional data on capital and life-cycle consumption, the calibrations in the literature can produce misleading results.

Main Conclusions

The authors begin by noting that there is disagreement in the various literatures regarding the extent to which demographic data affects interest rates. To explore the problem, the author follows three steps: Firstly, he uses Bayesian methods to estimate the structural parameters of an OLG model and show that (β,σ,δ) are not well-identified by the data. Secondly, he uses nonparametric prior sensitivity analysis to show how the prior for these parameters influences the estimated effects of demographics on interest rates. Finally, he shows that including data on the capital-output ratio and consumption over the life cycle can tighten the likelihood. Without these data, calibrating or estimating OLG models can lead to misleading conclusions about the quantitative effect of demographics.

In this paper, the author emphasizes that the estimated effects of demographics depend on the underlying structural parameters (β,σ,δ). When the economy is on the steady state, the OLG model captures four main channels through which an aging demographic affects the steady-state interest rate. Any demographic change influences the interest rate through a combination of these channels and all of them are based on the underlying structural parameters (β,σ,δ). But these parameters are not well-identified without additional data and lead to a disagreement of estimated effects in various literature. It's worth noting that the quantitative estimates from calibrated OLG models may be sensitive to their calibration. Introducing aggregate capital and life-cycle consumption data is a helpful approach to narrow the posteriors and reduce the prior sensitivity.

Contribution

The results in this paper inform the quantitative estimates from calibrated OLG models, and indicate that the existing literature may be sensitive to their calibration such as Ikeda and Saito (2014), Sudo and Takizuka (2020). This paper also uses prior sensitivity analysis, extending the study on identification in representative agent models to OLG models, for example, Canova and Sala (2009), Iskrev (2010). Differing with related work Janssens (2020), the author finds that the capital depreciation rate is poorly identified even with direct observations of the labor share.

The methodologies that this paper uses also contribute to the existing literature, including relative entropy prior sensitivity (REPS), Bayesian approach. The structural break framework contributes to the literature on estimating models using specific frequencies of the data (Smets and Wouters, 2007; Sala, 2015).

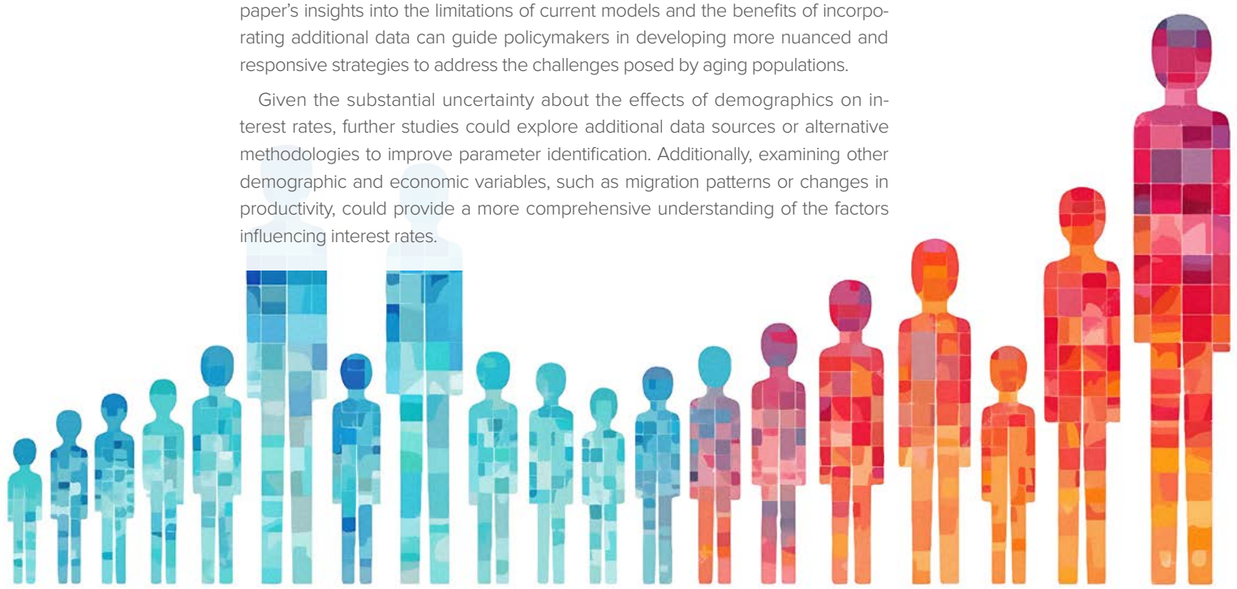
Discussion

The effects of an aging population on the interest rate crucial for forecasting and policy analysis. The paper highlights the critical need to accurately quantify the effects of demographic changes on interest rates. The significant discrepancies in previous estimates—from a 0.3 percentage point decline to as much as 2.5 percentage points—underscore the sensitivity of these estimates to the models and parameters used. The use of Bayesian techniques allows for a more flexible and nuanced estimation process, accommodating various priors and incorporating additional data to refine estimates. The prior sensitivity analysis, particularly through the REPS methodology, reveals the extent to which different assumptions can influence the estimated effects of demographics on interest rates.

The findings of this paper have direct implications for policymakers and economic forecasters. Accurate estimates of how demographic changes affect interest rates are essential for designing effective monetary and fiscal policies. The paper's insights into the limitations of current models and the benefits of incorporating additional data can guide policymakers in developing more nuanced and responsive strategies to address the challenges posed by aging populations.

Given the substantial uncertainty about the effects of demographics on interest rates, further studies could explore additional data sources or alternative methodologies to improve parameter identification. Additionally, examining other demographic and economic variables, such as migration patterns or changes in productivity, could provide a more comprehensive understanding of the factors influencing interest rates.

> The findings of this paper have direct implications for policymakers and economic forecasters. Accurate estimates of how demographic changes affect interest rates are essential for designing effective monetary and fiscal policies. The paper's insights into the limitations of current models and the benefits of incorporating additional data can guide policymakers in developing more nuanced and responsive strategies to address the challenges posed by aging populations.



References

Andrés, J., López-Salido, J. D., & Nelson, E. (2009). Money and the natural rate of interest: Structural estimates for the United States and the euro area. Journal of Economic Dynamics and Control, 33(3), 758-776.

Attanasio, O., S. Kitao and G. L. Violante (2007). "Global demographic trends and social security reform." Journal of Monetary Economics 54(1): 144-198.

Auerbach, A. J., & Kotlikoff, L. J. (1987). "Evaluating fiscal policy with a dynamic simulation model. " The American Economic Review, 77(2), 49-55.

Baldwin, R., & Teulings, C. (2014). Secular stagnation: facts, causes and cures. London: Centre for Economic Policy Research-CEPR.

Barsky, R., Justiniano, A., & Melosi, L. (2014). The natural rate of interest and its usefulness for monetary policy. American Economic Review, 104(5), 37-43.

Benhabib, J., & Bisin, A. (2018). Skewed wealth distributions: Theory and empirics. Journal of Economic Literature, 56(4), 1261-1291.

Berger, T., Kempa, B., & Zou, F. (2023). The role of macroeconomic uncertainty in the determination of the natural rate of interest. Economics Letters, 11119.

Bernanke, B. (2005). The global saving glut and the US current account deficit (No. 77). Board of Governors of the Federal Reserve System (US).

Bielecki, M., M. Brzoza-Brzezina and M. Kolasa (2020). "Demographics and the natural interest rate in the euro area." European Economic Review 129.

Caballero, R. J., & Simsek, A. (2021). A model of endogenous risk intolerance and LSAPs: asset prices and aggregate demand in a "COVID-19" shock. The Review of Financial Studies, 34(11), 5522-5580.

Caballero, R. J., Farhi, E., & Gourinchas, P. O. (2016). Safe asset scarcity and aggregate demand. American Economic Review, 106(5), 513-518.

Canova, F., Sala, L. (2009). Back to square one: identification issues in DSGE models. Journal of Monetary Economics, 56 (4), 431–449.

Clarida, R. (2019). The global factor in neutral policy rates: Some implications for exchange rates, monetary policy, and policy coordination. International Finance, 22(1), 2-19.

Cour-Thimann, P., R. Pilegaard, and L. Stracca (2006). The output gap and the real interest rate gap in the euro area, 1960-2003. Journal of Policy Modeling 28, 775-790.

Cuaresma, J., Gnan, E., & Ritzberger-Gruenwald, D. (2004). Searching for the natural rate of interest: a euro area perspective. Empirica, 31, 185-204.

Cúrdia, V. (2015). Why so slow? A gradual return for interest rates. FRBSF Economic Letter, 32.

Cúrdia, V., A., Ferrero, G. C. Ng, and A. Tambalotti (2015). Has US monetary policy tracked the efficient interest rate?. Journal of Monetary Economics 70, 72- 83.

Del Negro, M., D., Giannone, M. P. Giannoni, and A. Tambalotti (2017). Safety, liquidity, and the natural rate of interest. Brookings Papers on Economic Activity No. 1, 235-316.

Del Negro, M., Giannone, D., Giannoni, M. P., & Tambalotti, A. (2017). Safety, liquidity, and the natural rate of interest. Brookings Papers on Economic Activity, 2017(1), 235-316.

Del Negro, M., Giannone, D., Giannoni, M. P., & Tambalotti, A. (2019). Global trends in interest rates. Journal of International Economics, 118, 248-262.

Eggertsson, G. B., N. R. Mehrotra and J. A. Robbins (2019). "A Model of Secular Stagnation: Theory and Quantitative Evaluation." American Economic Journal: Macroeconomics 11(1): 1-48.

Ferrero, G., M. Gross and S. Neri (2019). "On secular stagnation and low interest rates: Demography matters." International Finance 22(3): 262-278.

Fiorentini, G., A. Galesi, G. Perez-Quiros, and E. Sentana (2018). The Rise and Fall of the Natural Interest Rate. CEPR Discussion Papers 13042.

Fiorentini, G., Galesi, A., Pérez-Quirós, G., & Sentana, E. (2018). The rise and fall of the natural interest rate.

Fries, S., Mésonnier, J. S., Mouabbi, S., & Renne, J. P. (2018). National natural rates of interest and the single monetary policy in the euro area. Journal of Applied Econometrics, 33(6), 763-779.

Gagnon, E., B. K. Johannsen and D. Lopez-Salido (2021). "Understanding the new normal: The role of demographics." IMF Economic Review 69: 357-390.

Giammarioli, N., and N. Valla (2003). The natural real rate of interest in the euro area. European Central Bank Working Paper Series No. 233.

Goldby, M., Laureys, L., & Reinold, K. (2015). An estimate of the UK's natural rate of interest. Bank Underground (Bank of England blog).

Hamilton, J. D., E. S. Harris, J. Hatzius, and K. D. West (2016). The equilibrium real funds rate: Past, present, and future. IMF Economic Review, 64, 660-707.

Hamilton, J. D., Harris, E. S., Hatzius, J., & West, K. D. (2015). The equilibrium real funds rate: Past, present and future (No. w21476). National Bureau of Economic Research.

Ikeda, D. and M. Saito (2014). "The effects of demographic changes on the real interest rate in Japan." Japan and the World Economy 32: 37-48.

Ikeda, D., Saito, M. (2014). The effects of demographic changes on the real interest rate in Japan. Japan World Economy, 32, 37–48.

Iskrev, N. (2010). Local identification in DSGE models. Journal of Monetary Economics, 57 (2), 189–202.

Janssens, E. (2020). Identification in Heterogeneous Agent Models. Working paper.

Johannsen, B. K., & Mertens, E. (2021). A Time- Series Model of Interest Rates with the Effective Lower Bound. Journal of Money, Credit and Banking, 53(5), 1005-1046.

Juselius, M., Borio, C. E., Disyatat, P., & Drehmann, M. (2016). Monetary policy, the financial cycle and ultra-low interest rates.

Kiley, M. T. (2015). What can the data tell us about the equilibrium real interest rate?.

Kiley, M. T. (2020). The global equilibrium real interest rate: concepts, estimates, and challenges. Annual Review of Financial Economics, 12(1), 305-326.

Krueger, D. and A. Ludwig (2007). "On the consequences of demographic change for rates of returns to capital, and the distribution of wealth and welfare." Journal of Monetary Economics 54(1): 49-87.

Laubach, T., & Williams, J. C. (2003). Measuring the natural rate of interest. Review of Economics and Statistics, 85(4), 1063-1070.

Laubach, T., & Williams, J. C. (2016). Measuring the natural rate of interest redux. Business Economics, 51, 57-67.

Laubach, T., & Williams, J. C. (2016). Measuring the natural rate of interest redux. Business Economics, 51, 57-67.

Lubik, T. A., & Matthes, C. (2015). Calculating the natural rate of interest: A comparison of two alternative approaches. Richmond Fed Economic Brief, (Oct).

Lubik, T. A., and C. Matthes (2015). Calculating the natural rate of interest: A comparison of two alternative approaches. Richmond Fed Economic Brief, October, 1-6.

Lunsford, K. G., & West, K. D. (2019). Some evidence on secular drivers of US safe real rates. American Economic Journal: Macroeconomics, 11(4), 113-139.

Neiss, K. S., & Nelson, E. (2003). The real-interest-rate gap as an inflation indicator. Macroeconomic dynamics, 7(2), 239-262.

Neri, S., & Gerali, A. (2019). Natural rates across the Atlantic. Journal of Macroeconomics, 62, 103019.

Obstfeld, M. (2020). Globalization cycles. Italian Economic Journal, 6(1), 1-12.

Papetti, A. (2021). "Demographics and the natural real interest Rate: historical and projected paths for the euro area." Journal of Economic Dynamics and Control 132.

Piketty, T., & Saez, E. (2003). Income inequality in the United States, 1913–1998. The Quarterly journal of economics, 118(1), 1-41.

Piketty, T., Saez, E., & Zucman, G. (2018). Distributional national accounts: methods and estimates for the United States. The Quarterly Journal of Economics, 133(2), 553-609.

Rachel, L. and T. Smith (2017). Secular Drivers of the Global Real Interest Rate. International Journal of Central Banking 13, 1-42.

Sala, L. (2015). DSGE models in the frequency domain. Journal of Applied Economics, 30, 219–240.

Smets, F., & Wouters, R. (2007). Shocks and frictions in US business cycles: A Bayesian DSGE approach. American economic review, 97(3), 586-606.

Smets, F., Wouters, R. (2007). Shocks and frictions in U.S. business cycles: a Bayesian DSGE approach. American Economic Review, 97 (3), 586–606.

Stähler, N. (2021). "The Impact of Aging and Automation on the Macroeconomy and Inequality." Journal of Macroeconomics 67.

Sudo, N. and Y. Takizuka (2019). "Population Aging and the Real Interest Rate in the Last and Next 50 Years: A Tale Told by an Overlapping Generations Model." Macroeconomic Dynamics 24(8): 2060-2103.

Sudo, N., Takizuka, Y. (2020). Population aging and the real interest rate in the last and next 50 years: a tale told by an overlapping generations model. Macroeconomic Dynamics, 24 (8), 2060–2103.

Us, V. (2018). Measuring the natural interest rate for the Turkish economy. 52nd issue (January 2018) of the International Journal of Central Banking.

Wang, B. (2019). Measuring the natural rate of interest of China: A time varying perspective. Economics Letters, 176, 117-120.

Wang, B., & Kwan, Y. K. (2021). Measuring the natural rates of interest of OECD and BRICS economies: A time varying perspective. Journal of International Money and Finance, 112, 102326.

Williams, J. C. (2015). The decline in the natural rate of interest. Business Economics, 50, 57-60.

Woodford, M. (2003). Interest and Prices: Foundations of a Theory of Monetary Policy," Princeton University.

Wynne, M.A., Zhang, R (2018a). Estimating the natural rate of interest in an open economy. Empirical Economics. 55(3), 1291–1318 (2018a).

Wynne, M.A., Zhang, R. (2018b). Measuring the world natural rate of interest. Economic Inquiry, 56 (1), pp. 530-544.

Zhang, Ren & Martínez-García, Enrique & Wynne, Mark A. & Grossman, Valerie, 2021. Ties that bind: Estimating the natural rate of interest for small open economies. Journal of International Money and Finance, Elsevier, vol. 113(C).

Zucman, G. (2019). Global wealth inequality. Annual Review of Economics, 11(1), 109-138.