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BAYES INFERENCE ON THE RATIO BETWEEN TWO PROPORTIONS

M. Antónia Amaral Turkman[1] and Elisete Correia[2]

[1]University of Lisbon, Faculty of Sciences, Portugal, *maturkman@fc.ul.pt*
[2]University of Tras-os-Montes e Alto Douro, Portugal, *ecorreia@utad.pt*

In this paper we are concerned with methods for elicitation of prior information when the interest lies in making inferences about the ratio of the unknown success probabilities, θ_1, θ_2, from independent binomial populations.

Let $Y_1 \sim B_i(N_1, \theta_1)$ and $Y_2 \sim B_i(N_2, ., \theta_2)$ be two independent Binomial populations. In many practical situations it is of interest to make inferences about the ratio of θ_1 and θ_2. In a Bayesian perspective inferences on $\xi = \theta_1 / \theta_2$ are made based on the posterior distribution of ξ given data (y_1, y_2), which is proportional to the likelihood $L(\theta_1, \theta_2 \mid y_1, y_2)$ times the prior $p(\theta_1, \theta_2)$. Here the parameter of interest is ξ, being $\Phi = \theta_2$ a nuisance parameter.

We will consider three methods for the specification of the prior information about the parameters of the model, namely Berger and Bernardo´s reference prior, Jeffrey´s prior and Arnold, Castillo and Sarabia´prior, based on conditional specification. We obtain exact posterior distributions for the parameter of interest ξ and compare the performance of the three different priors using a simulation study.