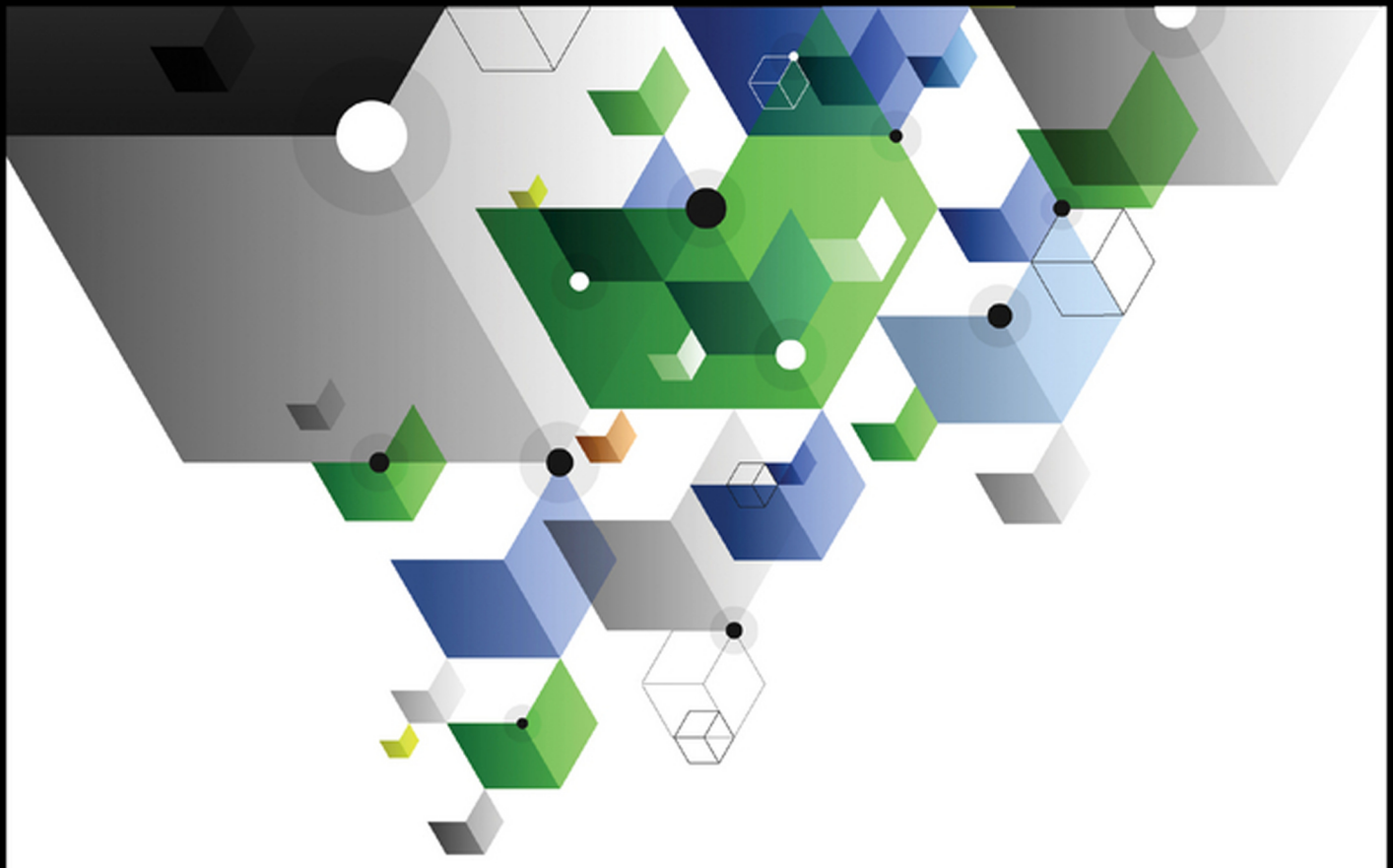

Wayne L. Winston

Marketing Analytics

Data-Driven Techniques with Microsoft Excel

WILEY

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To my wonderful family: Gregory, Jennifer, and Vivian

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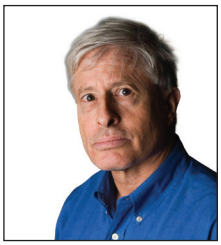

Wayne Winston is Professor Emeritus at the Indiana University Kelley School of Business and is currently a Visiting Professor at the University of Houston Bauer College of Business. Wayne has won more than 45 teaching awards at Indiana University. These awards include six school-wide MBA teaching awards. He has authored 25 reference journal articles and a dozen books including, *Operations Research*: *Applications and Algorithms* (Cengage, 1987), *Practical Management Science* (Cengage, 2011), *Data Analysis and Decision-Making* (Cengage, 2013), *Simulation Modeling with @RISK* (Cengage, 2004), *Mathletics* (Princeton, 2009), and *Excel 2013 Data Analysis and Business Modeling* (O'Reilly, 2014). Wayne has also developed two online courses for Harvard Business School: Spreadsheet Modeling, and Mathematics for Management. He has taught Excel modeling and consulted for many organizations including the U.S. Army, the U.S. Navy, Broadcom, Cisco, Intel, Pfizer, Eli Lilly, Ford, GM, PWC, Microsoft, IAC, Deloitte Consulting, Booz Allen Hamilton, QAS, eBay, the Dallas Mavericks, and the New York Knicks. Lastly, Wayne is a two-time *Jeopardy*! champion.

About the Technical Editor

Lopo Rego joined the Kelley School of Business at Indiana University in 2011 as an Associate Professor of Marketing. Trained in Economics, he "converted to the dark side" during his MBA and has since been interested in understanding the association between marketing strategy and firm performance. This proved to be a life-long quest, leading him to Ann Arbor where he eventually earned his Ph.D. in Marketing at the University of Michigan's Ross School of Business. Not surprisingly, his research interests focus primarily in understanding how marketing decisions, strategies, and investments translate into firm performance, be it at the product-marketplace level, financial-accounting level or shareholder wealth level. Additionally, Lopo is interested in marketing analytics, namely in developing and analyzing marketing metrics that drive firm performance. His research has been published in such outlets as the *Journal of Marketing*, *Marketing Science*, *European Journal of Marketing*, *Journal of Empirical Generalisations in Marketing*, *Harvard Business Review*, *Journal of Research in Marketing*, and *Marketing Science Institute Working Paper Series*.

Acknowledgments

Of all my books, this one was probably the hardest to write. Thanks to my wonderful wife Vivian who was so nice to me when I got frustrated during the authoring process. Wiley acquisitions editor Robert Elliott was always encouraging and his input was a great help in shaping the final product. Wiley project editor Victoria Swider did a great job in pushing me to become a better writer.

Lastly, I must give a special note of thanks to my technical editor, Associate Professor of Marketing at the Kelly School of Business, Lopo Rego. Lopo did an amazing job of suggesting alternative wording and catching errors. He went above and beyond his role as technical editor, and I am truly indebted to him for his Herculean efforts.

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Introduction

In the last 20 years, the use of analytic techniques in marketing has greatly increased. In April 2013, *Forbes* magazine reported a 67-percent growth in marketing-related analytics hires during the previous year and an amazing 136-percent growth during the previous 3 years.

Given this growth of interest in marketing analytics and my love of Excel modeling, I decided in 2004 to create a 7-week MBA elective in marketing analytics (K509) at the Indiana University Kelley School of Business. Although there are several excellent advanced marketing analytics books. (I am partial to *Database Marketing* by Robert Blattberg, Byung-Do Kim, and Scott Neslin (Springer, 2008).) I could not find an Excel-based book that provided a how-to-do-it approach suitable for an MBA elective or an advanced undergraduate course. With no suitable book in hand, I wrote up course notes that I used in classes for 10 years. The course has been wildly successful with nearly 65 percent of all MBA's at the Kelley School taking the class. In May 2013, I was honored to receive the Eli Lilly MBA teaching award as the best teacher in the MBA program, primarily for teaching K509. In November 2011, Robert Elliott of Wiley Publishing approached me about turning my notes into a book, and this book is the result. In addition to being utilized in K509, portions of the book have been used to teach marketing analytics to senior managers at Deloitte consulting, Booz Allen Hamilton consulting, and 3M marketing analysts.

How This Book Is Organized

Since I started using Excel in classes in 1992, I have become a total convert to teaching by example. This book is no exception. Virtually every chapter's primary focus is to teach you the concepts through how-to examples. Each example has the following components:

- Step-by-step instructions
- A downloadable Excel file containing data and solutions
- Screenshots of various steps and sections of the Excel file for clarity

The downloadable Excel files provide complete solutions to the examples, but the instructions encourage you to follow along and work through them on your own. If you follow along using the provided Excel files, you can work in empty

cells alongside the completed solution and compare your result with the provided solution to ensure your success.

The book has been organized around 11 topical areas.

Part I: Using Excel to Summarize Marketing Data

This part of the book introduces the marketing analyst to many Excel tools that can be used to analyze marketing problems: PivotTables (Chapter 1), charting (Chapter 2), and Excel statistical functions (Chapter 3), including the incredibly useful `COUNTIF`, `COUNTIFS`, `SUMIF`, `SUMIFS`, `AVERAGEIF`, and `AVERAGEIFS` functions.

Part II: Pricing

The determination of a profit maximizing pricing strategy is always difficult. In this section you learn how to quickly estimate demand curves and use the Excel Solver (Chapter 4) to determine profit maximizing prices. The Excel Solver is then used to optimize price bundling (Chapter 5), nonlinear pricing strategies (Chapter 6), and price-skimming strategies (Chapter 7). A brief introduction to revenue management, also known as yield management (Chapter 8), is also included.

Part III: Forecasting

Businesses need accurate forecasts of future sales. Sales forecasts drive decisions involving production schedules, inventory management, manpower planning, and many other parts of the business. In this section you first learn about two of the most used forecasting tools: simple linear (Chapter 9) and simple multiple regression (Chapters 10 and 11). Then you learn how to estimate the trend and seasonal aspects of sales (Chapter 12) and generate forecasts using two common extrapolation forecasting methods: the Ratio to Moving Average method (Chapter 13), and Winter's Method for exponential smoothing (Chapter 14) with trend and seasonality. Then you learn about neural networks (Chapter 15), a form of artificial intelligence whose role in marketing forecasting is rapidly growing.

Part IV: What Do Customers Want?

Every brand manager wants to know how various product attributes drive the sales of a product. For example, what is most important in a consumer's choice of car: price, brand, engine horsepower, styling, or fuel economy? In this section you learn how conjoint analysis (Chapter 16) and discrete choice (Chapter 18) can be used to rank the importance of product attributes and also rank levels of product attributes. For example, what type of styling on an SUV is most preferred? You also

learn about the widely used tool of logistic regression (Chapter 17), which is used to estimate probabilities involving situations in which two, or binary, outcomes must be forecasted. For example, how a person's demographic information can be used to predict the chance that he will subscribe to a magazine.

Part V: Customer Value

Companies cannot make intelligent decisions on how to spend money acquiring customers unless they understand the value of their customers. After all, spending $400 to acquire a customer who will generate $300 in long-term profits is a sure recipe for going out of business. In this section you learn how to measure customer value (Chapter 19), value companies based on the customer value concept (Chapter 20), incorporate uncertainty in customer value models (Chapter 21), and use your understanding of customer value to optimally allocate resources (Chapter 22) between acquisition and retention of customers.

Part VI: Market Segmentation

No matter what product you sell, your market consists of different market segments. For example, in Chapter 23 you will use cluster analysis to show that that every U.S. city can be classified into one of four demographic segments. In Chapter 25 you will learn how classification trees can be used to segment a market. You are also introduced to the exciting concepts behind collaborative filtering (Chapter 24), which is the basis for Amazon.com and Netflix recommendations.

Part VII: Forecasting New Product Sales

With little or no history about sales of a product, it is difficult to predict future product sales. Given a few data points, S curves (Chapter 26) can be used to predict future product sales. The famous Bass diffusion model (Chapter 27) explains how sales of products evolve over time and can be used to predict product sales even before a product comes to the market. The little-known Copernican Principle (Chapter 28) enables you to predict the remaining time for which a product will be sold.

Part VIII: Retailing

Analytic techniques can help retailers deal with many important issues. The concepts of market basket analysis and lift (Chapter 29) help retailers derive a store layout that maximizes sales from complementary products. Recency, frequency, and monetary value analysis (Chapter 30) helps direct mailers maximize profit from their mailings. The widely known SCAN*PRO (Chapter 31) model helps retailers

determine how factors such as seasonality, price, and promotions influence product sales. In Chapter 32 you learn how to use analytic techniques to determine optimal allocation of store space between products and also optimize the use of a corporate sales force. Finally in Chapter 33 you learn how to forecast total sales of a product from a few data points.

Part IX: Advertising

Department store owner John Wanamaker said, "Half the money I spend on advertising is wasted; the trouble is I don't know which half." In Chapter 34 you learn how John Wanamaker could have used the ADSTOCK model to measure the effectiveness of his advertising expenditures. In Chapter 35 you learn how to allocate ads between the available media outlets to maximize the effectiveness of ads. Chapter 36 deals with the math behind online ad auctions.

Part X: Marketing Research Tools

Often the marketing analyst must deal with data sets involving many variables. Principal components (Chapter 37) and Multidimensional Scaling (Chapter 38) enable the marketing analysts to reduce data sets involving many variables to a few easily understood variables. Often the marketing analyst must classify objects into one of several groups. Naive Bayes and discriminant analysis (Chapter 39) are great tools for developing classification rules. When the marketing analyst wants to determine if a single factor or a pair of factors has a significant effect on product sales, ANOVA (Chapter 40 and Chapter 41) is a useful tool.

Part XI: The Internet and Social Marketing

In the last 20 years, the Internet has turned our world upside down, and marketing is no exception. Social media such as Facebook and Twitter create many interesting opportunities for the marketer, which require careful analysis. In Chapter 42 you learn how the theory of networks sheds light on how you can identify people who are the key to spreading the word about your product. Chapter 43 discusses the math behind Malcom Gladwell's bestselling book *The Tipping Point (Back Bay Books, 2002).* Chapter 44 discusses the math behind videos (such as the notorious "Gangnam Style") going viral. Finally, in Chapter 45 you learn how text mining can be used to glean useful insight from Twitter, blogs, and Facebook posts.

Who Should Read This Book

There is plenty of material in this book for a one-semester course on marketing analytics at the advanced undergraduate or MBA level. I also believe the book can be useful to any corporate marketing analyst. With regard to prerequisites for the book, I assume you understand the Copy command in Excel. That is, you know when and where to put dollars signs in a formula. If you work hard, that's about all the prior knowledge needed to get a lot out of the book.

I always try to write my books in a modular fashion, so you can skip around and read about what interests you. If you don't want to read the book from start to finish, the following table should help you navigate the book.

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