Week 6 Homework

This homework is due in week 9.

1. Show that diffuse Inverted-Wishart priors are very informative about correlation coefficients via simulation. Simulate draws from $IW(3, 3I_3)$ distribution and display the marginal distributions of the correlations. In order to do this, you will need to write a function to convert a covariance matrix to a correlation matrix. It should return a vector of the correlations. Show this function in your hw solutions.

2. Write a Gibbs Sampler to sample from the diagonal MNP model:

$$z_i = X_i\beta + \varepsilon_i \quad \varepsilon_i \sim N(0, \Lambda)$$
$$\Lambda = \text{diag}(\sigma_1^2, \ldots, \sigma_p^2)$$

   Note that for this model, to achieve identification it is not necessary to difference. All that is necessary is to set $\sigma_1^2 = 1$. Use independent and identical scaled, inverted-chisq priors for the elements of Λ that are free.

$$\sigma_2^2, \ldots, \sigma_p^2 \sim \text{ind} \; \upsilon_0 s_0^2 / \chi^2_{\upsilon_0}$$

   Start by modifying the code for the full-covariance MNP in `rmnpGibbs`. You will have to write your own R code to draw each z. As in the full-covariance case, you can draw each z_i independent of the others.

   Note that, if $y_i = j$, then $z_{i,j} > \max(z_{i,-j})$.

   Test this sampler using simulated data.

3. Modify the C functions, `draww` and `drawwi`, found in `bayesmc.c` to draw the z vector for the diagonal model in part 2. bayesmc.c can be found on the course website.

   Check your C code against your R code. Profile your implementation using C and R code using the `Rprof()`. For those who are new to C, read "A Trivial Introduction to C" on the course web site. Be patient, you will make many mistakes! Start simply and test each piece of code independently of the others. Comment your C code!