

Computer Problem Sheet 4: Bayesian Inference in Models for Panel Data and Qualitative Choice

These exercises are taken (or adapted) from the book Bayesian Econometric Methods (BEM) and Matlab code can be found on the BEM website (you can connect through the link for the book on my website or directly to www.econ.iastate.edu/faculty/tobias/)

Exercise 1: The Stochastic Frontier Model with Panel Data

The stochastic frontier model is defined and motivated on pages 168-172 of Bayesian Econometrics. Using the notation established there it can be written as

$$y_i = X_i\beta + \varepsilon_i - z_i\upsilon_T.$$

As in the textbook, we will assume a prior of the form $p(\beta, h) = p(\beta)p(h)$ with:

$$\beta \sim N(\underline{\beta}, \underline{V}),$$

$$h \sim G(\underline{s}^{-2}, \underline{\nu}),$$

$$z_i \sim G(\mu_z, 2).$$

and

$$\mu_z^{-1} \sim G(\underline{\mu}_z^{-1}, \underline{\nu}_z).$$

The the full posterior conditionals necessary to do Gibbs sampling in this model are given on pages 171-172 of Bayesian Econometrics. Using them, carry out an empirical Bayesian analysis using a suitable data set. Note: the answer below uses an artificial data set which was generated from:

$$y_{it} = 1.0 + 0.75x_{2,it} + 0.25x_{3,it} - z_i + \varepsilon_{it}$$

for $i = 1, \dots, 100$ and $t = 1, \dots, 5$. We assume $\varepsilon_{it} \sim N(0, 0.04)$, $z_i \sim G(-\ln[.85], 2)$, $x_{2,it} \sim U(0, 1)$ and $x_{3,it} \sim U(0, 1)$ where all the random variables are independent of one another and independent over all i and t .

Solution: This is part of Exercise 14.14 of BEM.

Exercise 2: The Probit Model

Bayesian inference in the probit model is described in Bayesian Econometrics 214-216 or BEM Exercise 14.1. In an interesting paper, Fair (1978) analyzed the decision to have an extramarital affair. We have made a version of this data available on our website. Take this data and perform a probit analysis. Fit the model using the Gibbs sampler and interpret your results.

Solution: This is part of Exercise 14.3 of BEM.

Supplementary Exercises

BEM also contains an exercises on the ordered probit model covered in th course (see Exercises 14.5 an 14.6) as well as many extensions not covered in the course (see many other exercises in Chapter 14).