

On Regression Analysis with Random Regressors Using Ranked Samples

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Abstract

Many types of ranked samples are recently introduced in the literature for estimating the population mean and other parameters. The ranked samples are proven to be more efficient than simple random sample (SRS) in many situations. In this paper, two types of ranked samples are considered and their effect on regression analysis, when the regressors are assumed to be random, are investigated. In particular, parameter estimation, testing hypothesis of the simple regression model fit and residual analysis are studied. In case of symmetric populations, it is shown that these ranked samples give unbiased and more efficient estimators, of the regression model parameters, than those obtained by using SRS and ranked set sample (RSS), using the same number of quantified units. Some inferences using asymptotic results are given. Numerical comparison using simulation is used to compare the efficiency of the estimators and study the impact of these samples on regression analysis in general. In conclusion, this paper shows that, using these ranked samples increases the precision of regression analysis. Also, it is argued that all residual analysis methods for model diagnostics are still valid when using these samples. Finally, it is believed that this analysis can be extended in straight forward way to multiple regression problems.

Keywords: Simple Random Sample, Ranked Samples, Ranked Set Sample, Random Regressors, Regression Analysis.