A SIMULATION STUDY ON RIDGE TYPE BIASED ESTIMATION

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Analytical solution of a mathematical model might be mathematically complex, and in such a case simulation may provide a reassuring check. In some cases, approximate analytical solutions are sought for the models, and then simulations of the original model can be provided to check the accuracy of the approximations made. Such a solution as a part of the model, with the remainder investigated by simulations, is preferable by far to a simulation solution to the whole model.

In order to simulate any specified random process we must be able to construct, a sequence of random variables, corresponding to some fixed distribution function. In order to obtain a value of a random variable with some specified distribution function, we usually use one or more values of a uniformly distributed random numbers.

In 1975, G.C. McDonald and D.I. Galarneau defined a class of estimators for the parameter β indexed by a scalar parameter k. Using a Monte Carlo simulation study, they proposed two analytical methods for specifying k, and compared the Ordinary Least Squares Estimator (OLSE) and the Ordinary Ridge Regression Estimator (ORRE) in terms of mean square error and other stochastic properties. Their research was based on three explanatory variables, and showed that the least squares estimators were dominated by ORRE in all cases with the largest eigenvalue of the correlation matrix. However, mixed results were obtained for the cases investigated when comparing these estimators with the smallest eigenvalue of the correlation matrix.

In this study, the Monte Carlo simulation technique is used to generate five regressor variables and one response variable. Five hundred observations are generated for each variable, and one hundred observations are randomly selected for each variable for the analysis. The stochastic properties of the other ridge type estimators, such as Restricted Ridge Regression Estimator (RRRE), Modified Ridge Regression Estimator (MRRE) and the unbiased Restricted Least Squares Estimator (RLSE) are analyzed with three different multicollinearity levels, namely weak, strong and severe correlation. The stochastic properties are also compared for the same ridge type estimators as well as the unbiased least squares estimators.