PROBLEM SET 4
STAT 221

WON I. LEE

1. Implement MCMC

Please see the file `wonlee_mcmc.R` for the relevant implementation, according to the specifications provided.

2. Uniform Prior for Time Point 5

Using data from time point 5 only, we use a uniform prior over Λ and use 10 chains of MCMC with 12000 iterations (with 2000 iterations of burn-in) to conduct inference. **Figure 1** demonstrates our convergence diagnostics for each of the dimensions of X_2 (which is actually sampled using MCMC, whereas X_1 is computed from X_2), using each of the 10 chains.

We initially employed a Poisson proposal scheme as outlined in Tebaldi and West (1998), i.e. using independent draws:

$$X_i^* \sim Pois(\lambda_{i,t})$$

but this appeared to yield terrible results in terms of sample size, with ESS statistics of ≈ 5 over 10000 samples. As a result, in the spirit of incremental MCMC moves as discussed in this course, we opted for a small uniform proposal density around the current X_i value, namely:

$$X_i^* \sim Unif(X_{i,t-1} - \alpha, X_{i,t-1} + \alpha)$$

for some suitable value of α.

3. Informative Prior for Time Point 5

4. Boxplots for Different Priors

5. Uniform Prior for All Time Points

6. Informative Prior for All Time Points

7. Comparison of Posterior Intervals