A CONDITIONAL BAYESIAN APPROACH FOR TESTING INDEPENDENCE IN TWO-WAY CONTINGENCY TABLES

M. GANJALI AND Z. SABERI

Department of Statistics, Faculty of Mathematical Sciences
Shahid Beheshti University, Tehran, Iran.
Email: m-ganjali@sbu.ac.ir

Exact test for $I \times J$ tables utilizes the multiple hypergeometric distribution (Agresti, 2002, pp. 97) for testing independence. Freeman and Halton (1951) defined the p-value as the probability of the set of tables with the given margins that are no more likely to occur than the table observed. Although, special algorithms and software for computing exact tests for $I \times J$ tables are available, computing time, to enumerate the set of necessary tables, increases exponentially as number of observations, I or J increases. In addition no use of prior information, which may be properly elicited, is possible in the use of the classical p-value for inference. In this paper the non-null distribution of observations given margins is found. This distribution depends on global odds ratios. A proper multivariate prior distribution for these odds ratios is defined and samples from posterior distribution are generated using a conditional Bayesian approach. Then the Bayes factor is used as a summary of evidence for testing independence of the two variables. The robustness of results to different multivariate prior distributions is also discussed. In an application, independence of smoking and myocardial infarction in a 2×3 table is tested.

References

Agresti, A. (2002). Categorical Data Analysis, Second Edition, Wiley.

Freeman, G. H. and Halton J. H. (1951). Note on an exact treatment of contingency, goodness-of-fit and other problems of significance. Biometrika 38: 141-149.