Macquarie University Econometrics Workshop

Date: October 23, 2025

Location: Room 120 (Ground Floor), 1 Management Drive,
Macquarie Park, NSW 2113
(Macquarie University MGSM)

Welcome to the **Econometrics Workshop** at Macquarie University. This event showcases eleven paper presentations on a wide range of topics delivered by distinguished scholars in econometrics. The workshop is officially supported by the **Department of Economics** and the **Macquarie Minds and Intelligence Initiative**.

Program Schedule

8:45 - 9:00 Opening Remarks by John Romalis (Head of Department, Macquarie University)

9:00 - 10:30 Functional Data

- Dakyung Seong (University of Sydney)
  Functional Linear Projection and Impulse Response Analysis
- Hanlin Shang (Macquarie University)
  Temporal hierarchical functional time series forecasting: An application to particulate number size distribution
- Won-Ki Seo (University of Sydney)
  Functional regression with persistent nonstationarity and error contamination

10:30 - 11:00 Morning Tea

11:00 - 12:00 Econometric Modelling and Policy Evaluation

- Anders Rahbek (University of Copenhagen)
  Beyond the Mean: Limit Theory and Tests for Infinite-Mean Autoregressive Conditional Durations
- Shuping Shi (Macquarie University)
  Bubble Mitigation Policies: Counterfactual Analysis and Treatment Effect Inference

12:00 - 13:30 Lunch

13:30 - 15:00 Inference and Dynamic Responses

- Giuseppe Cavaliere (University of Bologna)
  Bootstrap diagnostic tests
- Nan Zou (Macquarie University)
  Statistical inference with optimal sampling
- Seojeong Jay Lee (Seoul National University)
  What Impulse Response Do Instrumental Variables Identify?

15:00 - 15:30 Afternoon Tea

15:30 - 17:00 Panel Data and Spatial Econometrics

- Yongcheol Shin (University of York)
  SFDID
- Wooyong Lee (University of Technology Sydney)
  Difference-in-differences with dynamic treatment choices
- Hanbat Jeong (Macquarie University)
  Connected Trade Flows: A Spatial Econometric Approach

17:30 - Dinner

- Venue: Panda Yum Cha
  Shop 3390/55-61 Talavera Rd, Macquarie Park NSW 2113

Paper Abstracts

Functional Linear Projection and Impulse Response Analysis
Presenter: Dakyung Seong (University of Sydney)
This paper proposes econometric methods for studying how economic variables respond to function-valued shocks. Our methods are developed based on linear projection estimation of predictive regression models with a function-valued predictor and other control variables. We show that the linear projection coefficient associated with the functional variable allows for the impulse response interpretation in a functional structural vector autoregressive model under a certain identification scheme, similar to well-known Sims' (1972) causal chain, but with nontrivial complications in our functional setup. A novel estimator based on an operator Schur complement is proposed and its asymptotic properties are studied. We illustrate its empirical applicability with two examples involving functional variables: economy sentiment distributions and functional monetary policy shocks.

Temporal hierarchical functional time series forecasting: An application to particulate number size distribution
Presenter: Hanlin Shang (Macquarie University)
Particulate matters are often measured at different time scales, such as hour, day, week, or fortnight. Forecasting particulate number size distribution (PNSD) at different scales plays an important role in developing environmental policy from hourly to fortnightly scale. However, independent forecasts at the hourly scale may not add up to the forecasts at the fortnight scale. To address this issue, we consider reconciling forecasts of PNSD, extending the methods of temporal hierarchical aggregation to functional time series, where PNSD is treated as a continuum and measured densely and irregularly spaced at 51 different sizes. The temporal hierarchical functional time series forecasting methods are proposed to produce point forecasts of the PNSD that are aggregated appropriately across different time scales. For evaluating forecast uncertainty, we propose a model-agnostic and distribution-free method for reconciling interval forecasts. Using the PNSD data from 3/January/2011 to 28/October/2018 in London, we investigate and compare the forecast accuracy between the independent and reconciled forecasts. The proposed methods are shown to be useful for reconciling forecasts of the PNSD at various time scales. Because of the temporal hierarchy, one can achieve improved forecast accuracy averaged over different time scales.

Functional regression with persistent nonstationarity and error contamination (with Kyungsik Nam, Hankuk University of Foreign Studies)
Presenter: Won-Ki Seo (University of Sydney)
This paper studies a functional regression model in which the nonstationary stochastic trend(s) of a dependent functional variable are explained by those of an explanatory functional variable. The model extends the cointegrating regression framework from conventional time series analysis. We develop novel autocovariance-based estimation and inference methods for this setting. The methodology is broadly applicable to economic and statistical functional time series with nonstationary dynamics. As an illustration—and due to its intrinsic importance—we apply it to assess the economic impact of climate change.

Beyond the Mean: Limit Theory and Tests for Infinite-Mean Autoregressive Conditional Durations (with G. Cavaliere, T. Mikosch, A. Rahbek and F. Vilandt)
Presenter: Anders Rahbek (University of Copenhagen)
Integrated autoregressive conditional duration (ACD) models serve as natural counterparts to the well-known integrated GARCH models used for financial returns. However, despite their resemblance, asymptotic theory for ACD is challenging and also not complete, in particular for integrated ACD.

Central challenges arise from the facts that (i) integrated ACD processes imply durations with infinite expectation, and (ii) even in the non-integrated case, conventional asymptotic approaches break down due to the randomness in the number of durations within a fixed observation period. Addressing these challenges, we provide here unified asymptotic theory for the (quasi-) maximum likelihood estimator for ACD models; a unified theory which includes integrated ACD models. Based on the new results, we also provide a novel framework for hypothesis testing in duration models, enabling inference on a key empirical question: whether durations possess a finite or infinite expectation. We apply our results to high-frequency cryptocurrency ETF trading data. Motivated by parameter estimates near the integrated ACD boundary, we assess whether durations between trades in these markets have finite expectation, an assumption often made implicitly in the literature on point process models. Our empirical findings indicate infinite-mean durations for all the five cryptocurrencies examined, with the integrated ACD hypothesis rejected – against alternatives with tail index less than one – for four out of the five cryptocurrencies considered.

Bubble Mitigation Policies: Counterfactual Analysis and Treatment Effect Inference

Presenter: Shuping Shi (Macquarie University)

To safeguard economic and financial stability policymakers regularly take actions designed to increase resilience to systemic risks and curb speculative market behavior. To assess the effectiveness of such mitigation policies, we introduce a counterfactual approach tailored to accommodate the mildly explosive dynamics that occur during speculative bubbles. We derive asymptotics of the estimated treatment effect under a common factor structure that allows for explosive, I(1), and stationary factors, thereby having applicability to a wide range of prevailing economic conditions. An inferential procedure is proposed for the policy treatment effect that has asymptotic validity and demonstrates satisfactory finite sample performance. An empirical analysis examines the monetary policy of interest rate hikes implemented by the Reserve Bank of New Zealand, beginning in October 2021.This policy exerted a statistically significant cooling effect on all regional housing markets in New Zealand. Our findings show that this policy led to 2%-18% reductions in house prices of six regions seven months after the enactment of the interest rate hike.

Bootstrap diagnostic tests (with Luca Fanelli and Iliyan Georgiev)

Presenter: Giuseppe Cavaliere (University of Bologna)

Violation of the assumptions underlying classical (Gaussian) limit theory frequently leads to unreliable statistical inference. This paper shows the novel result that the bootstrap can detect such violation by means of simple and powerful tests which (a) induce no pre-testing bias, (b) can be performed using the same critical values in a broad range of applications, and (c) are consistent against deviations from asymptotic normality. By focusing on the discrepancy between the conditional distribution of a bootstrap statistic and the (limiting) Gaussian distribution which obtains under valid specification, we show how to assess whether this discrepancy is large enough to indicate specification invalidity. The method, which is computationally straightforward, only requires a sample of i.i.d. draws of the bootstrap statistic. We derive sufficient conditions for the randomness in the data to mix with the randomness in the bootstrap repetitions in a way such that (a), (b) and (c) above hold. To demonstrate the practical relevance and broad applicability of our diagnostic procedure, we discuss five scenarios where the asymptotic Gaussian approximation may fail: (i) weak instruments in instrumental variable regression; (ii) non-stationarity in autoregressive time series; (iii) parameters near or at the boundary of the parameter space; (iv) infinite variance innovations in a location model for i.i.d. data; (v) invalidity of the delta method due to (near-)rank deficiency in the implied Jacobian matrix.

Statistical inference with optimal sampling

Presenter: Nan Zou (Macquarie University, School of Mathematical and Physical Sciences)
In classic statistical inference, Ordinary Least Squares regression (OLS) has been the workhorse in studying the effect of one or more predictors on response. However, for datasets with massive sample sizes, which are increasingly prevalent these days, the OLS can be computationally infeasible. To speed up the OLS for massive datasets, the optimal sampling OLS selects an optimal small subset of samples from the original massive number of samples. Despite its considerable popularity, it seems unclear what conditions can guarantee optimal sampling OLS's asymptotical normality. This talk will first introduce the optimal sampling OLS procedure and then investigate the conditions for its asymptotical normality. Specifically, it seems (1) when the number of predictors is fixed, the optimal sampling OLS is asymptotically normal if and only if the OLS itself is asymptotically normal, and (2) when the number of predictors goes to infinity, the optimal sampling OLS requires a more restrictive condition than the OLS. This work is joint with A. Welsh.

What Impulse Response Do Instrumental Variables Identify? (with Bonsoo Koo, Myung Hwan Seo, and Masaya Takano)
Presenter: Seojeong Jay Lee (Seoul National University)
Macroeconomic shocks are often composites of multiple components. We show that the local projection-IV (LP-IV) estimand aggregates component-wise impulse responses with potentially negative weights, challenging its causal interpretation. To address this, we propose identification strategies using multiple sign-restricted IVs or disaggregated data, which recover structurally meaningful responses even when individual LP-IV estimands are non-causal. We also show that, under weak stationarity, the identified sets are sharp and cannot be further narrowed in some key cases. Applications to fiscal and monetary policy demonstrate the practical value of our approach.

SFDID (with Marc Chan (Melbourne), Matt Greenwood-Nimmo (Melbourne), Simon Kwok (Sydney))
Presenter: Yongcheol Shin (University of York)
Following the rapidly evolving field of causal inference under network interference, we develop a class of regression-based estimators, called the spatial- and factor-dependent difference-in-difference estimators (SFDID). We propose the novel LDT algorithms as follows: (i) Using the data for both treatment and control groups from the pre-intervention periods, we estimate all the parameters including the group-wise spatial parameters by QML. (ii) Next, we estimate unobserved factors by applying the principal components to residuals constructed for the control group for all time periods. (iii) Using factor proxies estimated from control units and assuming that the unobservables follow an interactive effects structure, we finally estimate the main parameter of treatment effect, employing the data for the treatment group from all time periods.

We clarify the conditions under which the estimands represent useful causal parameters of interest. We establish that the SFDID estimator is consistent and follows asymptotic normal distribution under fairly mild conditions. Via Monte Carlo simulations we confirm the satisfactory finite-sample performance of the SFDID estimator. We then develop a framework for network analysis based on diffusion multipliers. We apply these tools to redress the effects of welfare waiver programs on welfare caseloads in the US.

Difference-in-differences with dynamic treatment choices
Presenter: Wooyong Lee (University of Technology Sydney)
This paper studies difference-in-differences (DID) models in which units may enter treatment in response to their lagged outcomes and predetermined covariates, allowing for behaviors such as workers enrolling in a job training program after a dip in their earnings. This dynamic treatment choice leads to selection on unobservables and violates the standard parallel trends assumption, making standard DID models not applicable. This paper shows that, under such treatment choice and a weaker paral-

lel trends assumption, the average treatment effect on the treated (ATT) is not point-identified but rather partially identified. This paper then proposes an easy-to-implement procedure for estimation and inference about the ATT.

Connected Trade Flows: How Trade Networks Endogenize Trade Costs and Amplify Pair-Specific Heterogeneity—A Spatial Econometric Approach (with Jieun Lee, Emory University)
Presenter: Hanbat Jeong (Macquarie University)
This paper introduces a network interaction model for origin-destination flows with a particular focus on trade flows and its corresponding estimation method. We derive a new type of gravity equation that illustrates how trade flows are shaped by a network-interaction-based trade cost structure, resulting in mutually recursive interdependence and amplified pair-specific heterogeneity. Specifically, by adopting the structure of the widely used spatial autoregressive model, we endogenize the trade cost mechanism, yielding a new specification that extends beyond the conventional exogenous iceberg costs. For estimation, we employ a Poisson pseudo-maximum-likelihood estimator targeting the conditional mean of trade flows in levels. Our approach ensures robust statistical inference by accommodating arbitrary correlation and heteroscedasticity in the error structure. Monte Carlo simulations demonstrate the consistency of our estimator and its reasonable nominal coverage.

In our empirical application, we suspect different structures and sources of consensus effects across four phases: Phase 1 (1986, trade liberalization), Phase 2 (1997, active NAFTA implementation), Phase 3 (2007, emergence of the China trade shock), and Phase 4 (2016, expansion of global supply chains). We identify variations in spillover patterns among trade pairs across these phases. We investigate whether differences in spillover mechanisms lead to varying effects of trade policies, such as tariffs or free trade agreements. Our impact analysis further addresses several critical questions, including how country-specific shocks—such as economic restructuring or changes in trade policy—affect international trade flows, and how geopolitical conflicts between two countries influence third-party nations. Finally, we examine how risks originating from dominant economies propagate, potentially causing welfare losses for consumers.

Participant Information (Alphabetical order)

1. **Giuseppe Cavaliere (University of Bologna)** Giuseppe Cavaliere is Professor of Econometrics at the University of Bologna and the University of Exeter. He is Co-Editor of the *Journal of Econometrics*, a Fellow of the IAAE, and a Fellow of the *Journal of Econometrics*. He has served as President of the Italian Econometric Association and as Research Fellow at the Granger Centre for Time Series Econometrics (University of Nottingham). His research has been published in leading journals, including *Econometrica*, *Annals of Statistics*, *Journal of American Statistical Association*, *Econometric Theory*, and *Journal of Econometrics*.

2. **Hanbat Jeong (Macquarie University)** Hanbat Jeong is Senior Lecturer in Economics at Macquarie University. He received his PhD in Economics from the Ohio State University in 2019 and previously worked there as a Postdoctoral Researcher. His research focuses on spatial econometrics and dynamic interaction models.

3. **Seojeong J. (Jay) Lee (Seoul National University)** Seojeong Jay Lee is Associate Professor of Economics at Seoul National University. He earned his PhD from the University of Wisconsin-Madison in 2012. His research focuses on econometric theory, particularly inference under misspecification, instrumental variables, and GMM. He has served as Associate Editor of the *Journal of Econometrics* since 2024. His work has appeared in *Econometrica*, *Journal of Econometrics*, and *Journal of Business & Economic Statistics*. His 2019 *Journal of Econometrics* paper won the 2020 Zellner Award.

4. **Wooyong Lee (University of Technology Sydney)** Wooyong Lee is Lecturer in Economics at the University of Technology Sydney. He received his PhD in Economics from the University of Chicago. His research focuses on econometric theory for panel data, with recent contributions on sequential exogeneity in linear panel models.

5. **Anders Rahbek (University of Copenhagen)** Anders Rahbek is Professor of Econometrics at the University of Copenhagen. His research spans bootstrap methods, GARCH models, cointegrated VARs, climate risk modelling, and duration/Hawkes processes. He has published in *Econometrica*, *Journal of Econometrics*, *Econometric Theory*, and *JASA*. He has received several research prizes and competitive grants.

6. **Hanlin Shang (Macquarie University)** Hanlin Shang is Professor in the Department of Actuarial Studies and Business Analytics at Macquarie University. His research focuses on functional time series analysis with applications in demography and finance. He has published in the *Annals of Statistics* and *JASA*, and serves as Co-Editor of the *Australian and New Zealand Journal of Statistics*. He is also on the editorial boards of *JCGS*, *Computational Statistics*, *International Journal of Forecasting*, and *Demographic Research*.

7. **Won-Ki Seo (University of Sydney)** Won-Ki Seo is Senior Lecturer in Economics at the University of Sydney. He earned his PhD from UC San Diego. His research interests include econometric theory, functional data, and high-dimensional time series, with recent work on cointegration and functional IV regression.

8. **Dakyung Seong (University of Sydney)** Dakyung Seong is Lecturer in Economics

at the University of Sydney. She obtained her PhD in Economics from UC Davis in 2020 and held a visiting position at Queen's University (Canada). Her research develops econometric methods for functional regression and dynamic causal analysis in panel data.

9. **Shuping Shi (Macquarie University)** Shuping Shi is Professor of Economics at Macquarie University. Her research in financial econometrics and applied economics has been published in journals including the *Review of Financial Studies*,*Journal of Econometrics*, *International Economic Review*, *Econometric Theory*, and *Management Science*. She currently serve as an Associate Editor of *Econometric Theory* and the *Journal of Time Series Analysis*.

10. **Yongcheol Shin (University of York)** Yongcheol Shin is Professor of Econometrics at the University of York. He earned his PhD from Michigan State University in 1992. He has held positions at Cambridge, Edinburgh, and Leeds. He is internationally recognized for his contributions to time series and panel econometrics, cointegration analysis, and global VAR models. He is widely cited for developing the pooled mean group estimator and for influential work on panel unit root and cointegration testing. He has published in journals including the *Journal of Econometrics*, *Journal of Applied Econometrics*, *JBES*, and *Management Science*. He is an elected Fellow of the IAAE and recipient of the 2018 Maekyung-KAEA Economist Award.

11. **Nan Zou (Macquarie University)** Nan Zou is Lecturer in Statistics in the School of Mathematical and Physical Sciences at Macquarie University. He received his PhD in Statistics from the University of California, San Diego. His research interests include empirical processes, time series, extreme value theory, and resampling methods. His current work examines inference for massive datasets and chaotic dynamical systems.