Problem Set 3

Due date: Thursday, November 20, in class.

1. Consider the following regression model with Gaussian errors:

\[ Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + u_t, \]

where \( u_t \sim iidN(0, \sigma^2). \)

Assuming natural conjugate priors for the slope coefficients and for the variance, generate their marginal posterior distributions using the Gibbs sampler. The data are in ps3_1.txt, are ordered \( Y, 1, X_1, \) and \( X_2, \) and there are 250 observations.

2. Consider the same problem with AR(2) errors:

\[ Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + u_t, \]

where \( u_t = \phi_1 u_{t-1} + \phi_2 u_{t-2} + \varepsilon_t, \) and \( \varepsilon_t \sim iidN(0, \sigma^2). \)

Use the Gibbs sampler to generate marginal posterior distribution for the 6 parameters, using the data in ps3_2.txt, containing 248 observations.

3. For Hamilton’s real GDP data, 1952:1 – 1984:4, use the Gibbs sampler to simulate the marginal posteriors for the 5 parameters in the following AR(0) model for the growth rate of GDP:

\[ \Delta y_t = \mu_0 + \mu_1 s_t + \varepsilon_t, \]

where \( \varepsilon_t \sim iidN(0, \sigma^2) \) and \( q \) and \( p \) are transition probabilities.