Simulation-based Bayesian Inference for Dynamic Structural Models

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Abstract:

This paper introduces a simulation-based approach to Bayesian inference to the economic literature allowing the estimation of posteriors even when the likelihood function is not tractable. This approach works even with data that has a latent time structure which is ubiquitous in macroeconomic structural modeling and hasn't been successfully done, as far as I know, even in the simpler and easily extendable maximum likelihood setting. My approach allows, to the best of my knowledge, value function iteration and other methods for solving structural models that don't return a tractable likelihood function to be estimated in a Bayesian fashion for the first time. I demonstrate the validity of the approach by estimating two 4 parameter toy models: An RBC model and a model solved via value function iteration. In both models, the estimation procedure returns a posterior that concentrates around the data generating parameters. I also estimate a 10 parameter HANK model solved via the Reiter method that generates 861 covariates per time step, showing that this approach can handle high dimensional data and suggests an ability to estimate heterogeneous agent models with intractable likelihoods.

Keywords: Neural Networks, Bayesian Inference, Dynamic Estimation, Simulation-Based Estimators

JEL Codes: C11, C68, C63, C45