

Finding Standard Error of Estimators with Complicated Analytical Form With The Help of Bootstrapping

In Statistical problems, we often deal with estimation of one or more unknown parameters related to a distribution. In estimating a parameter, we collect a random sample and observe the variable of our interest for the sample members and combine them to compute a suitable statistic for the estimation of the required unknown parameter. The Suitable choice of the statistic is determined by some method of estimation like Moment Method or Maximum Likelihood Method etc.

Its not enough to make an estimation for the parameter. In most of the inference problems we like to know the confidence interval of the estimator or we go forward for some testing problems involving the parameter. This kind of problem requires the standard error of the estimator. But when the estimator for the parameter is of complicated form it is very difficult to obtain the form of the standard error theoretically. In that case, we go forward to find the standard error through simulation. But in real life problem we are given with a single sample. With this single sample, we can only obtain a single value of the statistic, hence it is not possible to find the standard error of the statistic from a single sample.

One way out for this problem is to find the standard error by the method of Bootstrapping. Here from the given sample we will take samples of same size with replacement and generate say, $B=1000$ Bootstrap data. For each of them we compute the value of statistic and get B such value. Then from the standard deviation of those B values of the estimator can be taken as the standard error of the estimator.

In this Dissertation we will apply the above described method to some parameter of certain distribution whose estimator of the unknown parameter is simple in structure, then eventually we apply that method on some parameter of certain distributions whose estimators are complicated in form and hence their standard error cannot be determined theoretically. The objective is to see whether it is an useful method for the estimation of the standard error of the parameters having a complicated form of estimator.