SYST/STAT 664: Homework Assignment 10

due May 4, 2020

Homework is at the time and date indicated. Please make sure your name is on every page of the assignment, and it is clearly marked which question you are answering. Your response will be graded for correctness and clarity.

1. A compound called estriol was measured over a 24 hour period in the blood of pregnant women. The babies' weights were then recorded at birth. The purpose of the study was to determine whether there was a relationship between estriol and birth weight.[1] The data from this study can be found at http://www.biostat.umn.edu/~lynn/iid/estriol.dat. Estriol was measured in milligrams per 24 hours and birthweight was measured in grams/100.

   Using the non-informative prior distribution $g(\eta, \beta, \rho) \propto \rho^{-1}$, find the joint posterior distribution for the transformed intercept η, the slope β, and the precision ρ.

2. Comment on your results, including whether the assumptions for normal linear regression are met.

3. What is the predictive distribution for birthweight given milligrams of estriol? Find a 90% predictive interval for the birthweight of a baby given that 19 mg of estriol were measured in the mother's urine over 24 hours.

4. Use 1000 Monte Carlo samples to find an approximate 90% predictive interval for the birthweight of a baby given that 19 mg of estriol were measured in the mother's urine over 24 hours. Compare Problem 3. Discuss.

[1] Original source: Greene and Touchstone (1963). 'Urinary tract estriol: an index of placental function,' American Journal of Obstetrics and Gynecology, 85:1-9. Reprinted in Rosner (1982). Fundamentals of biostatistics, Duxbury Press.