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 University)

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 Detyriecki (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 Papaillas (King’s Business School)
### Forthcoming 2020 CCBS London events

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<th>Date</th>
<th>Subject</th>
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<td>24-26 February 2020</td>
<td>Regulation and supervision of capital adequacy in the banking sector</td>
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<tr>
<td>2-3 March 2020</td>
<td>Workshop for Heads of financial stability*</td>
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<tr>
<td>9-11 March 2020</td>
<td>Regulation and supervision of liquidity and funding risk in the banking sector</td>
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<tr>
<td>30 March-3 April 2020</td>
<td>Forecasting in central banks</td>
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<td>15-17 April 2020</td>
<td>Central bank organisation, values and governance**</td>
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<tr>
<td>27-28 April 2020</td>
<td>Workshop for Heads of banking supervision*</td>
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<td>11-12 May 2020</td>
<td>Chief Economists’ workshop*</td>
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<td>Research forum on macrofinance*</td>
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<td>Advanced analytical tools for financial supervision and risk management</td>
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<td>8-12 June 2020</td>
<td>Systemic risk assessment: identification and monitoring</td>
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<td>19 June 2020</td>
<td>Workshop on Household Finance Research*</td>
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<td>22-24 June 2020</td>
<td>Joint CCBS-FRBNY policy forum on the current state of market operations</td>
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<tr>
<td>29 June – 1 July 2020</td>
<td>Microprudential supervision tools</td>
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<td>Making resolution operational</td>
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<td>13-14 July 2020</td>
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<td>20-28 July 2020</td>
<td>Applied Bayesian econometrics for central bankers</td>
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<td>1-2 September 2020</td>
<td>The fintech revolution: opportunities and challenges**</td>
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<td>21-25 September 2020</td>
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<td>Monetary policy and operations</td>
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<td>6-8 October 2020</td>
<td>Central bank communication in a changing world</td>
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<td>12-14 October 2020</td>
<td>Structure of financial markets</td>
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<td>19-21 October 2020</td>
<td>Beyond prevention (and cyber): operational resilience of the financial sector</td>
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<td>Non-bank financial intermediation</td>
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<td>Challenges facing emerging markets and developing countries in the international monetary and financial system**</td>
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<td>Research forum on Advanced Analytics – topic to be confirmed</td>
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<td>9-11 November 2020</td>
<td>Causal inference using microdata</td>
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<td>16-18 November 2020</td>
<td>Risk management and financial supervision</td>
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<td>23-24 November 2020</td>
<td>Managing financial risks from climate change</td>
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<td>30 November – 11 December 2020</td>
<td>Economic modelling and forecasting</td>
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*By invitation only

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

### Monetary policy and operations

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<th>Author(s)</th>
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<tr>
<td>State of the art of inflation targeting</td>
<td>Gill Hammond</td>
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<tr>
<td>Monetary operations</td>
<td>Simon Gray and Nick Talbot</td>
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<tr>
<td>Understanding the central bank balance sheet</td>
<td>Garreth Rule</td>
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<td>Liquidity forecasting</td>
<td>Simon Gray</td>
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<td>Collateral management in central bank policy</td>
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<td>Issuing central bank securities</td>
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### Economic modelling and forecasting

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<tr>
<td>Applied Bayesian econometrics for central bankers</td>
<td>Andrew Blake and Haroon Mumtaz</td>
</tr>
<tr>
<td>Deriving option-implied probability densities for foreign exchange markets</td>
<td>Andrew Blake and Garreth Rule</td>
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### Financial stability and Prudential Regulation

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<tr>
<td>Modelling credit risk</td>
<td>Somnath Chatterjee</td>
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### Research and analytics

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<tr>
<td>Text mining for central banks</td>
<td>David Bholat, Stephen Hansen, Pedro Santos &amp; Cheryl Schonhardt-Bailey</td>
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The above handbooks can be downloaded from our website [www.bankofengland.co.uk/ccbs](http://www.bankofengland.co.uk/ccbs)
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.

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