Preface

Motivated by the fact that adding one or more parameters to a distribution function makes it richer and more flexible to analyzing data, this book is an attempt to collect results, using such distributions, that are useful in theory and practice. Furthermore, the book is devoted to explore some properties of exponentiated distributions (EDs) and their use in statistical inference. New results are obtained that may be added to the existing results.

There are several ways of adding one or more parameters to a distribution function. The simplest way is probably by exponentiating a cumulative distribution function G by a positive real number α.

The ED G^{α} is quite different from the baseline distribution G and needs special investigation. Exponentiating a distribution function by a positive parameter goes back to Gompertz (1825) and Verhulst (1838, 1845, 1847). In many cases, while G accommodates for only monotone hazard rate functions, the ED G^{α} accommodates for both monotone and non-monotone hazard rate functions. Special attention is paid to applications in reliability and life testing.

Chapter 1 is an introductory chapter which includes a historical note and preview, generalized order statistics, the uses of asymmetric loss functions, MCMC, Bayes prediction, and mixtures of EDs.

Inferences (estimations and predictions) and their properties using a general ED G^{α} are discussed in Chap. 2.

In Chap. 3, G is specified to be Weibull, so that the properties and inference of the exponentiated Weibull (EW) distribution are presented. In this chapter, related distributions to the EW distribution and applications are also provided.

In Chap. 4, G is specified to be exponential, so that the properties and inference of the exponentiated exponential (EE) distribution are presented. In this chapter, characterization of the EE distribution is given.

In Chap. 5, G is specified to be Burr type XII, so that the properties and inference of the exponentiated Burr XII (EBXII) distribution are presented. In this chapter, applications, related distributions, and beta-Burr XII distribution are introduced.

Chapter 6 discusses the properties and inference of finite mixtures of exponentiated distributions. Particular emphasis is made when the components are EE distributions.

We wish to express our gratitude to Professor Chris Tsokos for his valuable suggestions and comments about the manuscript which improved the quality and presentation of the book. We thank Zager Karssen and Keith Jones of Atlantis Press for the interesting discussions about the publication of the book.

Summer Research Grant and Sabbatical Leave from Rider University enabled the second author to complete his part of the work.

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http://www.springer.com/978-94-6239-078-2

Exponentiated Distributions

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2015, XIII, 139 p. 7 illus. in color., Hardcover
ISBN: 978-94-6239-078-2
A product of Atlantis Press