A NEW REGRESSION AND ANOVA METHOD UNDER HETEROSCEDASTICITY

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Abstract

Assuming a general linear model with unknown and possibly unequal normal error variances, the goal is to propose a one-sample testing procedure for testing a general linear hypothesis concerning a full regression model and a partial regression model, respectively. A new test statistic is constructed based on a weighted sample mean at each of predictor's data points; it can be shown that the test statistic is a quadratic function of independent Student's t random variables under the null hypothesis. As a result, the distribution of the proposed test statistic is completely independent of the unknown error variances. Hence, the p-value and/or the critical values of such test can be obtained from a computer simulation for small samples, or approximated by a Chi-squared distribution for large samples. This new approach can be readily applied to the analysis of variance under various designs of experiments.

Key Words and Phrases: Linear model; unequal variances; hypothesis testing; analysis of variance; function of Student's t distributions.