

School of Social Sciences, University of Surrey

September 15th - September 19th, 2025

Online Macroeconomics Summer School: Advanced
Macro-Modelling



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1 Introduction

The Centre for International Macroeconomic Studies (CIMS) in the School of Social Sciences, University of Surrey will hold an online Summer course, September 15th - September 19th 2025.

The advanced course is aimed at researchers who are already fluent in Dynare and DSGE modelling or who wish to learn directly more advanced techniques. This course will be useful both for advanced PhD students, academic researchers, and central bank researchers engaged in macroeconomic modelling work. The advanced course covers models that are either computationally expensive to simulate, nonlinear, require additional recursive assumptions, or have infinite dimensional state-spaces thanks to heterogeneous agents and optimal taxation.

Given the very successful experience of the previous years we have decided to keep the online format for the Summer school. This enables many participants to attend from all over the world without the need to travel. The course will be conducted using Team meeting platform. The university and the lecturers have extensive experience with online teaching and have state-of-the-art systems to do so as well as being able to deliver highly interactive lectures. Though we will do our best to record all the sessions, we are expecting participants to attend them live to enable them to interact with lectures and ask questions. Participants will be sent computer codes, lecture notes, and slides ahead of time. Participants will also receive direct assistance before the Summer school starts in order to set up all the systems ahead of the online events.

2 Instructors

Cristiano Cantore is a Professor of Economics at Sapienza University of Rome. He graduated from Bocconi University (Milan, Italy) in 2004. He then completed his MSc degree in Economics at Pompeu Fabra University (Barcelona, Spain). In 2010 he completed his Ph.D. in Economics at the University of Kent. He worked at the University of Surrey from 2009 until 2023 and at the Bank of England from 2018 to 2023. Cristiano has also worked at the OECD and the ECB as a trainee, visiting the Bank of Spain in 2012 as a research fellow and the University of California at San Diego as a visiting professor in 2014. Cristiano's research interests include monetary and fiscal policies, with a particular focus on macro labour issues. He has published in these areas in the Journal of Monetary Economics, Journal of European Economic Association, Journal of Economic Dynamics and Control, The Scandinavian Journal of Economics, Macroeconomic Dynamics and Economics Letters. For further details of publications see <http://www.cristianocantore.com/>

Hyungseok Joo is a Lecturer in the School of Social Sciences at the University of Surrey. He graduated from the Yonsei University (Seoul, South Korea). He then completed masters degree in Economics at University of Wisconsin, then he worked as a research analyst in tax and public finance area in a research institution in Korea. In 2015, he completed his PhD in Economics at Boston University, USA. He taught at the Wayne State University, USA, before being appointed as a Lecturer at the University of Surrey in 2019. His research fields are macroeconomics, international economics, and fiscal/monetary policy. For further details of publications see <https://sites.google.com/site/hsjoo214>

Ricardo Nunes is a professor and co-Director of the Centre of International Macroeconomic Studies at the University of Surrey. He obtained a PhD from Universitat Pompeu Fabra in 2007. He joined the Board of Governors of the Federal Reserve System in 2007, where he worked as an economist and senior economist. In 2014 he moved to the Federal Reserve Bank of Boston working as a senior economist and policy advisor. He was also a visiting researcher at the Bank of Portugal and the IMF. In 2018 and 2019 he worked at the Council of Economic Advisers to the Chancellor of the Exchequer. His main research is on monetary and fiscal policy. He has published in these areas in journals such as the Quarterly Journal of Economics, Journal of Political Economy, Journal of Monetary Economics, Journal of Economic Theory,

Journal of European Economic Association, among others. For further details of publications see <https://sites.google.com/view/ricardonunes/home>

Don Park is a senior economist at the Bank of Korea. He has a PhD and a MSc in economics from the University of Surrey and a BA from Seoul National University. He worked at the Bank of Korea as a Junior Economist from 2008-2014 and as an Economist from 2014-2016. His research focuses on macroeconomics, monetary policy, inflation expectations and consumption behaviour.

Luca Rondina is a Lecturer in Economics at the University of Sussex. He obtained a PhD degree at the University of Surrey in 2019. He graduated from the Politecnico di Milano in Industrial Engineering obtaining a BSc in 2012 and a MSc in 2015. His research focuses on macroeconomics, taxation, and labor supply.

Kirill Shakhnov is a Senior Lecturer in the School of Social Sciences at the University of Surrey. In 2015, he completed his Ph.D. in Economics at European University Institute, Italy. He then held the Foscolo Europe Fellowship position at the Einaudi Institute for Economics and Finance and taught at LUISS University, before being appointed as a Lecturer at the University of Surrey in 2019. Kirill's primary research interests lie in the fields of international macroeconomics with a focus on sovereign bond markets and cryptocurrencies. The research is organized around three related topics: asset pricing of internationally traded assets, public finance, and the sources of macroeconomic fluctuations. For further details, please see <https://sites.google.com/site/kshakhnov>

Hitoshi Tsujiyama is a Senior Lecturer at the University of Surrey. Prior to joining Surrey in 2022, he was an Assistant Professor at Goethe University Frankfurt in Germany. He received his PhD in Economics from the University of Minnesota, USA in 2013, and his BA and MA from the University of Tokyo, Japan. He has also worked as a research analyst at the Federal Reserve Bank of Minneapolis, USA. His research interests include macroeconomics and public finance. He has published in journals such as the Journal of Political Economy and the Journal of Monetary Economics. Website: <https://sites.google.com/site/hitoshitsujiyama/>

Vytautas Valaitis is a macroeconomist with a research focus on labour markets and optimal fiscal policy. His work on the intersection of macro and labor economics studies how household

labour market outcomes and their labour supply choices affect the macroeconomic dynamics and change the implications for government policies. His work on optimal fiscal policy studies the optimal mix of fiscal and monetary policies when government can borrow in multiple types of debt instruments. Vytautas holds a Ph.D. from Duke University and prior to that he studied at the Central European University in Budapest and the ISM University of Management and Economics in Vilnius. He was a Max Weber Fellow at the European University Institute before joining the University of Surrey as a lecturer in the Fall 2022

3 Course Timetable (BST)

09.30 am - 11.00 am: Session 1

11.00 am - 11.30 am: Break

11.30 am - 01.00 pm: Session 2

01.00 pm - 02.15 pm: Lunch

02.15 pm - 03.45 pm: Session 3

03.45 pm - 04.15 pm: Break

04.15 pm - 05.45pm : Session 4

4 Course Contents

The advanced course is aimed at people who are already fluent in Dynare and Matlab, but are finding that their ambition currently exceeds what they are able to do with these tools. We aim to distribute some of the numerical and computational tricks we have picked up over the course of our careers to enable people to tackle non-standard models. This course will be useful to anyone who is engaged in practical macroeconomic modelling work, especially if they are interested in working with models that are either computationally expensive to simulate, nonlinear, or infinite dimensional thanks to heterogeneous agents or optimal taxation.

- **Day 1: Applied Dynamic Programming and Global Solution Algorithms**

Instructor: Joo, Nunes

- The basic theory of dynamic programming
- Numerical Integration
- Function Approximation
- Value Function Iteration
- Policy Function Iteration
- Projection Methods
- Exercises in Lab (all day)

- **Day 2: Tractable Heterogeneous Agents Models**

Instructor: Cantore

- Summary of the key insights from the TANK/HANK literature
 - TANK and THANK models as in Bilbiie (2021)
 - * Inverted Aggregate Demand Logic
 - * Cyclical Inequality and iMPCs
 - * Forward Guidance
 - Zero-Liquidity HANK
 - Exercises in Lab (all day)
- **Day 3: Classical Heterogeneous Agents Models and Occasionally Binding Constraints**

Instructor: Shakhnov, Valaitis

- Computational Issues in Models with Heterogeneous Agents
 - Solving Heterogenous-Agent Models without Aggregate Uncertainty: the Model of Aiyagari
 - Solving Heterogenous-Agent Models with Aggregate Uncertainty: the Krussell-Smith Algorithm
 - Alternative Algorithms
 - Exercises in Lab (all day)
- **Day 4: Central Bank Communication, Imperfect Credibility, and Optimal Monetary Policy Applications**

Instructor: Nunes, Park, Rondina

- Policy communication and central bank design
- Price level targeting and alternative objectives
- Credibility and imperfect commitment
- Time-Inconsistency and Recursive Contracts
- Zero lower bound, exit strategies, and normalization policy
- Applications to medium and large scale models
- Exercises in Lab (all day)

• **Day 5: Inequality and Optimal Taxation**

Instructor: Tsujiyama

- Facts on Inequality
- Heterogeneous Agents Model and Ramsey Taxation
- Introduction to Mirrlees Taxation
- Solution of the fully non-linear tax systems
- Comparison of Ramsey and Mirrlees Policies
- Exercises in Lab (all day)