Robust estimations as a remedy for multicollinearity caused by multiple high leverage points

ABSTRACT

Problem statement: The Least Squares (LS) method has been the most popular technique for estimating the parameters of a model due to its optimal properties and ease of computation. LS estimated regression may be seriously disturbed by multicollinearity which is a near linear dependency between two or more explanatory variables in the regression models. Even though LS estimates are unbiased in the presence of multicollinearity, they will be imprecise with inflated standard errors of the estimated regression coefficients. It is now evident that the multiple high leverage points which are the outliers in the X-direction may be the prime source of collinearity-influential observations. Approach: In this study, we had proposed robust procedures for the estimation of regression parameters in the presence of multiple high leverage points which cause multicollinearity problems. This procedure utilized mainly a one step reweighted least square where the initial weight functions were determined by the Diagnostic-Robust Generalized Potentials (DRGP). Here, we had incorporated the DRGP with different types of robust methods to downweight the multiple high leverage points which lead to reducing the effects of multicollinearity. The new proposed methods were called GMDRGP- L1, GM-DRGP-LTS, M-DRGP, MM-DRGP, DRGP-MM. Some indicators had been defined to obtain the best performance robust method among the existing and new introduced methods. Results:The empirical study indicated that the DRGP-MM emerge to be more efficient and more reliable than other methods, followed by the GM-DRGP-LTS as they were able to reduce the most effect of multicollinearity. The results seemed to suggest that the DRGP-MM and the GM-DRGP-LTS offers a substantial improvement over other methods for correcting the problems of high leverage points enhancing multicollinearity. Conclusion/Recommendations: In order to solve the multicollinearity problems which are mainly due to the multiple high leverage points, two proposed robust methods, DRGP- MM and the GM-DRGP-LTS, were recommended.