

Problem Set #1

The file **Y.csv** contains data generated from the following state space models:

$$\begin{aligned}x_{t+1} &= g_0 + g_1 x_t + \varepsilon_{t+1}, & \varepsilon_t &\sim N(0, \sigma_\varepsilon^2) \\ y_t &= h_0 + h_1 x_t + \eta_t, & \eta_t &\sim N(0, \sigma_\eta^2)\end{aligned}$$

Let $\theta = \{g_0, g_1, \sigma_\varepsilon, h_0, h_1, \sigma_\eta\}$. Estimate θ under these two scenarios:

1. Flat prior on θ , that is, $p(\theta) \propto 1$. For this scenario report the MLE and the asymptotic standard errors.
2. An informative prior with marginals

$$\begin{aligned}g_0 &\sim N(0, 100), & g_1 &\sim \text{Beta}(5, 1.4), & \sigma_\varepsilon^2 &\sim \Gamma(1, 3) \\ h_0 &\sim N(0, 100), & h_1 &\sim \text{Beta}(5, 1.4), & \sigma_\eta^2 &\sim \Gamma(1, 3)\end{aligned}$$

For each scenario report evidence that the MH algorithm has converged and report the 95% credible interval.

The file **Y.csv** can be read by `Y = readcsv("Y.csv")`.