Affect of Multicollinearity in Unbiased Regression Models

Aboobacker Jahufer[1*]

ABSTRACT. One of the assumptions of the multiple linear regression model is that there is no exact linear relationship between any of the independent variables. If such a linear relationship does exist, It can be said that the independent variables are collinear or multicollinearity.

Unfortunately in most applications of regression analysis, the regressors are not orthogonal. Sometimes the lack of orthogonal is not serious. However, in some situations the regressors are nearly perfectly linearly related and in such cases the inferences based on the regression model can be misleading or erroneous.

The multicollinearity is a form of ill-conditioning in the X'X matrix. Furthermore the problem is one of degree; that is, every data set will suffer from multicollinearity to some extent unless the columns of X are orthogonal. As we can see, the presence of multicollinearity can make the usual best linear unbiased estimator regression model dramatically inadequate.

When multicollinearity exists among the regressors, a variety of interrelated problems are created. Specially, in the model building process multicollinearity causes high variance for parameters if ordinary least squares estimator is used. The main objective of this paper is to analyze and detect the multicollinearity in the data set and recommend some dealing methods for multicollinearity problems. Two multicollinearity data sets are used to illustrate the methodologies proposed in this paper. The first data set is generated using Monte Carlo Simulation method with the highest correlation between the regressors and the data set contains five regressor and a response variable. The second data set is also a real multicollinearity data set of Macroeconomic Impact of Foreign Direct Investment in Sri Lanka form 1978 to 2004 and the data set contains four regressor and one response variables.

Key words: Multicollinearity; Correlation Matrix; Eigen Analysis; Variance Inflation Factor; Conditional Indices; Variance Decomposition; Biased Estimation.

* To whom correspondence should be addressed : jahufer@yahoo.com
1 Department of Mathematical Sciences, Faculty of Applied Sciences, South Eastern University