A robust modification of the Goldfeld-Quandt Test for the detection of heteroscedasticity in the presence of outliers

ABSTRACT

Problem statement: The problem of heteroscedasticity occurs in regression analysis for many practical reasons. It is now evident that the heteroscedastic problem affects both the estimation and test procedure of regression analysis, so it is really important to be able to detect this problem for possible remedy. The existence of a few extreme or unusual observations that we often call outliers is a very common feature in data analysis. In this study we have shown how the existence of outliers makes the detection of heteroscedasticity cumbersome. Often outliers occurring in a homoscedastic model make the model heteroscedastic, on the other hand, outliers may distort the diagnostic tools in such a way that we cannot correctly diagnose the heteroscedastic problem in the presence of outliers. Neither of these situations is desirable. Approach: This article introduced a robust test procedure to detect the problem of heteroscedasticity which will be unaffected in the presence of outliers. We have modified one of the most popular and commonly used tests, the Goldfeld-Quandt, by replacing its nonrobust components by robust alternatives. Results: The performance of the newly proposed test is investigated extensively by real data sets and Monte Carlo simulations. The results suggest that the robust version of this test offers substantial improvements over the existing tests. Conclusion/Recommendations: The proposed robust Goldfeld-Quandt test should be employed instead of the existing tests in order to avoid misleading conclusion.