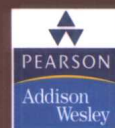


清华管理学系列英文版教材



初级统计学

第 8 版

(美) Mario F. Triola 著

Elementary Statistics
Eighth Edition



清华大学出版社



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北京

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出版说明

为了适应经济全球化的发展趋势,满足国内广大读者了解、学习和借鉴国外先进的管理经验和掌握经济理论的前沿动态,清华大学出版社与国外著名出版公司合作影印出版一系列英文版经济管理方面的图书。我们所选择的图书,基本上是已再版多次、在国外深受欢迎、并被广泛采用的优秀教材,绝大部分是该领域中较具权威性的经典之作。在选书的过程中,我们得到了很多专家、学者的支持、帮助和鼓励,在此表示谢意!清华管理学系列英文版教材由清华大学经济管理学院和北京大学经济学院马力、毛波、王雪莉、刘丽文、郎立君、钱小军、姜彦福、蔚林巍、吴志明、刘新立等老师审阅,在此一并致谢!

由于原作者所处国家的政治、经济和文化背景等与我国不同,对书中所持观点,敬请广大读者在阅读过程中注意加以分析和鉴别。

我们期望这套影印书的出版对我国经济科学的发展能有所帮助,对我国经济管理专业的教学能有所促进。

欢迎广大读者给我们提出宝贵的意见和建议;同时也欢迎有关的专业人士向我们推荐您所接触到的国外优秀图书。

清华大学出版社经管事业部

2003. 11

世纪之交,中国与世界的发展呈现最显著的两大趋势——以网络为代表的信息技术的突飞猛进,以及经济全球化的激烈挑战。无论是无远弗界的因特网,还是日益密切的政治、经济、文化等方面的国际合作,都标示着21世纪的中国是一个更加开放的中国,也面临着一个更加开放的世界。

教育,特别是管理教育总是扮演着学习与合作的先行者的角色。改革开放以来,尤其是20世纪90年代之后,为了探寻中国国情与国际上一切优秀的管理教育思想、方法和手段的完美结合,为了更好地培养高层次的“面向国际市场竞争、具备国际经营头脑”的管理者,我国的教育机构与美国、欧洲、澳洲以及亚洲一些国家和地区的大量的著名管理学院和顶尖跨国企业建立了长期密切的合作关系。以清华大学经济管理学院为例,2000年,学院顾问委员会成立,并于10月举行了第一次会议,2001年4月又举行了第二次会议。这个顾问委员会包括了世界上最大的一些跨国公司和中国几家顶尖企业的最高领导人,其阵容之大、层次之高,超过了世界上任何一所商学院。在这样高层次、多样化、重实效的管理教育国际合作中,教师和学生与国外的交流机会大幅度增加,越来越深刻地融入到全球性的教育、文化和思想观念的时代变革中,我们的管理教育工作者和经济管理学习者,更加真切地体验到这个世界正发生着深刻的变化,也更主动地探寻和把握着世界经济发展和跨国企业运作的脉搏。

我国管理教育的发展,闭关锁国、闭门造车是绝对不行的,必须同国际接轨,按照国际一流的水准来要求自己。正如朱镕基总理在清华大学经济管理学院成立十周年时所发的贺信中指出的那样:“建设有中国特色的社会主义,需要一大批掌握市场经济的一般规律,熟悉其运行规则,而又了解中国企业实情的经济管理人才。清华大学经济管理学院就要敢于借鉴、引进世界上一切优秀的经济管理学院的教学内容、方法和手段,结合中国的国情,办成世界第一流的经管学院。”作为达到世界一流的一个重要基础,朱镕基总理多次建议清华的MBA教育要加强英语教学。我体会,这不仅因为英语是当今世界交往中重要的语言工具,是连接中国与世界的重要桥梁和媒介,而且更是中国经济管理人才参与国际竞争,加强国际合作,实现中国企业的国际战略的基石。推动和实行英文教学并不是目的,真正的目的在于培养学生——这些未来的企业家——能够具备同国际竞争对手、合作伙伴沟通和对抗的能力。按照这一要求,清华大学经济管理学院正在不断推动英语教学的步伐,使得英语不仅是一门需要学习的核心

课程，而且渗透到各门专业课程的学习当中。

课堂讲授之外，课前课后的大量英文原版著作、案例的阅读对于提高学生的英文水平也是非常关键的。这不仅是积累相当的专业词汇的重要手段，而且是对学习者思维方式的有效训练。

我们知道，就阅读而言，学习和借鉴国外先进的管理经验和掌握经济理论动态，或是阅读翻译作品，或是阅读原著。前者属于间接阅读，后者属于直接阅读。直接阅读取决于读者的外文阅读能力，有较高外语水平的读者当然喜欢直接阅读原著，这样不仅可以避免因译者的疏忽或水平所限而造成的纰漏，同时也可以尽享原作者思想的真实表达。而对于那些有一定外语基础，但又不能完全独立阅读国外原著的读者来说，外文的阅读能力是需要加强培养和训练的，尤其是专业外语的阅读能力更是如此。如果一个人永远不接触专业外版图书，他在获得国外学术信息方面就永远会比别人差半年甚至一年的时间，他就会在无形中减弱自己的竞争能力。因此，我们认为，有一定外语基础的读者，都应该尝试一下阅读外文原版，只要努力并坚持，就一定能过了这道关，到那时就能体验到直接阅读的妙处了。

在掌握大量术语的同时，我们更看重读者在阅读英文原版著作时对于西方管理者或研究者的思维方式的学习和体会。我认为，原汁原味的世界级大师富有特色的表达方式背后，反映了思维习惯，反映了思想精髓，反映了文化特征，也反映了战略偏好。知己知彼，对于跨文化的管理思想、方法的学习，一定要熟悉这些思想、方法所孕育、成长的文化土壤，这样，有朝一日才能真正“具备国际战略头脑”。

以往，普通读者购买和阅读英文原版还有一个书价的障碍。一本外版书少则几十美元，多则上百美元，一般读者只能望书兴叹。随着全球经济合作步伐的加快，目前在出版行业有了一种新的合作出版的方式，即外文影印版，其价格几乎与国内同类图书持平。这样一来，读者可以不必再为书价发愁。清华大学出版社这些年在这方面一直以独特的优势领先于同行。早在1997年，清华大学出版社敢为人先，在国内最早推出一批优秀商学英文版教材，规模宏大，在企业界和管理教育界引起不小的轰动，更使国内莘莘学子受益良多。

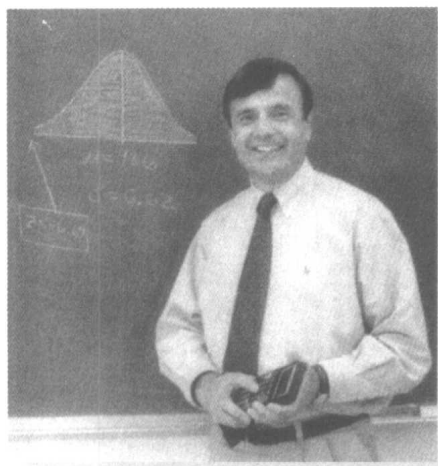
为了配合清华大学经济管理学院推动英文授课的急需，也为了向全国更多的MBA试点院校和更多的经济管理学院的教师和学生提供学习上的支持，清华大学出版社再次隆重推出与世界著名出版集团合作的英文原版影印商学教科书，也使广大工商界人士、经济管理类学生享用到最新最好质优价廉的国际教材。

祝愿我国的管理教育事业在社会各界的大力支持和关心下不断发展、日进日新；祝愿我国的经济建设在不断涌现的大批高层次的面向国际市场竞争、具备国际经营头脑的管理者的勉力经营下早日中兴。

赵纯钧 教授

清华大学经济管理学院院长
全国工商管理硕士教育指导委员会副主任

About the Author



Mario F. Triola is a Professor of Mathematics at Dutchess Community College, where he has taught statistics for over 30 years. Marty is the author of *Mathematics and the Modern World* and *A Survey of Mathematics* and is coauthor of *Introduction to Technical Mathematics*, and *Business Statistics*. Outside of the classroom, Marty's consulting work includes the mathematical design of casino slot machines and fishing rods, and he has worked with attorneys in determining probabilities in paternity lawsuits, identifying salary inequities based on gender, and analyzing disputed election results. Marty was recently a writing team member of the Project Coalition writing team with NASA and the American Mathematics Association of Two-Year Colleges.

When he's not working, Marty enjoys playing golf and tennis, running, hiking, and anything that flies. He has a commercial pilot's license with an instrument rating, and has flown airplanes, helicopters, sail planes, hang gliders, and hot air balloons. His passion for flying has included parachute jumps, flying in a Goodyear blimp, and parasailing.

The Text and Academic Authors Association has awarded Mario F. Triola a "Texty" for Excellence for his work on *Elementary Statistics*.



Preface

ABOUT THIS BOOK

The author and publisher of this award-winning book share a common goal: Provide the best possible introductory statistics book for both students and professors. *Elementary Statistics*, Eighth Edition, incorporates the latest technological and teaching advances, an abundance of pedagogical features, and real, meaningful, and interesting applications, such as those related to these questions:

- Does it rain more on weekends (as reported by the media)?
- Is the mean body temperature really 98.6°F , as is commonly believed?
- When the Titanic sank, did passengers follow the rule of "women and children first"?
- Would you be surprised to learn that regular Coke weighs more than diet Coke?
- Can analysis of discarded garbage be used to predict the size of a population?
- Do fighter jet ejection seats need to be designed to better accommodate female pilots?

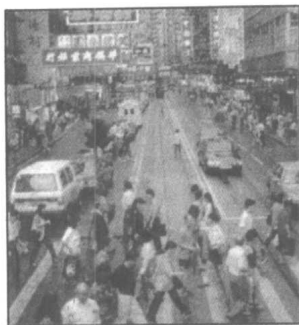


AUDIENCE/PREREQUISITES

Elementary Statistics is written for students majoring in any field. Although the use of algebra is minimal, students should have completed at least an elementary algebra course. In many cases, underlying theory is included, but this book does not stress the mathematical rigor more suitable for mathematics majors. Because the many examples and exercises cover a wide variety of different and interesting statistical applications, *Elementary Statistics* is appropriate for students pursuing careers drawing from a wide variety of disciplines ranging from the social sciences of psychology and sociology to areas such as education, the allied health fields, business, economics, engineering, the humanities, the physical sciences, journalism, communications, and liberal arts.

CONTENT AND ORGANIZATION CHANGES IN THE EIGHTH EDITION

- Section 1-5 (Statistics with Calculators and Computers) from the 7th edition has been deleted, because references to calculators and computers are now included throughout this 8th edition. The Cumulative Review Exercises for Chapter 1 continue to include calculator "warm-up" exercises.



- The 7th edition section on the Multiplication Rule is now divided into two separate sections: Section 3-4 (Multiplication Rule: Basics) and Section 3-5 (Multiplication Rule: Complements and Conditional Probability). This provides greater flexibility for instructors who prefer to include less probability, and it also helps students by allowing them to focus on the basics of the multiplication rule before studying the more difficult applications of that rule.
- Section 5-7 (Determining Normality) is a new section that describes methods for determining whether a set of sample data appears to come from a population having a normal distribution.
- The 7th edition section on "Estimating a Population Mean: Large Samples" has been reorganized so that the subsection of "Determining Sample Size" is now a separate section (Section 6-4). It is our experience that the former Section 6-2 could not be covered in a single class hour. The new organization makes it easier to cover confidence interval estimates for means before considering the separate issue of determining sample size.
- The sections of Chapter 8 (Inferences from Two Samples) have been rearranged to better fit the preferences of instructors who would like to include some, but not all, sections of this chapter.
- Section 9-6 (Modeling) is a new section that uses some of the correlation/regression tools in developing a mathematical function that describes real-world data. It includes nonlinear functions, such as quadratic, exponential, and power functions.
- Throughout the book there is even greater emphasis on *describing*, *exploring*, and *comparing* data. For examples, see Section 2-3 or 8-2, or the Chapter Problem for Chapter 11.
- Throughout the book there is even greater emphasis on *interpreting* results. Instead of simply obtaining an answer, the consequences of the answer are considered. For example, when discussing probability in Chapter 3, instead of simply finding probability values, we interpret them by differentiating between events that are usual and those that are unusual. In Section 4-4, after we find the values of means and standard deviations in binomial probability distributions, we use those results to distinguish between results that are usual and those that are unusual. With hypothesis testing, we don't simply end with a conclusion of rejecting or failing to reject a null hypothesis; we proceed to state a practical conclusion that addresses the real issue. Students are encouraged to *think* about the implications of results instead of cranking out cookbook results that make no real sense.

FLEXIBLE SYLLABUS

The organization of this book reflects the preferences of most statistics instructors, but there are two common variations that can be used easily with this 8th edition:

- **Early coverage of correlation/regression:** Some instructors prefer to cover the basics of correlation and regression early in the course, such as immediately following the topics of Chapter 2. *Sections 9-2 (Correlation) and 9-3 (Regression)*

can be covered early in the course. Simply omit the subsection in Section 9-2 clearly identified as "Formal Hypothesis Test (Requires Coverage of Chapter 7)."

- **Minimum probability:** Some instructors feel strongly that coverage of probability should be extensive, while others feel just as strongly that coverage should be kept to a bare minimum. Instructors preferring minimum coverage can include Section 3-2 while skipping the remaining sections of Chapter 3. Sections 3-3 through 3-7 are not essential for the chapters that follow. Many instructors prefer to cover only the fundamentals of probability along with the basics of the addition rule and multiplication rule. The reorganized coverage of the multiplication rule (Sections 3-4 and 3-5) now offers that flexibility.

NEW FEATURES

- **Statistics in the News**, a feature included at the end of each chapter, provides real-life illustrations and activities that relate to the use of statistics in current and newsworthy applications.
- **Internet Projects**, also included at the end of each chapter, involve the student with applications using data found on the Internet. The projects can be found at <http://www.awlonline.com/triola>.
- **TI-83 Plus** instructions and screen displays are included throughout the book.
- **Excel** instructions and screen displays are now included throughout the book.
- **Titles for Examples and Exercises** are included so that instructors and students can quickly identify the topic and/or methodology involved.
- **ActivStats® icons** throughout the text encourage students to go to the ActivStats CD when encountering difficult concepts.
- **CD-ROM**, packaged free with the text, contains the STATDISK statistical software, the Excel add-in (Data Desk/XL), and the Appendix B data sets in formats for different technologies, as well as a TI-83 Plus data application.



*Internet
Project*

EXERCISES

There are **1500** exercises—*more than 60 percent of them new!* Many more of the exercises require interpretation of results. Because exercises are of such critical importance to any statistics book, great care has been taken to ensure their usefulness, relevance, and accuracy. Three statisticians have read carefully through the final stages of the book to verify accuracy of the text material and exercise answers. Exercises are arranged in order of increasing difficulty by dividing them into two groups: (1) Basic Skills and Concepts and (2) Beyond the Basics. The Beyond the Basics exercises address more difficult concepts or require a somewhat stronger mathematical background. In some cases, these exercises also introduce a new concept.

Real data: *More than half of the exercises use real data.* Because the use of real data is such an important consideration for students, hundreds of hours have been devoted to finding real, meaningful, and interesting data. In addition to the real data included throughout the book, many exercises refer to the 20 data sets listed in Appendix B.

HALLMARK FEATURES

Beyond an interesting and accessible (and sometimes humorous) writing style, great care has been taken to ensure that each chapter of *Elementary Statistics* will help students understand the concepts presented. The following features are designed to help meet that objective:

- **Chapter-opening features:** A list of chapter sections previews the chapter for the student; a chapter-opening problem, using real data, then motivates the chapter material; and the first section is a chapter overview that provides a statement of the chapter's objectives.
- **End-of-chapter features:**
 - Statistics in the News** encourages analysis of timely applications of statistics.
 - A Vocabulary List** of important terms (a full glossary is found in Appendix D);
 - A Chapter Review** summarizes the key concepts and topics of the chapter;
 - Review Exercises** provide practice on chapter concepts and procedures;
 - Cumulative Review Exercises** reinforce earlier material;
 - From Data to Decision: Critical Thinking**, a capstone problem, requires critical thinking and a writing component;
 - Cooperative Group Activities** encourage active learning in groups;
 - Technology Projects** are specifically designed to incorporate an application using technology;
 - Internet Project** that applies important chapter concepts.
- **Margin Essays:** The text includes 106 margin essays, which illustrate uses and abuses of statistics in real, practical, and interesting applications. Topics include "Six Degrees of Separation," "Statistics and Land Mines," "Using Statistics to Identify Thieves," and "Choosing Personal Security Codes."
- **STATDISK, Minitab, Excel, and TI-83 Plus** instructions and output appear throughout the book.
- **Flowcharts:** These appear throughout the text to simplify and clarify more complex concepts and procedures.
- **Real Data Sets:** Real data are used extensively throughout the entire book. Appendix B lists 20 data sets, 10 of which are new. These data sets are provided in printed form in Appendix B at the back of the book, and in electronic form on the CD packaged with the book. The data sets include such varied topics as eruptions of the Old Faithful geyser, nicotine contents of cigarettes, diamond prices and characteristics, weights of diet and regular Coke and Pepsi, movie financial and rating data, and rainfall amounts.
- **Interviews:** Every chapter of the text now includes interviews with professional men and women in a variety of fields who use statistics in their day-to-day work.
- **Appendices:** Appendix A contains tables; Appendix B lists 20 data sets; Appendix C is a summary of important TI-83 Plus procedures; Appendix D is a glossary of important terms; Appendix E is a bibliography of recommended text and reference books; Appendix F contains answers to all the odd-numbered section exercises, as well as *all* answers to Review Exercises and Cumulative Review Exercises.
- **Quick-Reference Endpapers:** Tables A-2 and A-3 (the normal and t distributions) are reproduced on the front inside cover pages. A symbol table is included on the last pages for quick and easy reference to key symbols.



from **DATA** to
DECISION

- **Detachable Formula/Table Card:** This insert, organized by chapter, gives students a quick reference for studying, or for use when taking tests (if allowed by the instructor). The formula/table card is also available on the book Web site.

TECHNOLOGY

Elementary Statistics, Eighth Edition, can be easily used without reference to any specific technology. Many instructors have successfully used past editions of this book with students using only scientific calculators. However, for those who choose to supplement the course with specific technology, the following tools are available:

TECHNOLOGY SUPPLEMENTS

- **STATDISK:** An easy-to-use statistical software package developed specifically for use with *Elementary Statistics*, included on the CD-ROM provided with this book. The new Version 8.1 of STATDISK is available for Windows and Macintosh systems. In addition to this free software, there are references to STATDISK throughout this book, and there is a separate STATDISK manual/workbook designed specifically as a supplement to this book.
- **Minitab:** There are references to Minitab (Release 12) throughout this book, and there is a separate Minitab manual/workbook designed specifically as a supplement. The Appendix B data sets are included on the CD-ROM in a Minitab format.
- **Excel:** References to Excel are included throughout this book, and there is a separate Excel manual/workbook designed specifically as a supplement to this text. The Appendix B data sets are included on the CD-ROM in an Excel Format.
- **Excel Add-In:** Data Desk/XL is a software supplement on the CD-ROM that enhances the statistics capabilities of the Excel program.
- **TI-83 Plus:** References to the TI-83 Plus calculator appear throughout, and there is a separate manual/workbook designed specifically as a supplement to this book. The CD-ROM includes a data application for the TI-83 Plus. This application includes the Appendix B data sets.
- **SPSS:** There is a separate SPSS manual/workbook designed specifically as a supplement to this book. The Appendix B data sets are included on the CD-ROM in an SPSS format.
- **Data CD:** The Appendix B data sets included in formats for Minitab, Excel, SPSS, the TI-83 Plus calculator, and text files are included on the CD and packaged with the book.
- **Web Site:** www.awlonline.com/triola includes further information and links to other sites with useful data sets.

STATDISK**MINITAB****EXCEL****TI-83 Plus**

SUPPLEMENTS

The student and instructor supplements packages are intended to be the most complete and helpful learning system available for an introductory statistics course. The following supplements are available from Addison Wesley Longman Publishing Company. Instructors should contact the local AWL sales consultant, or e-mail the company directly at exam@awl.com for examination copies.

FOR THE INSTRUCTOR

- **Annotated Instructor's Edition**, by Mario F. Triola, contains answers to all exercises in the margin, recommended assignments, and teaching suggestions. ISBN: 0-201-61480-4. (Student for-sale edition ISBN: 0-201-61477-4).
- **Instructor's Guide and Solutions Manual**, by Mario F. Triola and Milton Loyer (Penn State University), contains solutions to all the exercises, quizzes (with answers), transparency masters, and sample course syllabi. ISBN: 0-201-70460-9.
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