Bayesian Updating of Input-Output Tables

Topic: Methodological aspects of input-output analysis I
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The paper continues efforts on developing Bayesian method of updating IO tables, presented by the authors on the 21th IIOA conference, and extends the methodology and results in several ways. Previously we concentrated on the Monte Carlo experiments to analyze competiveness of proposed method with classical methods and updating IO tables for Russia. In the first part of the current paper we test our methodology on the “long” survey based IRIOS tables. We treat the last table for each country as unknown and estimate it with the Bayesian method using all previously available matrixes for constructing prior distribution. When specifying prior distribution we argue that Beta distribution for IO coefficients is more appropriate than Normal distribution and fit it for the each coefficient on previously available matrixes. We consider two point estimates of “unknown” IO table: posterior mode and posterior mean. To find posterior mode we use nonlinear optimization techniques, to explore posterior distribution we use modern MCMC methods. Posterior mode robustly outperforms competitive methods, popular in the literature, according to different closeness statistics. Posterior mean perform slightly worse than posterior mode. We conclude that point estimate of Bayesian method at least is compatible with the other methods on real data examples.
But the main contribution of our method is that it provide probabilistic estimate of IO coefficients consistent with all available aggregate data constraints. This property is very useful for analyzing uncertainty about IO coefficients and results of the models that calibrated to IO tables. In the second part of the paper we concentrate on the constructing creditable set for IO coefficients. We provide arguments that standard symmetric creditable interval for input-output coefficient is inappropriate and induce significant bias. We argue for using higher posterior credible set for characterization of the uncertainty. We construct credible sets for estimates of IRIOS tables and for the results of some simple IO models. We also perform Monte Carlo experiments were we show that posterior higher posterior credible set have better coverage properties.
In the third part of the paper we upgrade and extend estimates of SUT tables for Russia.