CHAPTER -2

REVIEW OF LITERATURE

Different parameter estimation methods are available for every distribution. But it is difficult to find which method gives better estimator for specific distribution. To overcome this difficulty, many Authors studied the performance of methods for different sample sizes and find out the best method of estimation for parameter by using Monte Carlo simulation in terms of bias, MSE etc.

I. Pobočíková and Z. Sedliačková (2012) studied the performance of the least square method and the weighted least square method for estimating the Weibull distribution parameter. They considered three estimators of the cumulative distribution function and the weight factor proposed by Bergman (1986). Least square method and the weighted least square method are compared in terms of the root mean square error and sample size. The comparison is based on the Monte Carlo simulation. Their comparison shows that the weight factor improves the accuracy of the estimation the Weibull distribution parameters.

Ivana Pobočíková et. al. (2014) studied the performance of the least square method, the weighted least square method, the maximum likelihood method and the method of moments for estimating the Weibull distribution parameters. They compared these methods based on the Monte Carlo simulation in terms of the root mean square error and sample size $n$. The comparison showed that the maximum likelihood method and the method of moments provide similar estimates. They recommend the maximum likelihood method to estimate the Weibull distribution parameters due to its good properties. For very small sample sizes they recommend the weighted least square method. Kamran Abbas et. al. (2012) estimated the scale parameter for Frechet distribution with known shape by using Maximum likelihood estimation and Probability weighted moment estimation methods. They obtained Bayes estimator by using Jeffreys’ prior under quadratic loss function, El-Sayyad’s loss function and linex loss function. Simulation is used to compare the performance of these estimators considering various sample size based on mean squared error (MSE). Their result shows that ML estimator performs better than other estimators in terms of biases for all cases considered. Whereas MSE decreases for PWM method with increasing $\alpha$. They also concluded that Bayes estimates based on squared error loss function and El-Sayyad function are very close to the ML estimator for $\beta=1$ and...
different values of $\alpha$ as sample size increases. Moreover, Bayes estimate relative to the linex loss function is also close to the ML estimate for the case when $c= -1$ and $\beta=1$. They also concluded that Bayes estimate under linex loss function for $c=1$ and $\beta=1$ is confining to the ML estimate as sample size increases. As in the case of different values of $r$, $l$ and $c$, we obtain approximately the same results. Finally, they say that in each scenario the ML method outperforms in terms of bias and MSE.

N. Vivekanandan (2013) studied estimation of extreme rainfall for a desired return period is a pre-requisite for planning, design and management of hydraulic structures like barrages, bridges, culverts, dams, spillways, etc. This can be achieved by probabilistic approach involving fitting of probability distributions to the recorded Annual Maximum Rainfall (AMR) data. He presented the methodology adopted in determination of parameters of Gumbel and Frechet distributions for Fatehabad and Tohana regions. Parameter estimation procedures such as Method of Moments (MOM), Maximum Likelihood Method (MLM), Method of Least Squares (MLS), Order Statistics Approach (OSA), Principle of Maximum Entropy (PME) and Probability Weighted Moments (PWM) are used for determination of parameters of Gumbel and OSA for Frechet. Kolmogorov-Smirnov test is used for checking the adequacy of fitting of a method of probability distribution to the recorded data. Diagnostic test involving D-index is used for selection of a suitable method/distribution for estimation of extreme rainfall for different return periods. His analysis showed that the Gumbel distribution (using MLS) is better suited for estimation of rainfall for Fatehabad and Tohana regions. His results also showed that the UCL value of 1000-yr return period extreme rainfalls of about 292 mm and 358 mm given by Gumbel distribution (using MLS) may be considered for design purposes at Fatehabad and Tohana respectively.

Demet Aydinet. al. (2015) studied the seven different methods, namely, method of moments (ME), method of maximum likelihood (ML), method of modified maximum likelihood (MML), the method of least squares (LS), method of weighted least squares (WLS), method of percentile (PE) and method of probability weighted moments (PWM) for two-Parameter Gumbel Distribution. The performance of these seven methods compared through Monte Carlo Simulation with respect to their biases, MSE and deficiency (Def) values. Their study showed that the method of PWM was the best performance as compare to other methods in terms of bias criterion and the Maximum Likelihood estimation method outperforms the other methods in terms of
Def criterion. A real life example taken from the hydrology literature is given at the end of the paper.

Mahdi Teimouria et. al. (2013) compared the four estimation methods with TL moments method for Weibull distribution. In their study, they proposed L-moment estimator for the Weibull distribution and then compared with method of maximum likelihood estimation, the method of logarithmic moments, the percentile method, the method of moments. The comparison was done on the basis of bias and the mean-squared error (MSE) criteria. Their results showed that the TL moments method gives the best overall performance with respect to the biases of the estimators of the shape and scale parameters. The performs as well as the MLE or else second only to the MLE with respect to the mean-squared errors of the estimators of the shape and scale parameters. The TL moments method has closed form estimators. If the five methods considered, the best performances are by the LM and the MLE estimators. The worst performances are by the MM, the PM and the MLM estimators.

Felix Noyanim Nwobi (2014) studied the different methods for estimation of the parameters of the Weibull distribution. These methods are compared in terms of their fits using the mean square error (MSE) and the Kolmogorov- Smirnov (KS) criteria to select the best method. Goodness-of-fit tests showed that the Weibull distribution is a good fit to the squared returns series of weekly stock prices of Cornerstone Insurance PLC. Their results show that the mean rank (MR) is the best method among the methods in the graphical and analytical procedures. Numerical simulation studies carried out and it shows that the maximum likelihood estimation method (MLE) significantly outperformed other methods.

Mubarak M. (2012) estimated the parameter based on the Frechet Progressive Type II Censored Data with Binomial Removals. The number of units removed at each failure time has a binomial distribution. He used the maximum likelihood estimation method to obtain the estimators of parameters and derive the sampling distributions of the estimators, and he also constructed the confidence intervals for the parameters and percentile of the failure time distribution.