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Econometric methods for empirical climate modelling

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To understand the evolution of climate time series, it is essential to take account of their non-stationary nature with both stochastic trends and distributional shifts: see e.g., . Using the novel approach of saturation estimation, explained in the presentation, we model observational records on evolving climate processes that also shift, undertaking empirical studies that are complementary to analyses based on laws of conservation of energy and physical process-based models. Despite saturation estimation creating more candidate variables than observations in the initial general formulation, our machine learning model selection algorithm has seen many successful applications, illustrated here by modelling the highly non-stationary data on UK CO₂ emissions annually 1860-2018 with strong upward then downward trends, punctuated by large outliers from world wars, national coal strikes and stringent legislation.