***Model-Adaptive Approach to Dynamic Discrete Choice Models with Large State Spaces***

By Ertian Chen (University College London)

**Abstract**

We consider the estimation of Dynamic Discrete Choice models with large state spaces. Sieve approximation methods are often used to solve the Bellman Equation numerically. The performance of the approximation depends crucially on the choice of the sieve chosen by the researcher, e.g., polynomials, splines and etc. In this paper, we propose a model-adaptive sieve space, which is constructed by iteratively augmenting the space with the residual from the previous iteration. We show both theoretically and numerically that model-adaptive sieves can dramatically improve performance. In particular, the approximation error decays at a superlinear rate in the sieve dimension, unlike a linear rate achieved using conventional bases. Our method works for both Conditional Choice Probability Estimators and full-solution method with policy iteration. We apply our method to analyze consumer demand for laundry detergent using Kantar Worldpanel data.