

A Comparison of Bayesian and Classical Testing Procedures for the Association Parameter in a 2×2 Contingency Table

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Abstract

Bayesian alternatives to classical tests for Fisher's exact test in 2×2 contingency tables are considered. Point null test versus one-sided hypothesis is tested using the log odds ratio in 2×2 contingency tables. Hierarchical Bayes, empirical Bayes and noninformative Bayes procedures are compared with the appropriate classical procedures, either the p-value in Fisher's exact test or a randomized test. A conjugate prior at the first stage and a noninformative prior at the second stage are used for the hyperparameter(s) in the hierarchical approach. For different testing procedures, the likelihood of making a type I error is chosen to be approximately the same. Then the power of different tests is compared: the larger the power, the better the test. In small samples, the randomized test performs well in comparison with the other methods. For moderate samples, empirical Bayes and randomized test procedures perform better than other approaches.

Keywords: Bayes factor, contingency tables, empirical and Hierarchical Bayes, non-informative prior, mid P-value.

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