

Efficient Gibbs Sampling Algorithms for Hierarchical Bayesian Modeling of Panel Data

Makoto Nakakita* Teruo Nakatsuma[†]

April 8, 2025 @ Keio Econometrics Workshop

Abstract

In the first-half of our talk, we propose efficient Gibbs sampling algorithms for hierarchical Bayesian modeling of panel data, which are applicable to linear regression models or logit models of panel data with individual effects, mixed effects or multilevel modeling. To improve mixing of generated chains of model parameters, the proposed algorithms employ the ancillarity-sufficiency interweaving strategy (ASIS) by Yu and Meng (2011). The efficacy of the proposed algorithms is examined with Monte Carlo experiments.

In the second half, we analyze socioeconomic factors that potentially influence self-rated health (SRH) with the Keio Household Panel Survey (KHPS) data. Since SRH responses are binary, we estimate a panel data logit model of SRH by applying a Pólya-gamma-augmented Gibbs sampling algorithm (Polson et al. (2013)) coupled with ASIS. This part of our talk is based on Nakakita and Nakatsuma (2024).

Keywords: ASIS, Gibbs sampling, hierarchical Bayesian modeling, MCMC, panel data

References

- [1] Nakakita, Makoto and Nakatsuma, Teruo (2024) “A Hierarchical Bayesian Approach for Identifying Socioeconomic Factors Influencing Self-Rated Health in Japan,” *Healthcare Analytics*, 6, 100367.
- [2] Polson, Nicholas G. and Scott, James G. and Windle, Jesse (2013) “Bayesian Inference for Logistic Models Using Pólya-Gamma Latent Variables,” *Journal of the American Statistical Association*, 108:504, 1339–1349.
- [3] Yu, Yaming and Meng, Xiao-Li (2011) “To Center or Not to Center: That Is Not the Question – An Ancillarity-Sufficiency Interweaving Strategy (ASIS) for Boosting MCMC Efficiency,” *Journal of Computational and Graphical Statistics*, 20:3, 531–570.

*Center for Advanced Intelligence Project, RIKEN

[†]Faculty of Economics, Keio University