

Sequential algorithm for structural estimations with equilibrium constraints*

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Abstract

This study investigates sequential algorithms exhibiting the Zero Jacobian Property (ZJP) for estimating structural models with equilibrium constraints. For the Maximum Likelihood Estimation (MLE) and the Generalized Method of Moments (GMM), the current study shows that they attain fast (near-quadratic) local convergence in large samples to the solution of the constrained optimization problem. If the initial consistent estimate of the parameters are available, the algorithms yield asymptotically efficient estimator even after one iteration.

It then proposes a novel algorithm called Sequential Linearly Constrained (SLC) algorithm, which is applicable to a broader class of structural models than existing methods. SLC is attractive in that it can be implemented without explicitly computing the Jacobian of the equilibrium constraints and can be several times faster than the Nested Fixed Point (NFXP) approach. The current study demonstrates the good performance through two numerical experiments: a dynamic discrete game with time-varying unobserved heterogeneity and a dynamic demand model.

Keywords: Sequential estimation; Zero-Jacobian property; SLC algorithm; NFXP; MPEC

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