MCMC M1: G

MH Acceptance Probability

MD

Acceptance probability is the ratio of the posterior probability under the new parameters and the posterior probability under the current parameters. Each probability is then weighted by the inverse probability of arriving in that state from the previous one.

Let $\theta = (z_i, q, r)$ be the current values, $\theta' = (z_i', q', r')$ be the proposed values, $P(\cdot)$ be the posterior distribution, and $T(\theta|\theta')$ be the transition probability of moving from θ' to θ.

$$\alpha = \frac{P(\theta'|y)}{P(\theta|y)} \cdot \frac{T(\theta|\theta')}{T(\theta'|\theta)}$$

$$T(\theta|\theta') = \frac{1}{T(\theta'|\theta)}$$

$$T(\theta'|\theta) = \frac{T(z_i'|z,q,r)}{T(z|z_i',q,r)} \cdot \frac{T(q'|q,z,r)}{T(q|q',z,r)} \cdot \frac{T(r'|r,q,z)}{T(r|r',q,z)}$$

$$= \left[\frac{P(z_i')}{P(z_i)} \cdot \frac{T(z|z')}{T(z'|z)}\right] \cdot \left[\frac{P(q')}{P(q)} \cdot \frac{T(q|q')}{T(q'|q)}\right] \cdot \left[\frac{P(r')}{P(r)} \cdot \frac{T(r|r')}{T(r'|r)}\right]$$

$$= 1.$$

Note: $T(z_i|z') = P(z_i)$

$T(z'|z) = P(z_i') = 0.5$

$T(q|q') = P(q)$

$T(q'|q) = P(q') = q'$

$T(r|r') = P(r)$

$T(r'|r) = P(r') = r'$

Proposing from full conditions, the MH acceptance probability will be 1. This makes it equivalent to the Gibbs sampler. ∎