شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

Ain Shams University
Faculty of Science
Mathematics Department

Bayesian analysis of a mixture of two components of different families of distributions under different censoring schemes

A Thesis
Submitted for the Award of the Ph.D. Degree in Science in Mathematical Statistics

Submitted By

MARWAH AHMED MOHAMED AEFA

B. Sc., (in Statistics), Faculty of Science,
Sebha University (2010)

M. Sc., (in Mathematical Statistics), Faculty of Science,
Ain Shams University (2016)

Supervised By

Prof. Dr. MOHAMED MAHMOUD MOHAMED MAHMOUD

Professor of Mathematical Statistics

Department of Mathematics

Faculty of Science, Ain Shams University

Prof. Dr. MANAL MOHAMED MAHMOUD NASSAR

Professor of Mathematical Statistics

Department of Mathematics

Faculty of Science, Ain Shams University

Ain Shams University

2021

CONTENTS

CHAPTER (II)

Bayesian Estimation and Prediction from a Mixture of Weibull and Lomax Distributions Based on Complete Sample

Page

CHAPTER (III)

Bayesian Estimation and Prediction Based on Progressively First Failure Censored Scheme from a Mixture of Weibull and Lomax Distributions

CHAPTER (IV)

Bayesian Approximation for a Mixture Weibull and Lomax Distributions Based on Progressive Type-II Censoring Scheme

Page

CHAPTER (V)

Parameter Estimation for a Mixture of Inverse Chen and Inverse Compound Rayleigh Distributions Based on Type-II Hybrid Censoring Scheme

CHAPTER (VI)

Parameter Estimation for a Mixture of Inverse Chen and Inverse Compound Rayleigh Distributions Based on Type-I Hybrid Censoring Scheme

Page

List of Tables

Table Page

Table Page

Table Page

List of Figures

ACKNOWLEDGEMENTS

With all humble gratitude, I thank Allah Who showed me the right path, guided me, provided me with knowledge and gave me strength and support to present such a work.

I would like to express my deepest thanks and most sincere gratitude to my dear supervisors,

Prof. Dr. Mohamed Mahmoud Mohamed Mahmoud

Prof. Dr. Manal Mohamed Mahmoud Nassar

Lighting my way as a shining beacon, they have been there for me throughout the journey of writing this thesis, giving me their support, guidance and advice. May God keep them shining stars in the world of science, helping others like me to fulfill their dreams.

My deepest gratitude and most sincere feelings of appreciation go to members of the jury. I am so honored that they accepted being part of my journey by participating in this thesis discussion and appraisal.

I would like also to express my gratitude to my beloved homeland, Libya, for supporting me to continue my studies until the highest levels of scientific qualifications.

My deepest gratitude and most sincere feelings of love and appreciation go to my dear husband for supporting me during this journey of mine, and the same to my beloved parents for their support and encouragement. May God continue to bless them with a long life full of health.

My deepest gratitude and most sincere feelings of appreciation go to my beloved family members, as they gave me continuous support, advice and guidance. Finally, I would like to dedicate my humble efforts to my dearest children, Elaf, Masouda, Ahmed and Mohamed.

ABSTRACT

MARWAH AHMED MOHAMED AEFA

Bayesian analysis of a mixture of two components of different families of distributions under different censoring schemes

Degree of Ph.D. of Philosophy of Science in Mathematical Statistics.

Mathematics Department, Faculty of Science, Ain Shams University, 2021.

Finite mixtures models have received considerable attention in areas of survival analysis and reliability in recent years, from analysis in both the methodological development and multifarious applications. This thesis discuss the statistical inference of heterogeneous population model by using two component mixture model when the data are of different censoring schemes. We consider the maximum likelihood estimation and Bayes estimation of parameters assuming informative and non-informative priors under symmetric and asymmetric loss functions. In some cases three different approximation methods are used for Bayesian computation, importance sampling method, Lindley approximation and Tierney and Kadane approximation. We perform Monte Carlo simulation to compare the performance of the different methods. The Bayes prediction intervals are also determined.

Key Words: Mixture model, Progressive first failure censored scheme**,** Progressive Type-II censoring, Hybrid censored, Maximum likelihood estimation**,** Bayesian estimation**,** Bayesian prediction.

SUMMARY

The survival analysis of lifetime (failure time) data is an important topic in statistics and has applications in different fields of life and also is a collection of statistical procedures for data analysis for which the outcome variable of interest is the time until an event occurs. Various parametric families of models are used in the analysis of lifetime data. For this purpose, we use a mixture model of Weibull and Lomax distributions and Inverse Chen and Inverse Compound Rayleigh distributions.

Finite mixture models provide a flexible framework to handle heterogeneous data supposed to comprise a number of subpopulation mixed in an unknown proportion, also to be of considerable interest in terms of both of the methodological development and multifarious applications. Mixture distributions have gained great interest for the analysis by many statisticians and mathematicians. For the purpose of the discussion, the estimation of surveys and their application in different fields of life, mixture distributions play a vital role in many practical applications. Direct applications of finite mixture models are medicine, botany, life testing, reliability, etc. Indirect applications include outliers, cluster analysis, latent structure models, modelling prior densities, empirical Bayes method and nonparametric density estimation.

Point estimation is one of the core topics in mathematical statistics. The Bayes methods consider the most common method of point estimation, and is an important approach to statistics, which formally seeks use of prior information and Bayes theorem to provide the formal basis for using this information. In recent years analysis of mixture models under Bayesian framework has received considerable attention.

This thesis focuses on the problem of estimating the parameters and prediction intervals under two-component mixture of different distributions under different censoring techniques and using different loss function.

The thesis consists of six chapters as follows:

Chapter I: Contains the concepts and basics of this thesis. Some of the previous studies of distributions used are presented.