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Quantile-Based Reliability Analysis (Statistics for Industry and Technology)

By N. Unnikrishnan Nair, P.G. Sankaran, N. Balakrishnan



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This book provides a fresh approach to reliability theory, an area that has gained increasing relevance in fields from statistics and engineering to demography and insurance. Its innovative use of quantile functions gives an analysis of lifetime data that is generally simpler, more robust, and more accurate than the traditional methods, and opens the door for further research in a wide variety of fields involving statistical analysis. In addition, the book can be used to good effect in the classroom as a text for advanced undergraduate and graduate courses in Reliability and Statistics.



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Editorial Review

Review

From the book reviews:

“This book introduces quantile-based reliability analysis. It gives a novel approach to reliability theory using quantile functions in contrast to the traditional approach based on distribution functions. ... This book has a broad applicability across fields such as statistics, survival analysis, economics, engineering, demography, insurance, and medical science. It can be used as an excellent reference book for faculty and professionals.” (Yuehua Wu, zbMATH 1306.62019, 2015)

“The reviewer finds it to be a good and quite exhaustive collection of results that are centered around quantile-based notions involving life distributions. Any researcher in the areas of probabilistic or statistical reliability theory may find this monograph to be a useful reference book.” (Moshe Shaked, Mathematical Reviews, April, 2014)

From the Back Cover

Quantile-Based Reliability Analysis presents a novel approach to reliability theory using quantile functions in contrast to the traditional approach based on distribution functions. Quantile functions and distribution functions are mathematically equivalent ways to define a probability distribution. However, quantile functions have several advantages over distribution functions. First, many data sets with non-elementary distribution functions can be modeled by quantile functions with simple forms. Second, most quantile functions approximate many of the standard models in reliability analysis quite well. Consequently, if physical conditions do not suggest a plausible model, an arbitrary quantile function will be a good first approximation. Finally, the inference procedures for quantile models need less information and are more robust to outliers.

Quantile-Based Reliability Analysis's innovative methodology is laid out in a well-organized sequence of topics, including:

- Definitions and properties of reliability concepts in terms of quantile functions;
- Ageing concepts and their interrelationships;
- Total time on test transforms;
- L-moments of residual life;
- Score and tail exponent functions and relevant applications;
- Modeling problems and stochastic orders connecting quantile-based reliability functions.

An ideal text for advanced undergraduate and graduate courses in reliability and statistics, *Quantile-Based Reliability Analysis* also contains many unique topics for study and research in survival analysis, engineering, economics, and the medical sciences. In addition, its illuminating discussion of the general theory of quantile functions is germane to many contexts involving statistical analysis.

About the Author

N. Unnikrishnan Nair obtained his Ph.D. from the University of Kerala, India and was conferred the degree of Doctor of Human Letters (honoris causa) by the Juniata College, USA. He was Professor and Chair, Department of Statistics, Dean, Faculty of Science and the Vice-Chancellor of the Cochin University of Science and Technology in India. He is a Fellow and past President of the Indian Society for Probability and Statistics, as well as an elected member of the International Statistical Institute. Dr. Nair has published 120 peer reviewed research papers and is an author, editor, or contributor of several books for publishers including Birkhauser Boston and Education Book Distributors (and others in foreign languages). P.G. Sankaran received his Ph.D. from Cochin University of Science and Technology, India. He was awarded BOYSCAST Fellowship of the Department of Science and Technology by the Government of India in 2000. He is a member of the International Statistical Institute and the Executive Council of International Society for Business and Industrial Statistics. His commendations include the Young Researcher Award of International Indian Statistical Association (IISA) in 2010, and his output encompasses 62 research papers and two edited books published by Education Book Distributors and the Department of Statistics at Cochin.

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