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شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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قسم

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MONA MAGHRABY

Department: Mathematics

Estimation of Stress-Strength Reliability for Some General Bivariate Distributions

A Thesis submitted in Partial Fulfillment of the requirement for the Master Degree in Science in Mathematical Statistics

By

Student name/ Dina Ahmed Mohamed Abd El-Razik

To

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Year(2021)

نموذج بيانات منح درجة

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Degree: Master of Science in Mathematical Statistics

Department: Department of Mathematics

Faculty: Faculty of Science

University: Ain Shams University

Graduation Year: 2015

Grant **Year:** 2021

For the soul of my beloved father.

Acknowledgements

First of all, all thanks to **Allah** for giving me strength, patience, and knowledge to bring this thesis.

Second, I pay my sincere gratitude to my supervisors; **Prof. Dr. Nahed Abd El Salam Mokhlis** for her continuous support, patience, guidance, valuable suggestions and the amount of time she spent with me discussing the results the discussions with her were consistently productive and **Dr. Sohair Khames Gomaa** for her continuous help, support, guidance and encouragement to me. This work would not have been conceivable without your efforts. I'm extremely thankful.

Third, I would like to thank **my mother** for her infinite love and support. **My father**, I wish you were still here so I could make you proud and let you know how much I love you. I will never forget you and your beautiful, kind words always in my mind. God bless your soul.

I should not forget to thank the kindest, smartest and best brother in the world **Abd El-Rahman** thank you for your encouragement I love you and my brother **Mohamed** thank you for being in my life. My dear cousins **Omnia**, **Mustafa** and **Hadeer** I thank you for your continued love, support and belief in me.

Last but not least, I would like to thank my best friends **Aya**, **Samia**, **Yasmin** and **Hamda** who kept encouraging me to get this work done, thank you for believing in me without you, it was so hard.

Dina Ahmed

Contents

Abstract

Dina Ahmed Mohamed Abd El-Razik. Estimation of Stress-Strength Reliability for Some General Bivariate Distributions. Degree Master of Science in Mathematical Statistics. Mathematics Department, Faculty of Science, Ain Shams University, 2021.

The main objective of this thesis is the point estimation of a stress-strength model, $R = (X_1 > X_2)$, in two cases: the first case when X_1 and X_2 are dependent variables with marginal distribution functions having the same forms of distribution general exponential or general inverse exponential forms. The second case is when X_1 and X_2 are dependent variables with marginal distribution functions having different forms of distribution general exponential and general inverse exponential forms or vice versa. Different point estimators are obtained by different methods which can be classified into two main methods, the classical point estimation method and the Bayesian method. The estimation is performed based on complete sample and double Type II censored sample which contain the left Type II censored sample, right Type II censored sample and complete sample as special cases. Various statistical distributions in the literature possess the general exponential and the general inverse exponential forms. So, the results obtained can be applied to all these distribution. As illustration of the results obtained, Weibull and generalized inverted exponential are applied as example of general exponential form. While Burr III and generalized exponential are applied as example of general inverse exponential form. Simulation studies are also carried out for comparison of the different point estimators obtained. The comparison is based on mean squared error and the bias of the different estimators. A real life data set is also presented to demonstrate the applicability of the forms studied and the results obtain.

Keywords: Farlie- Gumbel- Morgenstern copula, general exponential form, general inverse exponential form, stress-strength reliability model, Metropolis-Hastings algorithm, Type II censored data, maximum likelihood estimator, Bayesian estimator, MCMC methods.

List of Abbreviations

AIC	Akaike information criterion
BGE–FGM	Bivariate General Exponential FGM Model
BGE–I–FGM	Bivariate General Exponential–General Inverse Exponential FGM Model
BGI–E–FGM	Bivariate General Inverse Exponential–General Exponential FGM Model
BGI–FGM	Bivariate General Inverse Exponential FGM
BIC	Bayesian information criterion
cdf	Cumulative distribution function
FGM	Farlie–Gumbel–Morgenstern
GEF(α, β)	General Exponential Form
IEF(λ, ω)	General Inverse Exponential Form
IFM	Inference functions for margins
K–S Test	Kolmogorov–Smirnov Goodness–of–Fit Test
MCMC	Markov Chain Monte Carlo Methods
MH	Metropolis–Hastings Technique
MLE	Maximum likelihood estimator
MSE	Mean–squared error
pdf	Probability density function

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