Business Statistics

Robert A. Donnelly, Jr.

Thu Vien DHKTCN-TN
KDO.14008512

note: see inside!

Business Statistics

Robert A. Donnelly, Jr.

PEARSON

Boston Columbus Indianapolis New York San Francisco Upper Saddle River
Amsterdam Cape Town Dubai London Madrid Milan Munich Paris Montréal Toronto
Delhi Mexico City São Paulo Sydney Hong Kong Seoul Singapore Taipei Tokyo

Editorial Director: Sally Yagan
Editor in Chief: Donna Battista
Senior Acquisitions Editor: Chuck Synovec
Senior Editorial Project Manager: Mary Kate Murray
Editorial Assistant: Ashlee Bradbury
Director of Development: Steve Deitmer
Development Editor: Amy Ray
Director of Marketing: Maggie Moylan
Executive Marketing Manager: Anne Fahlgren
Senior Managing Editor: Judy Leale
Production Project Manager: Jacqueline A. Martin
Senior Operations Supervisor: Arnold Vila
Operations Specialist: Cathleen Petersen
Associate Director of Design and Text Designer: Blair Brown
Art Director and Cover Designer: Kathryn Foot
Photo Researcher: Lauren McFalls
Associate Media Project Manager: Sarah Peterson
Media Project Manager: John Cassar
Lead Media Project Manager: Jean Choe
Full-Service Project Management: PreMediaGlobal USA, Inc.
Composition: PreMediaGlobal, Inc.
Printer/Binder: Courier/Kendallville
Cover Printer: Lehigh-Phoenix Color/Hagerstown
Text Font: Times 10/12

Credits and acknowledgments borrowed from other sources and reproduced, with permission, in this textbook appear on the appropriate page within the text.

Microsoft® and Windows® are registered trademarks of the Microsoft Corporation in the U.S.A. and other countries. This book is not sponsored or endorsed by or affiliated with the Microsoft Corporation.

Microsoft and/or its respective suppliers make no representations about the suitability of the information contained in the documents and related graphics published as part of the services for any purpose. All such documents and related graphics are provided "as is" without warranty of any kind. Microsoft and/or its respective suppliers hereby disclaim all warranties and conditions with regard to this information, including all warranties and conditions of merchantability, whether express, implied or statutory, fitness for a particular purpose, title and non-infringement. In no event shall Microsoft and/or its respective suppliers be liable for any special, indirect or consequential damages or any damages whatsoever resulting from loss of use, data or profits, whether in an action of contract, negligence or other tortious action, arising out of or in connection with the use or performance of information available from the services.

The documents and related graphics contained herein could include technical inaccuracies or typographical errors. Changes are periodically added to the information herein. Microsoft and/or its respective suppliers may make improvements and/or changes in the product(s) and/or the program(s) described herein at any time. Partial screen shots may be viewed in full within the software version specified.

Copyright © 2013 by Pearson Education, Inc. All rights reserved. Manufactured in the United States of America. This publication is protected by Copyright, and permission should be obtained from the publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or likewise. To obtain permission(s) to use material from this work, please submit a written request to Pearson Education, Inc., Permissions Department, One Lake Street, Upper Saddle River, New Jersey 07458, or you may fax your request to 201-236-3290.

Many of the designations by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and the publisher was aware of a trademark claim, the designations have been printed in initial caps or all caps.

Library of Congress Cataloging-in-Publication Data

Donnelly, Robert A.
Business statistics / Robert A. Donnelly, Jr.—1st ed.
p. cm.
Includes index.
ISBN 978-0-13-214539-8
1. Commercial statistics. 2. Industrial management—Statistical methods. I. Title.
HF1017.D646 2013
519.5—dc23

2011045717

10 9 8 7 6 5 4 3 2 1

PEARSON

ISBN 10: 0-13-214539-1
ISBN 13: 978-0-13-214539-8

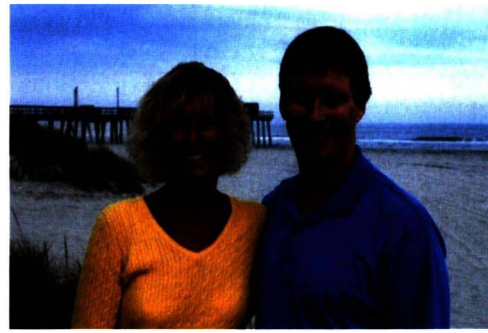
To my wife, Debbie,

who supported and encouraged me every step of the way.

I could not have done this without you, Babe.

About the Author

Robert A. Donnelly, Jr.



Robert (Bob) A. Donnelly Jr. is a professor at Goldey-Beacom College in Wilmington, Delaware, with more than 25 years of teaching experience. He teaches classes in statistics, operations management, management information systems, and database management at both the undergraduate and graduate level. Bob earned an undergraduate degree in chemical engineering from the University of Delaware, after which he worked for several years as an engineer with the Diamond Shamrock Corporation in a chlorine plant. Despite success in this field, Bob felt drawn to pursue a career in education. It was his desire to teach that took him back to school to earn his MBA and Ph.D. in Operations Research, also from the University of Delaware. Bob also teaches in the MBA program at the International School of Management in Paris, France. He thoroughly enjoys discussing research methods and business statistics with both his French and American students.

Bob's working experience gathered prior to his teaching career has provided him with many opportunities to incorporate real-life examples into classroom learning. His students appreciate his knowledge of the business world as well as his mastery of the course subject matter. Many former students seek Bob's assistance in work-related issues that deal with his expertise. Typical student comments focus on his genuine concern for their welfare and his desire to help them succeed in reaching their goals.

Brief Contents

Preface xxi
Acknowledgments xxvii
Dear Students xxxi

Chapter **1** An Introduction to Business Statistics 1

Chapter **2** Displaying Descriptive Statistics 19

Chapter **3** Calculating Descriptive Statistics 77

Chapter **4** Introduction to Probabilities 141

Chapter **5** Discrete Probability Distributions 189

Chapter **6** Continuous Probability Distributions 247

Chapter **7** Sampling and Sampling Distributions 291

Chapter **8** Confidence Intervals 335

Chapter **9** Hypothesis Testing for a Single Population 387

Chapter **10** Hypothesis Tests Comparing Two Populations 443

Chapter **11** Analysis of Variance (ANOVA) Procedures 509

Chapter **12** Chi-Square Tests 581

Chapter **13** Hypothesis Tests for the Population Variance 633

Chapter **14** Correlation and Simple Regression Analyses 659

Chapter **15** Multiple Regressions and Model Building 719

Chapter **16** Forecasting 777

Appendix A 839
Appendix B 881
Index 937