

4.1 Bivariate Distributions: Discrete Type

For this section, two functions are said **bivariate** two random variables, both said **bivariate** and **X** . Two bivariate functions are joint probability distributions of two discrete random variables.

Joint Probability Mass Functions

Definition 4.1.1

Let X and Y be two random variables defined on a common space. Let $\mathcal{X}$ denote the set comprising X realizations and $\mathcal{Y}$ the set comprising Y realizations of X and Y , the two random variables of the discrete type. The probability that $X = x$ and $Y = y$ is denoted by $P(X, Y) = P(X = x, Y = y)$. The function $P(X, Y)$ is called the joint probability mass function (or joint pmf) of X and Y and has the following properties.

$$(i) \quad P(X, Y) \geq 0$$

$$(ii) \quad \sum_{x \in \mathcal{X}} \sum_{y \in \mathcal{Y}} P(X, Y) = 1$$

$$(iii) \quad P(X = x, Y \in \mathcal{A}) = \sum_{y \in \mathcal{A}} P(X, y), \text{ where } \mathcal{A} \text{ is a subset of the space } \mathcal{Y}$$

Example: A couple has a child after a while. Let X represent X if this child is a male newborn, and Y otherwise. Let P represent P if this child is in $\mathcal{X}$, and Q otherwise.

(a) What is the probability that either sex and month greater than 1?

(b) What is the probability that this child is not even numbered?

Soln: What is table:

X (sex)	Y	
	Q (even)	P (odd)
$X = \text{male}$	$1/8$	$1/8$
$X = \text{female}$	$1/8$	$1/8$

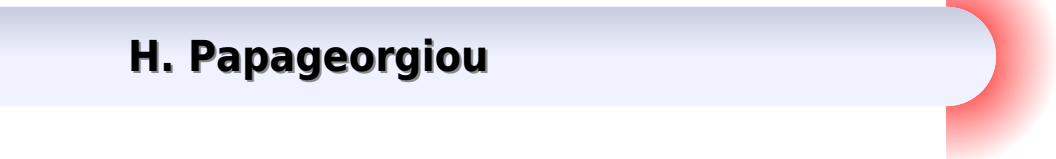
Joint probability	Sum
$P(X, Y) = \text{male, } Y = 1$ for odd in $\mathcal{X}$	$1/8$
$P(X, Y) = \text{male, } Y = 2$ for odd in $\mathcal{Y}$	$1/8$
$P(X, Y) = \text{male, } Y = 3$ for odd in $\mathcal{Y}$	$1/8$
$P(X, Y) = \text{male, } Y = 4$ for odd in $\mathcal{Y}$	$1/8$

$$(a) \quad P(X = 1, Y = 2) = P(X, Y) = 1/8$$

$$(b) \quad P(X = \text{male}) = P(X = 1) = 1/8 + 1/8 + 1/8 + 1/8$$

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H. Papageorgiou



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BLLD Announcement Bulletin British Library. Lending Division, 1978 **Continuous Bivariate Distributions** N Balakrishnan, Chin-Diew Lai, 2010-09-30 Along with a review of general developments relating to bivariate distributions this volume also covers copulas a subject which has grown immensely in recent years In addition it examines conditionally specified distributions and skewed distributions **Conditionally Specified Distributions** Barry C. Arnold, Enrique Castillo, Jose-Maria Sarabia Alegria, 2012-12-06 The concept of conditional specification is not new It is likely that earlier investigators in this area were deterred by computational difficulties encountered in the analysis of data following conditionally specified models Readily available computing power has swept away that roadblock A broad spectrum of new flexible models may now be added to the researcher's tool box This monograph provides a preliminary guide to these models Further development of inferential techniques especially those involving concomitant variables is clearly called for We are grateful for invaluable assistance in the preparation of this monograph In Riverside Carole Arnold made needed changes in grammar and punctuation and Peggy Franklin miraculously transformed minute hieroglyphics into immaculate typescript In Santander Agustin Manrique expertly transformed rough sketches into clear diagrams Finally we thank the University of Cantabria for financial support which made possible Barry C Arnold's enjoyable and productive visit to Santander during the initial stages of the project Barry C Arnold Riverside California USA Enrique Castillo Jose Maria Sarabia Santander Cantabria Spain January 1991 Contents 1 Conditional Specification 1 1 1 Why 1 1 2 How may one specify a bivariate distribution 2 1 3 Early work on conditional specification 4 1 4 Organization of this monograph 5 2 Basic Theorems 7 Compatible conditionals The finite discrete case **Tables of the Bivariate Normal Distribution Function and Related Functions** United States. National Bureau of Standards, 1959 *Families of Bivariate Distributions* K. V. Mardia, 1970-06 *Continuous Bivariate Distributions, Emphasising Applications* T. P. Hutchinson, C. D. Lai, 1990-01-01 *Bivariate Discrete Distributions* Kocherlakota, 1992-05-18 This book provides a comprehensive study of the bivariate discrete distributions and details the computer simulation techniques for the distributions It develops distributions using sampling schemes explores the role of compounding and covers Waring distribution for use in accident theory **The Engineering Statistician's Guide to Continuous Bivariate Distributions** T. P. Hutchinson, C. D. Lai, 1991 **Continuous Multivariate Distributions, Volume 1** Samuel Kotz, N. Balakrishnan, Norman L. Johnson, 2004-04-05 Continuous Multivariate Distributions Volume 1 Second Edition provides a remarkably comprehensive self contained resource for this critical statistical area It covers all significant advances that have occurred in the field over the past quarter century in the theory methodology inferential procedures computational and simulational aspects and applications of continuous multivariate distributions In depth coverage includes MV systems of distributions MV normal MV exponential MV extreme value MV beta MV gamma MV logistic MV Liouville and MV Pareto distributions as well as MV natural exponential families which have grown immensely

since the 1970s Each distribution is presented in its own chapter along with descriptions of real world applications gleaned from the current literature on continuous multivariate distributions and their applications

Multivariate Statistical Simulation Mark E. Johnson, 1987-02-04 Provides state of the art coverage for the researcher confronted with designing and executing a simulation study using continuous multivariate distributions Concise writing style makes the book accessible to a wide audience Well known multivariate distributions are described emphasizing a few representative cases from each distribution Coverage includes Pearson Types II and VII elliptically contoured distributions Khintchine distributions and the unifying class for the Burr Pareto and logistic distributions Extensively illustrated the figures are unique attractive and reveal very nicely what distributions look like Contains an extensive and up to date bibliography culled from journals in statistics operations research mathematics and computer science

Probability Distributions Nick T. Thomopoulos, 2018-04-09 This volume presents a concise and practical overview of statistical methods and tables not readily available in other publications It begins with a review of the commonly used continuous and discrete probability distributions Several useful distributions that are not so common and less understood are described with examples and applications in full detail discrete normal left partial right partial left truncated normal right truncated normal lognormal bivariate normal and bivariate lognormal Table values are provided with examples that enable researchers to easily apply the distributions to real applications and sample data The left and right truncated normal distributions offer a wide variety of shapes in contrast to the symmetrically shaped normal distribution and a newly developed spread ratio enables analysts to determine which of the three distributions best fits a particular set of sample data The book will be highly useful to anyone who does statistical and probability analysis This includes scientists economists management scientists market researchers engineers mathematicians and students in many disciplines

Distributions With Given Marginals and Statistical Modelling Carles M. Cuadras, Josep Fortiana, José A. Rodríguez-Lallena, 2013-11-11 This volume contains the papers presented at the meeting Distributions with given marginals and statistical modelling held in Barcelona Spain July 17 20 2000 This is the fourth meeting on given marginals showing that this topic has a remarkable interest BRIEF HISTORY The construction of distributions with given marginals started with the seminal papers by Hoeffding 1940 and Fienberg 1951 Since then many others have contributed on this topic Dall Aglio Farlie Gumbel Johnson Kellner Kotz Morgenstern Marshall Olkin Strassen Vitale Whitt etc as well as Arnold Cambanis Deheuvels Genest Frank Joe Kirlindorf Nelsen R schendorf Sampson Scarsini Tiit etc In 1957 Sklar and Schweizer introduced probabilistic metric spaces In 1975 Kirlindorf and Sampson studied the uniform representation of a bivariate distribution and proposed the desirable conditions that should be satisfied by any bivariate family In 1991 Darsow Nguyen and Olsen defined a natural operation between copulas with applications in stochastic processes In 1993 Alsina Nelsen and Schweizer introduced the notion of quasi copula

Tables of the Bivariate Normal Distribution Function and Related Functions United States. National Bureau of Standards, 1959

Fitting Statistical Distributions Zaven A.

Karian,Edward J. Dudewicz,2000-05-24 Although the study of statistical modelling has made great strides in recent years the number and variety of distributions to choose from continue to create problems Focusing on techniques used successfully across many fields Fitting Statistical Distributions presents all of the relevant results related to the Generalized Lambda Distribution the Generalized Bootstrap and Monte Carlo simulation It provides the tables algorithms and computer programs needed for fitting continuous probability distributions to data in a wide variety of circumstances covering bivariate as well as univariate distributions and including situations where moments do not exist *Monotonic Dependence Functions of Bivariate Distributions* T. Kowalczyk,E. Pleszczyńska,1976 **Tables of the Bivariate Normal Distribution Function and Related Functions** ,1959 *Certain Properties of Bivariate Generalized Poisson Distributions with Special Reference to the Hermite Distribution* H. Papageorgiou,1977 *Factoring Bivariate Distributions* Frank Lad,University of Canterbury. Department of Mathematics and Statistics,2005 *Tables of Bivariate Normal Distribution Function and Related Functions [with Bibliography]* ,1959 A Test of Fit for Bivariate Distributions Ram C. Dahiya,John Gurland,University of Wisconsin--Madison. Mathematics Research Center,WISCONSIN UNIV MADISON MATHEMATICS RESEARCH CENTER.,1971 Tests of fit based on generalized minimum chi square techniques are developed for bivariate distributions The asymptotic null distribution of the test statistic is chi square while the asymptotic non null distribution turns out to be that of a weighted sum of independent non central chi square variates The special case of testing the fit of a bivariate normal distribution is investigated in detail and the power is obtained for several alternative families of bivariate distributions

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