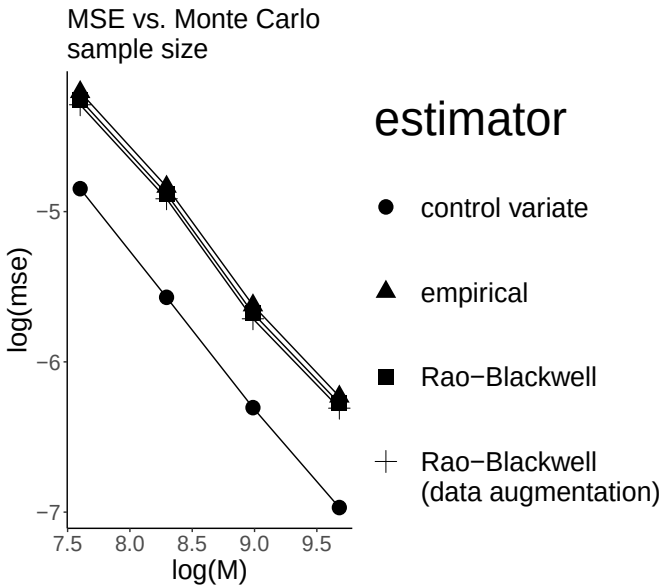
Variance reduction for deterministic sweep Markov chains

Deterministic sweep MC example with $K = 3$:

$$X_0 \xrightarrow{\Pi_1(X_0,\cdot)} X_1 \xrightarrow{\Pi_2(X_1,\cdot)} X_2 \xrightarrow{\Pi_3(X_2,\cdot)} X_3 \xrightarrow{\Pi_1(X_3,\cdot)} X_4 \xrightarrow{\Pi_2(X_4,\cdot)} \dots$$

$$\hat{\mu}_M^{emp} = M^{-1} \sum_{t=0}^{M-1} g(X_t) \qquad \text{(Empirical)}$$

$$\hat{\mu}_M^{RB} = M^{-1} \sum_{t=0}^{M-1} \Pi_t g(X_t) \qquad \text{(Rao-Blackwellized)}$$



we show $\Sigma^{RB} \leq \Sigma^{emp}$, for det. sweep Gibbs sampling, any number of component kernels

- can do better using control variates

- S. Berg, J. Zhu, and M. K. Clayton. Control variates and Rao-Blackwellization for deterministic sweep Markov chains. *arXiv*, art. arXiv:1912.06926, Dec 2019