

Contents

Declaration	v
Acknowledgements	vii
Abstract	ix
List of Research Papers	xi
1 Introduction and Basic Terminology	1
1.1 Introduction	1
1.1.1 Random Censoring	2
1.1.2 Progressive Censoring	2
1.1.3 Progressive First Failure Censoring	2
1.2 Estimation Methods	3
1.2.1 Classical Estimation Methods	3
1.2.2 Bayesian Estimation Method	4
1.2.2.1 Bayesian Approximation Techniques	5
1.2.2.2 Prior Distributions	5
1.2.2.3 Loss Function	6
1.3 Goodness of Fit Test and Model Comparison Criteria	6
1.3.1 Kolmogorov-Smirnov Test	7
1.3.2 Anderson-Darling Test	7
1.3.3 Maximum Likelihood Criterion	7
1.3.4 Akaike's Information Criterion	8
1.3.5 Bayesian Information Criterion	8
1.3.6 Kaplan-Meier Estimator	8
1.4 Thesis at a Glance	9
2 Statistical Inference in Inverse Pareto Lifetime Model using Randomly Censored Data	11
2.1 Introduction	11
2.2 The Model	14
2.3 Maximum Likelihood Estimation	16
2.3.1 Asymptotic Confidence Intervals	16
2.4 Bayesian Estimation	17
2.4.1 MCMC Technique	19
2.4.2 HPD Credible Intervals	20

2.5	Numerical Computations	21
2.6	Real Data Analysis	25
2.7	Concluding Remarks	28
3	Statistical Inference in Inverse Weibull Lifetime Model using Randomly Censored Data	29
3.1	Introduction	29
3.2	The Model	30
3.3	Maximum Likelihood Estimation	32
3.3.1	Expected Fisher Information Matrix	33
3.4	Expected Time on Test	35
3.5	Bayesian Estimation	36
3.5.1	TK Approximation Method	38
3.5.2	Gibbs Sampling Method	41
3.5.3	HPD Credible Intervals	43
3.6	Numerical Computations	43
3.7	Real Data Analysis	51
3.8	Concluding Remarks	53
4	Classical and Bayesian Estimation of Stress-Strength Reliability for Inverse Pareto Lifetime Model using Progressively Censored Data	55
4.1	Introduction	55
4.2	The Model	58
4.3	Maximum Likelihood Estimation	58
4.3.1	Asymptotic Confidence Interval	60
4.4	Bayesian Estimation	61
4.4.1	Loss function	61
4.4.2	Prior and Posterior Distributions	62
4.4.3	Importance Sampling Technique	63
4.4.4	HPD Credible Interval	64
4.5	Numerical Computations	64
4.6	Real Data Analysis	70
4.6.1	Real Data Set I	70
4.6.2	Real Data Set II	72
4.7	Concluding Remarks	76
5	Classical and Bayesian Estimation in Inverse Pareto Lifetime Model using Progressively First Failure Censored Data	79
5.1	Introduction	79
5.2	The Model	82
5.3	Classical Estimation	82
5.3.1	Maximum Likelihood Estimation	83
5.3.2	Bootstrap Confidence Intervals	84
5.3.2.1	Percentile Bootstrap (boot-p) Confidence Interval	84
5.3.2.2	Student's t Bootstrap (boot-t) Confidence Interval	85

5.4	Bayesian Estimation	85
5.4.1	TK Approximation	86
5.4.2	Importance Sampling Technique	88
5.4.3	Metropolis-Hastings Algorithm	89
5.4.4	HPD Credible Interval	90
5.5	Numerical Computations	90
5.6	Real Data Analysis	102
5.7	Concluding Remarks	107
6	Statistical Inference of Shannon's Entropy from Maxwell Lifetime Model using Progressively First Failure Censored Data	109
6.1	Introduction	109
6.2	The Model	111
6.3	Classical Estimation	111
6.3.1	Maximum Likelihood Estimation	112
6.3.2	Asymptotic Confidence Interval	113
6.3.3	Bootstrap Confidence Intervals	115
6.3.3.1	Boot-p Confidence Intervals	115
6.3.3.2	Boot-t Confidence Intervals	115
6.4	Bayesian Estimation	115
6.4.1	TK Approximation Method	117
6.4.2	MCMC Method	118
6.4.3	HPD Credible Interval Estimation	119
6.5	Numerical Computations	119
6.6	Real Data Application	128
6.7	Concluding Remarks	131
	Bibliography	135