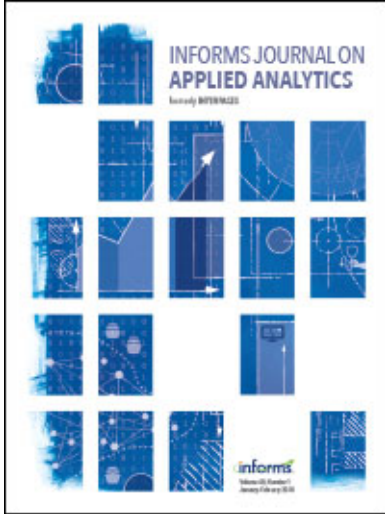




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Book Reviews

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Book Reviews

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In *Book Reviews*, we review an extensive and diverse range of books. They cover theory and applications in operations research, statistics, management science, econometrics, mathematics, computers, and information systems. In addition, we include books in other fields that emphasize technical applications. The editor will be pleased to receive an email from those willing to review a book, with an indication of specific areas of interest. If you are aware of a specific book that you would like to review, or that you think should be reviewed, please contact the editor.

The following books are reviewed in this issue of *Interfaces*, 46(4), July–August 2016: *Phishing for Phools: The Economics of Manipulation and Deception*, George A. Akerlof and Robert J. Shiller; and *Applied Probability: Models and Intuition*, Arnold I. Barnett.

AKERLOF, GEORGE A., ROBERT J. SHILLER. 2015. *Phishing for Phools: The Economics of Manipulation and Deception*. Princeton University Press. 272 pp. \$24.95.

Phishing “is about getting people to do things that are in the interest of the phisher, but not in the interest of the target” (p. xi). Similarly, a phool “is someone who, for whatever reason, is successfully phished” (p. xi). With these two definitions in place, the eminent authors of this book contend that by their very nature, competitive markets—the much vaunted construct that is so dear to most economics textbooks—give rise to deception and to trickery. That is, consumers operating in competitive markets are standardly being phished and, quite often, they do not even know that this is happening. This is the central thesis that the authors explore at some length in this book. Rather than provide a tedious chapter-by-chapter review, I shall sample selectively from this book’s contents. This should provide the reader with an adequate flavor for the book’s intellectual contributions.

Consider one particularly egregious kind of phishing, namely, reputation mining. As the authors helpfully explain, suppose Mr. A has a reputation for selling beautiful, ripe avocados. Mr. A now has an opportunity with regard to the use of his reputation. Specifically, he can sell Mr. B a mediocre avocado at the price that Mr. B would have paid for the beautiful, ripe avocado. By doing this, Mr. A will have effectively mined his reputation and, at the same time, phished Mr. B for a

phool. This kind of phishing works because of Mr. A’s reputation and because Mr. B cannot easily tell the difference between high-quality and low-quality avocados; in economics-speak, Mr. B has *imperfect information* about the underlying transaction. The authors claim, with considerable justification, that this kind of reputation mining by some of our most prominent financial institutions was responsible for “the subversion of the system for rating fixed-income securities” (p. 23).

Next, consider automobile purchases. Referring to extant research on this subject, the authors point out that black men and women routinely get bad deals. In addition, automobile salespersons seem to have great success in convincing large numbers of buyers to either pay more for items that should cost less and (or) to pay for items that they do not need. Why does this happen? According to the authors, this happens because “salespeople just have a sense, based on racial and sexual stereotypes, regarding who is less likely to walk away from a bad deal” (p. 61).

The story is similar in the case of credit card usage. Most consumers think that the ability to use credit cards makes life more convenient; however, the authors point to research showing that credit card companies routinely trick people into spending more than they otherwise would. This explains why convenience stores continue to permit customers to use credit cards although credit card companies charge them high fees. On a related note, we learn that if “people are

unknowingly spending more because they are paying by credit card, it would be ill-advised for Macy's, or even the local supermarket, to remind their customers that they might, well, get a discount for paying by cash" (p. 69).

The above discussion is lucid; however, the authors do not discuss the point that when credit card users are phished, the issue is *not* always the possession of imperfect information but a problem of the *absence* of self-control. That is, even if consumers had perfect information about a transaction, they might still pay too much and (or) buy more than they really need because they are prone to impulse buying.

With regard to tobacco and alcohol, the authors note that although both substances are deleterious, the general perception of tobacco differs substantially from the corresponding perception of alcohol. Why? Because we now have incontrovertible evidence that cigarette smoking is injurious to one's health. In contrast, the general story about alcohol is "that alcoholism is a serious condition; but it is also fairly rare" (p. 109). Despite the many and well-known dangers of smoking cigarettes, "Big Tobacco" has still been able to phish consumers for long periods by effectively changing the narrative that confronts smokers and potential smokers. As the authors put it, "Big Tobacco has won its share of victories. In the United States, appealing to its free-speech rights, Big Tobacco has been able to stave off obtrusive labeling requirements..." (p. 107).

So far so good; however, it is possible to take issue with the authors' claim that with regard to both tobacco and alcohol, the "basic phish" (p. 116) is their easy availability. Once again, is the problem not a *lack* of self-control? After all, even over-the-counter drugs can be abused by people without adequate self-control. Can one then credibly claim that there is a basic phish with the availability of such drugs?

Let me supplement the points made above and conclude this review with the following five observations. First, although the authors contend that deception and manipulation are an endemic part of competitive markets, it is not clear that one could ever be free of these undesirable features, irrespective of the underlying market structure. Second, on occasion, the points the authors make are obvious. In this regard, one hardly needs a complete chapter to learn that lobbying in American politics is a problem. Third, this book

includes a lot of repetition, which frequently takes the following form: the authors tell us what material they will cover in a chapter, they then cover this material, and finally they summarize what they just covered. Fourth, instead of covering a lot of territory, this book's central argument would have been more persuasive if the authors had focused in greater detail on a smaller number of topics. Finally, the above jeremiads notwithstanding, this book is easy to read, it is entertaining, and its principal point that competitive markets can easily dupe naïve consumers is valid and deserving of further study.

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BARNETT, ARNOLD I. 2015. *Applied Probability: Models and Intuition*. Dynamic Ideas LLC. 354 pp. \$79.99.

This is an outstanding new book. What mainly distinguishes it from other probability texts is its extensive use of practical, real-world examples, clarity of writing, and focus on insight. Barnett shows that he loves probability, knows the theory well, and has used probability concepts extensively in his research and other work. He also knows how to explain concepts, using a conversational style that does not sacrifice rigor. Readers, especially students, will likely feel that Professor Barnett is speaking directly to them. He seems to be saying: The world of probability is a fascinating one. Come join me as we explore it together.

The book has four chapters, each beginning with a motivating example that the author later solves. Chapter 1, *The Laws of Probability*, starts with the well-known birthday problem. Minerva and Mendel, two recurring characters, argue about the likelihood that no two people of the 60 at a party share a birthday. The birthday problem is a perfect introduction to Chapter 1 and the book because the results will seem so counterintuitive. Later, Barnett shows that the probability of no matches among 60 people is about one in 170, and explains the intuition behind an answer that most find so surprising.

Chapter 1 covers the usual topics, including experiment, sample space, events, the axioms of probability, conditional probability, joint probability and independence, and the use of probability trees, with examples presented as the material unfolds. But then it is off to the races as Barnett presents more than 20 examples of games of chance and fascinating real-world

problems with detailed solutions that cover as many as three pages, and include both his reasoning and the intuition. In *A Coincidence in Connecticut* after the daily lottery number was 828 on two consecutive days, *Time* magazine labeled it a one-in-a-million event. With 1,000 equally likely three-digit numbers, the probability that 828 occurred on the two specific consecutive days is one in a million. But the relevant question is: what is the probability that at least once during a year, the same number occurs on consecutive days? That probability is about one in three. In the famous *Let's Make a Deal/Monty Hall* problem, Barnett presents a simple solution based on the law of alternatives (i.e., the law of total probability) that I had not seen before. In *Homicide in Detroit*, a 1975 *New York Times* article argued that a resident of Detroit had only a one in 2,000 chance of being a homicide victim based on 700 homicides among 1.4 million residents in 1974, where $700/1,400,000 = 1/2,000$. But this is an estimate of the risk per year; over an assumed 70-year life span, the probability is about one in 28. The author labels a number of examples "A True Story," emphasizing the book's focus on real problems.

Other examples in Chapter 1 address airline safety, airport screening, a mortgage bond problem that sheds light on the financial crisis of 2008, a Bayes' theorem problem that asks whether John Hinckley, who shot President Reagan, was schizophrenic, and a problem that estimates drug effectiveness based on a randomized trial of Viagra, where Barnett shows that simply subtracting the percent that report improvement from the placebo from the percent that report improvement from the drug underestimates the drug's true effectiveness. I especially liked the material at the end of each chapter; in this material, which the author labels "The Takeaway Bar," he summarizes key ideas and includes some parting insightful thoughts, such as "When it is difficult exactly to determine the probability of some event, it is useful to approximate that probability under simplifying assumptions" (p. 71). Chapter-ending problems are extensive and range in difficulty, starting with a group aptly named EZ-Pass.

Chapter 2 covers discrete probability distributions: the binomial, geometric, negative binomial, hypergeometric, and Poisson, and provides clear derivations and discussions of means and variances, and conditional expectation, a concept that Barnett uses frequently. Examples include political polling, insurance

risk assessment, finding the probability that adjacent compartments on a cargo plane have containers weighing more than an unsafe threshold value (a true story), queuing at an ATM machine, and air traffic control and the probability that two planes are flying too close to each other (another true story).

Chapter 3 focuses on continuous probability distributions, including the uniform, exponential, gamma, and normal distribution. Additional distributions, such as the *t*-distribution and lognormal, are addressed in the end-of-chapter problems.

Chapter 3 examples include the likelihood of smoke from lithium-ion batteries on the Boeing 787, waiting at the Department of Motor Vehicles, airline revenue management, the classic newsboy problem, and *California Nightmare*. In this last example, geological measurements indicate that major earthquakes in a Southern California area of the San Andreas Fault occur every 160 years on average. Barnett makes the assumption that the time between major earthquakes is normally distributed with a mean of 160 years and an assumed standard deviation of 30 years. Given that this example was written in 2014 and given that the last major earthquake in this region occurred in 1857 (157 years before 2014), Barnett finds the conditional probability that the next major quake in the region will occur in the next 10 years. He defines the random variable *X* as the time from the 1857 quake to the next major one and determines the probability as

$$\begin{aligned} P(157 \leq X \leq 167) \mid X > 157 \\ = \frac{P(157 \leq X \leq 167)}{P(X > 157)} = 0.244; \end{aligned}$$

this is a nice example that raises a scary thought.

Chapter 4, *Combinations of Random Variables*, is especially rich, covering joint distributions of random variables, sums and differences of independent random variables, the central limit theorem, correlation, and covariance. It also includes the more advanced topics of *z*-transforms and moment-generating functions, giving an instructor the flexibility to include these topics.

A Diversified Portfolio includes two stocks with specified means and variances of yearly returns and a negative correlation. The solution includes finding the fractions of the portfolio invested in each stock that would yield the least risk (smallest standard deviation

of the portfolio return). The author could also have extended this example to show the effect of moving the correlation from negative to positive.

Other examples in the chapter include estimating the correlation between rainfall in Chicago and New York City, a statistical control chart for fraction defective, and a commuter problem in which Mendel's route consists of two highly variable and negatively correlated segments, which produce an apparently paradoxical result that shows little variation in the total travel time.

The book is ideally suited for undergraduate and graduate courses for engineers, natural science and social science majors, and others with a recent and reasonably good grasp of calculus. In the MBA program at my institution, we are limited to teaching seven class sessions on probability in a core course in probability and statistics, and we include the book as additional reading.

In teaching probability, it is common to present a fairly limited number of real-world examples, while focusing on laying the foundation for applications in courses to follow. This book is an exception, because it

extends the groundwork to show through its many great examples why probability is so important.

Although the book has some typos, all that I found were rather obvious and should not confuse the reader. I would have liked to see more emphasis on probability trees, and the introduction of the standard normal distribution would have been useful because expressing a normal random variable in standard deviation units provides insight. Including examples using Excel functions also would have been worthwhile, particularly for finding normal distribution probabilities, and adding some probability history would have been interesting. These concerns are minor, however, compared to the many virtues of this textbook.

In summary, *Applied Probability: Models and Intuition* is a unique and remarkably engaging book that through its spirited energy, clarity, and real-world examples makes an outstanding contribution to the teaching of probability.

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