UNIVERSITY OF BRESCIA
DEPARTMENT OF ECONOMICS AND MANAGEMENT

SEMINAR

Reservoir computing for Macroeconomic Forecasting with Mixed Frequency Data

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Room A6, S. Chiara Building

Macroeconomic forecasting has recently started embracing techniques that can deal with large-scale datasets and series with unequal release periods. The aim is to exploit the information contained in heterogeneous data sampled at different frequencies to improve forecasting exercises. Currently, Mixed-Data Sampling (MIDAS) and Dynamic Factor Models (DFM) are the two main state-of-the-art approaches that allow modeling series with non-homogeneous frequencies. We introduce a new framework called the Multi-Frequency Echo State Network (MFESN), which originates from a relatively novel machine learning paradigm called reservoir computing (RC). Echo State Networks are recurrent neural networks with random weights and trainable readout. They are formulated as nonlinear state-space systems with random state coefficients where only the observation map is subject to estimation. This feature makes the estimation of MFESNs considerably more efficient than DFMs. In addition, the MFESN modelling framework allows to incorporate many series, as opposed to MIDAS models, which are prone to the curse of dimensionality. Our discussion encompasses hyperparameter tuning, penalization, and nonlinear multistep forecast computation. In passing, a new DFM aggregation scheme with Almon exponential structure is also presented, bridging MIDAS and dynamic factor models. All methods are compared in extensive multistep forecasting exercises targeting US GDP growth. We find that our ESN models achieve comparable or better performance than MIDAS and DFMs at a much lower computational cost.

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