Empirical Investigation of Type 1 Error Rate of Univariate Tests of Normality

International Journal of Computer Applications
Foundation of Computer Science (FCS), NY, USA

Volume 148
Number 8

Year of Publication: 2016

Authors:
Kayode Ayinde, John Olatunde Kuranga, Gbenga Sunday Solomon

Abstract

Normality assumption is important in univariate parametric statistical tests. Either the variables or the error terms in the model have to be normally distributed before valid statistical conclusions could be made. Various tests of univariate normality including that of Pearson, Kolmogorov–Smirnov, Anderson-Darling, Shapiro–Wilk, Lilliefors, D’Agostino and Pearson, Jarque-Bera, Shapiro-Francia, Energy and Cramer-von Mises tests have been developed. However, when applied in practice, they hardly give the same result. Thus, this research work aims at investigating the Type 1 error rate of these tests so as to identify the best one and suggest the same for statistics users. The tests were compared by conducting Monte Carlo experiments five thousand (5000) times with six sample sizes at three pre-selected levels of significance. A test was adjudged good at a particular level of significance if its empirical Type 1 error rate approximated the true error rates most often. It is best if its number of counts at which it was good over the sample sizes and levels of significance was the highest. Results reveal that Type 1 error rate of all the univariate tests are good except that of Kolmogorov–Smirnov,
Empirical Investigation of Type 1 Error Rate of Univariate Tests of Normality

Pearson Unadjusted and Jarque-Bera. Moreover, those of Anderson-Darling, Shapiro-Wilk, Energy and Cramer-von Mises tests are relatively best. They are therefore recommended for testing the assumption of normality in any univariate data set.

References

1. Pearson, K. 1900. On the criterion that a given system of deviations from the probable in the case of a correlated system of variables is such that it can be reasonably supposed to have arisen from random sampling, Philosophical Magazine Series, 550 (302), 157–175.
8. Agostino, R. D and Pearson, E. S. 1973. Test for Departure from Normality. Empirical Results for the Distributions of b_2 and √(b_1 ), Biometrika, 60 (3), 613-622.
Empirical Investigation of Type 1 Error Rate of Univariate Tests of Normality

1 Error Rates of Some Multivariate Tests of Normality, Nigerian Association of Mathematical Physics, 34 (1), 185-198.

Index Terms

Computer Science

Information Sciences

Keywords

Parametric test statistics, Monte Carlo experiments, Type 1 error rate, Inferencial statistics tests, Levels of significance.