ABSTRACT

Let \( f_X(u) = c_X^{-1} q_X(u) \) and \( f_Y(u) = c_Y^{-1} q_Y(u) \) be two density functions. Bridge sampling (Bennett 1976, Meng and Wong 1996) is a Monte Carlo technique that estimates \( R = c_Y/c_X \) based on the equality

\[
R \equiv \frac{E_X\{\alpha(X)q_Y(X)\}}{E_Y\{\alpha(Y)q_X(Y)\}},
\]

whenever it is well defined; where \( \alpha(u) \) is called a bridge function and it can be chosen according to some criteria. Thus, bridge sampling replaces the expected values by the sample averages of \( \alpha(X)q_Y(X) \) and \( \alpha(Y)q_X(Y) \). Bennett (1976), and Meng and Wong (1996) derived the optimal bridge function that minimizes the mean square error of \( \hat{R} \) when the sequences \( \{X_i\}_{i \geq 1} \) and \( \{Y_j\}_{j \geq 1} \) are independent.

I am going to present the optimal bridge function for the case where the sequences \( \{X_i\}_{i \geq 1} \) and \( \{Y_j\}_{j \geq 1} \) are independent, but the draws within the sequences are dependent; the result is relevant because bridge sampling is usually applied with dependent draws generated by a Markov chain Monte Carlo method.