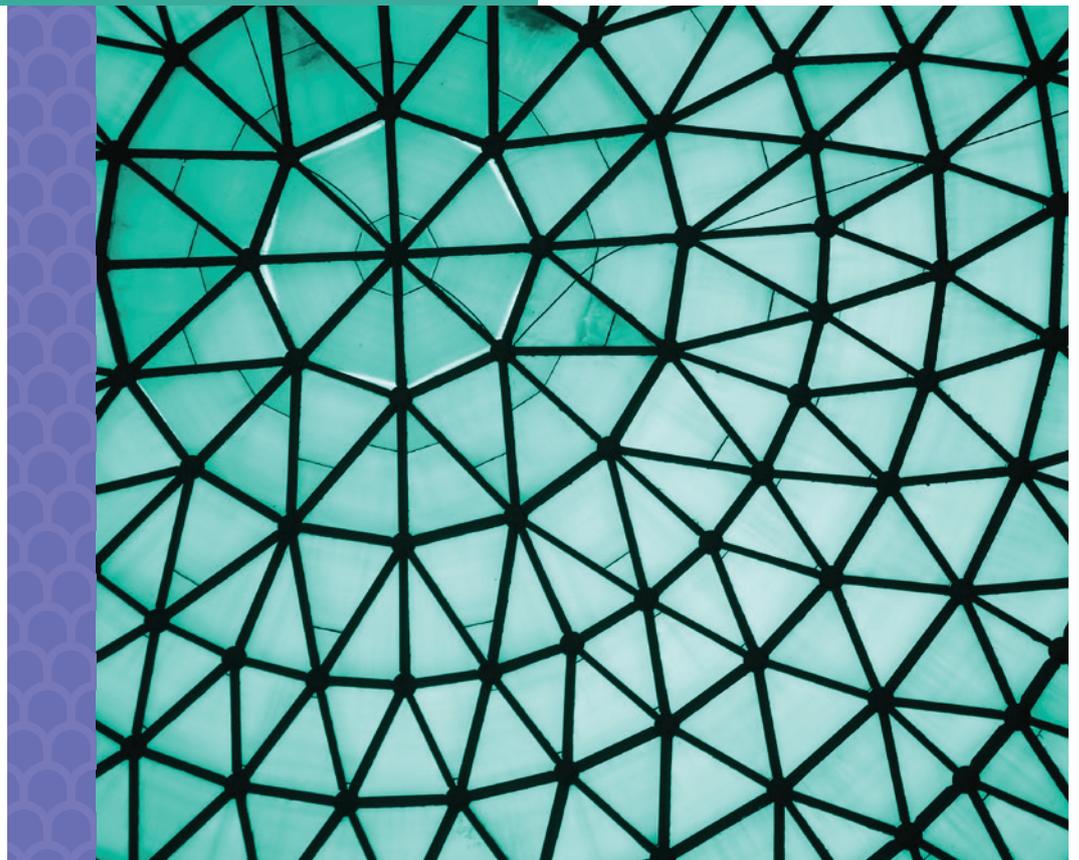BANK OF ENGLAND

KING'S College LONDON

Centre for Central Banking Studies

Modelling with big data and machine learning:
interpretability and model uncertainty

4–5 November 2019
Jointly organised by the Bank of England and the
Data Analytics for Finance and Macro Research Centre
at King's College London

Event Location: Moorgate Auditorium, Prudential
Regulation Authority, 20 Moorgate, London, EC2R 6DA

Day 1

Monday 4 November 2019

08:00 – 08:30   **Registration and coffee**

08:30 – 08:40   **Opening remarks**
Gareth Ramsay, Bank of England, Executive Directorate, Data & Statistics

08.40 – 11.00   *Session: Causal Machine Learning*
Chair: Fotis Papailias (King's College London)

08:40 – 09:20   **What is the value added by using causal machine learning methods in welfare experiment evaluation?**
Anthony Strittmatter (University of St Gallen)

Discussant: Kuan Xu (Dalhousie University, Saint Mary's University)

09:20 – 10:00   **Instrument validity tests with causal trees: With an application to the same-sex Instrument**
Helmut Farbmacher and Raphael Guber (Munich Center for the Economics of Aging)

Discussant: Nicolas Woloszko (OECD)

10:00 – 10:20   **Break**

10:20 – 11:00   **Analysing non-linear relationships between structural policies and growth with double-post-lasso**
Nicolas Woloszko, Eleonora Mavroeidi and Elia Pérennès (OECD)

Discussant: Anthony Strittmatter (University of St Gallen)

11.00 – 12.00   *Keynote* *Chair: Sinem Hacioglu (Bank of England)*
Generic machine learning inference on heterogeneous treatment effects
Victor Chernozhukov (MIT & Amazon)

12:00 – 13:00   **Lunch**

13.00 – 15.00   *Session: Big Model Estimation*
Chair: Chiara Osbat (European Central Bank)

13:00 – 13:40   **Large scale dynamic predictive regressions**
Daniele Bianchi (Queen Mary University of London) and Kenichiro McAlinn (Temple Universtity)

Discussant: Helmut Farbmacher (Munich Center for the Economics of Aging)

13:40 – 14:20   **Interpreting big data in the macroeconomy: A Bayesian mixed frequency estimator**

David Kohns, Arnab Bhattacharjee (Heriot-Watt University)

Discussant: Daniele Bianchi (Queen Mary University of London)

14:20 – 15:00   **Machine learning for zombie hunting: Firms' failures, financial constraints and Misallocation**

Armando Rungi, Massimo Riccaboni and **Falco Bargagli Stoffi** (IMT School for Advanced Studies)

Discussant: Gias Uddin (Bank of Canada)

15:00 – 15:30   **Break**

15.30 – 16.50   *Session: Text & News*
Chair: Paul Robinson (Bank of England)

15:30 – 16:10   **Does fake news affect voting behaviour?**

Nicolò Fraccaroli (University of Rome Tor Vergata), Michele Cantarella (University of Modena, ECB) and Roberto Volpe (Italian Ministry of Economic Development)

Discussant: Arthur Turrell (Bank of England)

16:10 – 16:50   **Attention to Bitcoin**

Amirhossein Sadoghi (ESC Rennes School of Business)

Discussant: Nicolò Fraccaroli (University of Rome Tor Vergata)

16.50 – 18.30   *Poster Session*
Chair: Andreas Joseph (Bank of England)

16:50 – 17:10   **See it all: One minute madness**

17:10 – 18:30   **Poster session & drinks reception**

1   **Machine learning, the treasury yield curve and recession forecasting**
         Michael Puglia and Adam Tucker (Federal Reserve Board)
2   **Anomaly detection in RTGS systems: Performance comparisons between shallow and deep Neural Networks**
         Luca Arciero, Giuseppe Bruno, Sabina Marchetti and **Juri Marcucci** (Bank of Italy)
3   **Measuring and understanding patterns of consumer credit stress**
         Gias Uddin and Brian Peterson (Bank of Canada)
4   **A Microstructure study of circuit breakers in the Chinese stock markets**
         Kuan Xu (Dalhousie University, Saint Mary's University), Steven Shuye Wang (Renmin University) and Hao Zhang (University of Victoria)
5   **Predicting bank distress in the UK with machine learning**
         Joel Suss (LSE, Bank of England) and Henry Treitel (Bank of England)
6   **Risk Scorecards with Machine Learning**

	Fabrizio Russo (4most)
7	**Boosting crises over a century a multi-country perspective**
	Luca Alfieri (University of Tartu)
8	**Financial condition indexes in an incomplete data environment**
	Miguel Herculano (University of Glasgow)
9	**Machine learning explainability in finance: An application to default risk analysis**
	Philippe Bracke (Financial Conduct Authority), Anupam Datta (Carnegie Mellon University), **Carsten Jung** (Bank of England), Shayak Sen (Carnegie Mellon University)
10	**Unsupervised anomaly detection in financial market infrastructures using neural networks: An Application to the Canadian Automated Clearing and Settlement System (ACSS)**
	Leonard Sabetti (Payments Canada) and **Ronald Heijmans** (Payments Canada, De Nederlandsche Bank, Tilburg University)
11	**Econometrics at scale: Spark up big data in economics**
	Benjamin Bluhm (external consultant at Boehringer Ingelheim) and Jannic Cutura (Goethe University, Columbia University)

19:00 – 21:00   Conference dinner (by invitation only)

Day 2

Tuesday 5 November 2019

08:00 – 08:30   Registration and coffee

08.30 – 10.30   *Session: Structural Estimation*
Chair: Arthur Turrell (Bank of England)

08:30 – 09:10   Structural estimation of dynamic equilibrium models with unstructured data

Sara Casella (University of Pennsylvania), Jesús Fernández-Villaverde (University of Pennsylvania, NBER, CEPR) and Stephen Hansen (Imperial Business School)

Discussant: Andrew Blake (Bank of England)

09:10 – 09:50   A new approach to estimating heterogeneous effects and the distribution of the marginal propensity to consume

Daniel Lewis, Davide Melcangi and Laura Pilossoph (Federal Reserve Bank of New York)

Discussant: Sara Casella (University of Pennsylvania)

09:50 – 10:30   New developments in machine learning models

Eleni Kalamara and **George Kapetanios** (King's Business School)

Discussant: David Kohns (Heriot-Watt University)

10:30 – 10:50   Break

10.50 – 12.10   *Session: Interpretability*
Chair: Imane Bakkar (Bank of England)

10:50 – 11:30   Concept tree: High-level representation of variables for more interpretable surrogate decision trees

Xavier Renard (AXA), Nicolas Woloszko (OECD), Jonathan Aigran (AXA), Marcin Detyniecki (AXA, Sorbonne University, Polish Academy of Science)

Discussant: Carsten Jung (Bank of England)

11:30 – 12:10   On the interpretability of deep neural networks in macroeconomics

George Kapetanios and **Felix Kempf** (King's College London)

Discussant: Andreas Joseph (Bank of England)

12:10 – 13:10   Lunch

13.10 – 14.10   *Keynote Chair: George Kapetanios (King's Business School)*

Argumentation-Based Interactive Explanations

Francesca Toni (Imperial College London)

14.10 – 16.40   *Session: Now & Forecasting*
Chair: Nick Bate (Bank of England)

14:10 – 14:50   **How is machine learning used for macroeconomic forecasting**

Philippe Goulet Coulombe (University of Pennsylvania) and Maxime Leroux (Université du Québec à Montréal), Dalibor Stevanovic (Université du Québec à Montréal)

Discussant: Christopher Kurz (Federal Reserve Board)

14:50 – 15:20   **Break**

15:20 – 16:00   **Nowcasting US business cycles with machine learning**

Andrés Azqueta-Gavaldón (ECB, University of Glasgow), **Dominik Hirschbuehl** (ECB), Luca Onorante (ECB) and Lorena Saiz (ECB)

Discussant: Philippe Goulet Coulombe (University of Pennsylvania)

16:00 – 16:40   **Using the yield curve to forecast economic growth**
Parley Ruogu Yang (University of Oxford)

Discussant: Michael Puglia (Federal Reserve Board)

16:40 – 16:50   **Closing remarks**
George Kapetanios (Director, DAFM, King's Business School)

Scientific committee:

- Andrew Blake (Bank of England)
- Mingli Chen (University of Warwick)
- Stephen Hansen (University of Oxford)
- Andreas Joseph (Bank of England)
- George Kapetanios (King's College London)
- Christopher Kurz (Federal Reserve Board)
- Fotis Papailias (King's Business School)
- Chris Redl (Bank of England)

Local organising committee:

- Andrew Blake (Bank of England)
- Maria Brady (Bank of England)
- Andreas Joseph (Bank of England)
- George Kapetanios (King's College London)
- Fotis Papailias (King's Business School)

Forthcoming 2020 CCBS London events

Date	Subject
24-26 February 2020	Regulation and supervision of capital adequacy in the banking sector
2-3 March 2020	Workshop for Heads of financial stability*
9-11 March 2020	Regulation and supervision of liquidity and funding risk in the banking sector
30 March-3 April 2020	Forecasting in central banks
15-17 April 2020	Central bank organisation, values and governance**
27-28 April 2020	Workshop for Heads of banking supervision*
11-12 May 2020	Chief Economists' workshop*
28-29 May 2020	Research forum on macrofinance*
1-5 June 2020	Advanced analytical tools for financial supervision and risk management
8-12 June 2020	Systemic risk assessment: identification and monitoring
19 June 2020	Workshop on Household Finance Research*
22-24 June 2020	Joint CCBS-FRBNY policy forum on the current state of market operations
29 June – 1 July 2020	Microprudential supervision tools
2-3 July 2020	Making resolution operational
13-14 July 2020	Workshop for Heads of insurance supervision*
20-28 July 2020	Applied Bayesian econometrics for central bankers
1-2 September 2020	The fintech revolution: opportunities and challenges**
21-25 September 2020	R Modelling
28-30 September 2020	Monetary policy and operations
6-8 October 2020	Central bank communication in a changing world
12-14 October 2020	Structure of financial markets
19-21 October 2020	Beyond prevention (and cyber): operational resilience of the financial sector
26-28 October 2020	Non-bank financial intermediation
2-4 November 2020	Challenges facing emerging markets and developing countries in the international monetary and financial system**
5-6 November 2020	Research forum on Advanced Analytics – topic to be confirmed

9-11 November 2020	Causal inference using microdata
16-18 November 2020	Risk management and financial supervision
23-24 November 2020	Managing financial risks from climate change
30 November – 11 December 2020	Economic modelling and forecasting

*By invitation only
***CCBS-DFID thematic seminars in London by invitation only.*

CCBS publications

Monetary policy and operations | Author(s)

State of the art of inflation targeting	Gill Hammond
Monetary operations	Simon Gray and Nick Talbot
Understanding the central bank balance sheet	Garreth Rule
Liquidity forecasting	Simon Gray
Collateral management in central bank policy	Garreth Rule
Issuing central bank securitites	Garreth Rule

Economic modelling and forecasting | Author(s)

Applied Bayesian econometrics for central bankers	Andrew Blake and Haroon Mumtaz
Deriving option-implied probability densities for foreign exchange markets	Andrew Blake and Garreth Rule

Financial stability and Prudential Regulation | Author(s)

Modelling credit risk	Somnath Chatterjee

Research and analytics | Author(s)

Text mining for central banks	David Bholat, Stephen Hansen, Pedro Santos & Cheryl Schonhardt-Bailey

The above handbooks can be downloaded from our website www.bankofengland.co.uk/ccbs

Centre for Central Banking Studies

The CCBS provides an extensive programme of events for central bankers from all over the world. These cover many of the analytical and technical areas of central banking from a practitioner's perspective. Speakers are experts in their field from the Bank of England, the London financial markets, academia and of course the participants themselves.

The seminars and other events are mostly aimed at experienced central bank personnel, who already have expertise in the subject. Participants are often asked to prepare papers beforehand and to give presentations to their course colleagues. This facilitates the sharing of diverse experiences, and contributes to the participative nature of these events, which typically study the different approaches used by central banks around the world. Most seminars include syndicate work and discussions.

Director
John Power

Senior advisers
David Barr
Andrew Blake

Advisers
Angus Foulis
Christine Jayaseelan
Matthew Pegg
Gabor Pinter
Michael Smart
Jagdish Tripathy