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Bivariate discrete distributions. (English) Zbl 0794.62002
Statistics: Textbooks and Monographs. 132. New York: Marcel Dekker. xvi, 361 p. (1992).

The area of discrete distributions has received considerable attention in the last 40 years. The applications that these distributions have found in modeling various random phenomena have made them indispensable tools in any statistical problem. On the other hand the use of computers and the possibility of generating random observations leading to the simulation of diverse types of populations has given new impetus to the field. The recent second edition of *N. L. Johnson*, *S. Kotz* and *A. W. Kemp*, Univariate discrete distributions. 2. ed. (1992; Zbl 0773.62007), has provided a valuable source on univariate discrete distributions.

The book under review covers another area of discrete distributions, namely that of the bivariate discrete distributions. It may seem strange why one should concentrate on the bivariate forms and not deal directly with the multivariate forms. As the authors of the book explain however, the general multivariate analytic tools that have become commonplace in the normal case are not available for the discrete distributions. Also, in most multidimensional generalizations the distributions are of the "homogeneous" type. Most of the non-homogeneous type of probability generating functions have to be restricted to the bivariate situations to facilitate mathematical tractability. Finally, the existing literature on inference and practical applications made it possible to provide ample material for a book on bivariate discrete distributions.

Chapter 1 of the book gives a general introduction to the structural properties of discrete distributions (various generating functions and their relationships to the probability generating function; moment relationships, polynomial representations of the bivariate probability generating functions; basic ideas of compounding and generalizing; and the computer simulation of random variables).

Chapter 2 provides a general discussion of the problems of statistical inference with emphasis on specific techniques pertinent to the discrete case. The lead-off topic on Chapter 3 is the use of Bernoulli trials for developing distributions that arise in the bivariate case. In Chapter 4 the bivariate Poisson distribution is introduced and studied both as a limit of the bivariate binomial distribution and as a stochastic process.

In chapter 5, under the general heading of the bivariate negative binomial distribution, inverse sampling and waiting times in Bernoulli trials are considered. The genesis of the distributions from the point of view of compounding is also discussed, although the general topic of generalized and compound distributions is deffered to a later chapter. Sampling from a finite population without replacement is the thrust of Chapter 6 giving rise to the bivariate hypergeometric distributions of different forms. Inverse sampling from such populations is also examined in this chapter.

The bivariate logarithmic series distribution is derived as the Fisher- limit to the bivariate negative binomial distribution in Chapter 7. Various other models leading to this distribution and its modified versions are also presented in this chapter. Problems related to compounding with the bivariate Poisson distribution are considered in the more general setting in Chapter 8.

The final chapter of the book deals with the distributions of more recent origin developed in connection with accident theory. These are the bivariate Waring and 'short' distributions. In addition, the bivariate generalized power series distribution is briefly discussed.

The book is a very welcome addition to the bibliography on distribution theory. Unfortunately its very high price may prevent many people, especially graduate students, from buying it.

Reviewer: J.Panaretos (Patras)

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MSC:

62-02 Research exposition (monographs, survey articles) pertaining to statistics
62E10 Characterization and structure theory of statistical distributions
62H05 Characterization and structure theory for multivariate probability distributions; copulas
62E15 Exact distribution theory in statistics
62H10 Multivariate distribution of statistics

Cited in **1** Review
Cited in **98** Documents

Keywords:

sampling from a finite population without replacement; bivariate short distributions; bivariate Waring distributions; bivariate discrete distributions; structural properties; generating functions; probability generating function; moment relationships; polynomial representations; compounding; simulation of random variables; Bernoulli trials; bivariate Poisson distribution; stochastic process; bivariate negative binomial distribution; inverse sampling; waiting times; bivariate hypergeometric distributions; bivariate logarithmic series distribution; Fisher-limit; accident theory; bivariate generalized power series distribution

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