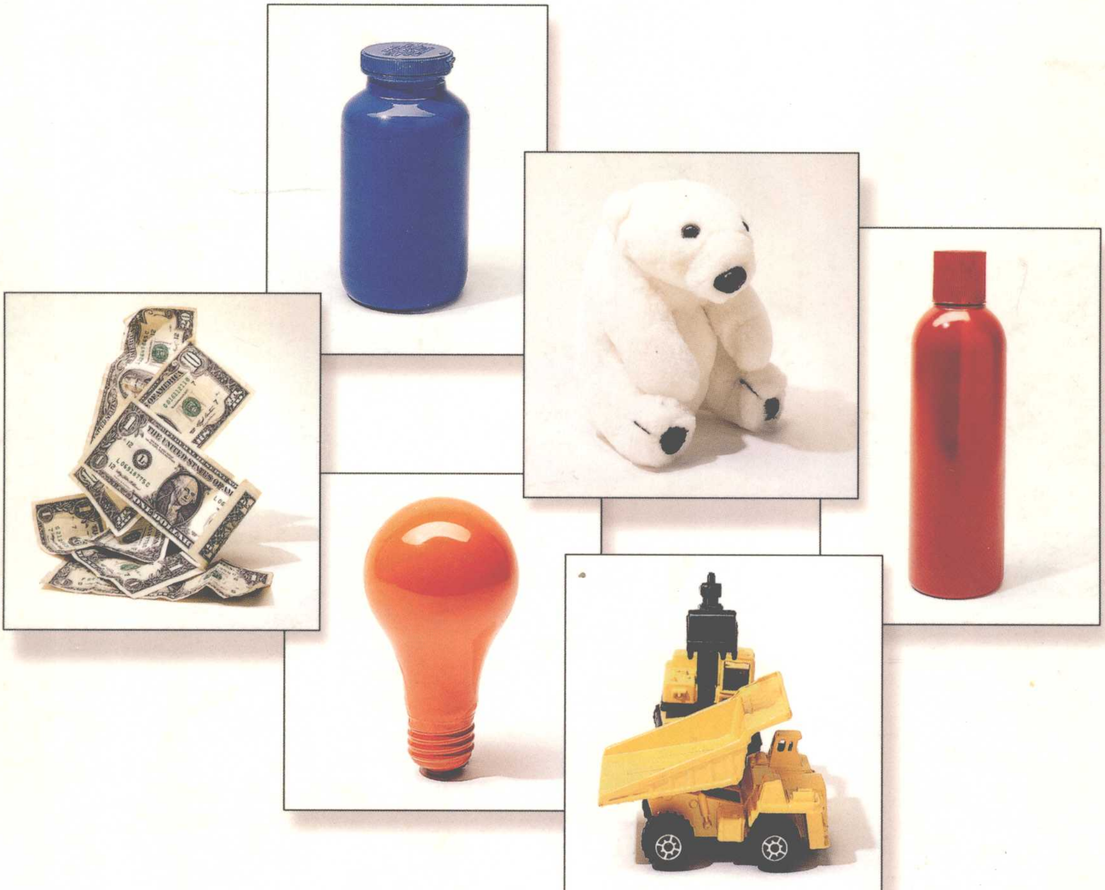
Quantitative Business Analysis Casebook



SAMUEL E. BODILY
ROBERT L. CARRAWAY / SHERWOOD C. FREY, JR.
PHILLIP E. PFEIFER

Quantitative Business Analysis Casebook

Samuel E. Bodily
Darden Graduate School of Business Administration
University of Virginia

Robert L. Carraway
Darden Graduate School of Business Administration
University of Virginia

Sherwood C. Frey, Jr.
Darden Graduate School of Business Administration
University of Virginia

Phillip E. Pfeifer
Darden Graduate School of Business Administration
University of Virginia

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To student-centered learning and to the MBA students of the Darden Graduate School of Business Administration, University of Virginia, who have enriched us with their personalities and energized our teaching with their enthusiasm for learning.

PREFACE

This book contains a set of cases that have proven to be effective pedagogical tools for MBA and executive education audiences in the general area of quantitative business analysis, including decision analysis, statistics, and management science. As such, the cases in this book can be used to complement virtually any existing MBA (or undergraduate, for that matter) curriculum, providing practice in the application of the most commonly used quantitative tools and techniques in realistic business settings.

This book can be much more than this; it can provide the basis for moving away from the traditional technique-driven, compartmentalized, quantitative methods course to a course that is

- decision and action oriented, not technique and numbers driven;
- integrated in both form and pedagogy within a business curriculum, not compartmentalized;
- managerially exciting, not methodologically dull.

Such a course would contain all of the usual topics of existing quantitative courses. Students in such a course will develop the skill and the perspective to use quantitative techniques artfully to gain insight into the resolution of practical business problems. They not only master the specific techniques, but also develop the ability to garner information from commonly available sources and to recognize when a particular technique is appropriate, when additional analysis is called for, and when to end the analysis and make the decision. The most widely applicable methodologies of decision and risk analysis, probability and statistics, competitive analysis, and management science are thus integrated with personal judgment and intuition in a way that is meaningful to MBA and executive learners alike.

A key characteristic of such a course is field-based (i.e., they actually happened) cases drawn from all the functional areas of business. The cases provide realistic, unstructured, business settings wherein the methodologies of the course can be usefully and creatively applied to the decisions of the practicing manager. The case studies serve as vivid answers to the question, Why do I need to learn this? A common theme cutting across all cases, and indeed across the entire course, is the need to make real *decisions.* The cases thus avoid being academic exercises, but assume the vitality of business itself. Thus, *decision analysis* becomes an accurate descriptor of all the cases in this book and is a critical framework from which this new type of quantitative methods course hangs.

Just what is a case? The answer must recognize that cases play a variety of roles in a course. They may be focused on understanding core tools and concepts, on applying methodology appropriately, on defining the limits of good practice, or on inventing new methods and adapting existing ones for the problem at hand.

Some cases in this book are highly structured, focused on a single issue, with needed data laid out. These cases can be used to develop methodology; the cases are not intended merely to present institutional information and provide practical enrichment. Such a case is more than a problem or exercise; it requires some initial assumptions, which may lead to alternative answers, and the analysis must be explained by the student in the case context.

Some of the cases are appraisal cases, where the analysis is partly or wholly done. The student will evaluate the work, applying what has been learned about good practice, and perhaps push the analysis further.

Finally, and more commonly in this book, many cases are unstructured, with multiple issues and data challenges (missing or incomplete data, choices among data, or data preparation needed). In these cases, the student must diagnose the situation, perform the analysis, and explain the use of the analysis and its limits. The intent here is not to produce apprehension, but to show that skills can be confidently applied to realistic situtations. Some of the student's fear that may arise when using cases comes from concern that there is a single right answer and that the student will be unable to find it. If students can see that many reasonable assumptions may be made (some more reasonable than others, to be sure) and that they can do analyses (some more insightful than others), they will find their own way and complement their efforts with ideas that emerge in class.

What makes a strong case? A leading characteristic is a *decision orientation. Relevancy* is key; students recognize that the resolution of the situation matters to them. A strong case demonstrates a *need to know* something not currently known. It involves the *practice of skills,* including new and recently acquired skills. And it requires some *internalization* of concepts and the *articulation* of the reasoning process. Students will see that they are involved in situations that can be key to their careers.

In addition to these characteristics, these cases provide integration with other courses. Issues come up from other disciplines that provide bridges to other courses. If these issues are not immediately put aside in class and built upon, the course is not pigeon holed: "That's *quant,* not management, and therefore not for me." These cases provide many opportunities for joint class sessions, where the regular instructor can be joined by a professor of accounting, ethics, economics, finance, marketing, operations, or human resources to bring together two streams of concepts and to solidify the role of quantitative analysis in each of the business functions.

This casebook's dedication to student-centered learning places both added responsibility and ownership of the learning process upon students who use the book and leads to improved skill retention and less complaining.

The cases are organized alphabetically, not according to a particular methodological approach. This organization allows flexibility in the use of the cases and preserves student responsibility to determine what should be done with each case. Of course, the cases are not to be taught in alphabetical order. The *Instructor's Manual* describes the typical use of each case and provides sample course outlines.

The cases have been used in a one-year course in quantitative analysis or quantitative methods at the first-year MBA level. Many of them have also been used in executive education in short, non-degree programs. They would fit nicely in courses more narrowly focused in decision analysis, management science, or forecasting and regression. For short courses, any subset of these cases can be selected for custom publishing by Irwin.

The cases cover the following topics:

Decision Analysis (both as a methodology in its own right and as a general framework for the course and decision making): Decision Diagrams (trees), Discrete Probability, Expected Value, Sensitivity Analysis, Risk Preference, Value of Information and Control

Discounted Cash Flow Analysis: Relevant Flows, Present Value, NPV, and IRR

Continuous Probability and Probability Distributions: Subjective Assessment, From Data, Analytical Distributions

Risk Analysis with Many Uncertain Quantities: Monte Carlo Simulation, Spreadsheet Modeling with Add-ins

Sampling

Time Series Forecasting

Regression Modeling

Multi-Objective/Multi-Stakeholder Analysis

Competitive Analysis and Negotiation

Optimization: Linear Programming, 0-1 Integer Programming.

We assume virtually no prerequisites. Although calculus is not needed, some algebra is assumed, but rarely getting as far, for example, as solving two equations in two unknowns. Although no prior probability or statistics is presumed, some familiarity can help the student. The principal requirements are clear thinking, the ability to conceptualize, and the ability to cut to the core of an issue.

Even though this case book is software neutral, the electronic spreadsheet is assumed to be a fundamental tool available to the student. The spreadsheet is a very helpful way for instructors to provide the right amount of help to students. Spreadsheets containing data from case exhibits and, sometimes, the setup for analysis are available with the *Instructor's Manual*. They may also be downloaded from the QBA Casebook home page accessible through the Darden School's home page (http://www.darden.virginia.edu/) on the internet. It will be necessary to use @Risk or Crystal Ball, and the Solver within Excel or What'sBest! to do some of the cases. Other software tools, such as TreePlan or DPL, may be useful to students in the course but are not necessary.

A complete instructor's manual, with sample course outlines and an extensive teaching note for each case, is available from Irwin. To the instructor's advantage, the authors have put as much effort and time into the teaching notes as the cases. Each note is the product of many teaching meetings and discussions of pedagogy.

The production of this casebook reaffirms our commitment to what we have been doing with cases for many years. We are glad to see that others in our discipline are also interested in using cases, as evidenced by many sessions on the topic at the meetings of such professional societies as the Institute for Operations Research and the Management Sciences, and the Decision Sciences Institute. We welcome the interest and hope that our efforts may be useful elsewhere.

Please provide feedback (especially about successes and failures with these cases), new case ideas, and innovative ways of teaching. Write to any of the authors at Darden Graduate Business School, University of Virginia, Box 6550, Charlottesville, VA 22906-6550, or send E-mail.

Samuel E. Bodily (bodilys@virginia.edu)
Robert L. Carraway (rlc6g@virginia.edu)
Sherwood C. Frey, Jr. (scf@virginia.edu)
Phillip E. Pfeifer (pep8s@virginia.edu)

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We thank the many companies and individuals who willingly cooperated with the field research needed for the cases. We are pleased to note that there are many managers who recognize the educational value of field-based course materials and, as a result, who generously contributed their time and experience. Some of the companies are named in the cases; others for a variety of reasons chose to have their material disguised. Although the cases in this book are written as fact, almost all of them have some facts disguised. In some, individual names have been changed; in others, some of the numbers are changed. Some are written from general experience, without a specific sponsoring company. We are pleased if the cases appear to be totally realistic, but the reader should be aware that names, numbers, and situations are not all real.

We benefited (as will the users) from the efforts of Darden editors Bette Collins, Stephen Smith, and Elaine Moran.

Finally, we thank the Irwin editors Dick Hercher, for approving this project, and Wanda Zeman, for shepherding it along.

QUANTITATIVE BUSINESS ANALYSIS CASEBOOK

C O N T E N T S

CASE 1
AMERICAN LAWBOOK CORPORATION (A)

Ed Troy glanced briefly out the window of his downtown office toward the busy street below, then returned his gaze to the three Publication Proposals on his desk (Exhibit 1). He had just finished filling in his assessment of the first year's sales potential for these titles (Exhibit 2). As director of educational and professional publishing for the American Lawbook Publishing Company (AL), he was ultimately responsible for choosing which of these titles the company would offer for use in American law schools in the fall of 1982.

Law school professors were normally offered a complimentary examination copy of every book published for classroom use in their fields. When deciding whether or not to "adopt" any of these books, a professor might consider the reputation and background of the author; the breadth and organization of topics covered; the length of individual chapters and of the book itself; whether an innovative pedagogical approach was used; the availability of auxiliary teacher's notes; the style and readability of the prose; whether cases and examples were up to date; the aesthetics of the typeface, layout, and binding; the retail price that their students would have to pay (usually in the range of $25 to $35); and similar considerations.

As a graduate of the Duke University Law School, and a veteran of the law school publishing business, Troy had a strong intuitive understanding for the many factors that influenced the performance of a new book. Indeed, everyone at AL recognized that Troy was the person most qualified to synthesize the available information on a new title into a subjective forecast of first-year sales. Troy, however, was never entirely comfortable with the task. He maintained that AL needed a more systematic approach for evaluating and weighing the critical factors affecting sales, assessing the risks, and ranking different proposals. He was therefore concerned not just with the disposition of these three proposals but with the more fundamental questions of what marketing information should be collected and how it should be analyzed to guide future publishing activities. Since law school publishing would always retain a substantial element of risk, he believed it was essential to know the odds against which one was playing.

Law and Law School Publishing

The American Lawbook Corporation was founded in Boston, Massachusetts, in 1897 and had grown to employ over 350 people, including approximately 70 lawyer-editors. The company specialized in the editing, annotation, and printing

EXHIBIT 1 Three Publication Proposals

Proposal One: Casebook in Admiralty Maritime Law

Authors:	Thomas Schoenbaum, J. D. Michigan 1965, Professor of Law, Tulane University A. N. Yiannapoulos, J. S. D. Berkeley 1956, Professor of Law, Tulane University	
Pages:	800	
Enrollment:*	Percentage of students with opportunity	0.5816
	Percentage of students enrolling	0.0317
	Estimated national enrollment	2,139
Books in field:†	2 case, 1 text	

Proposal Two: Casebook in Administrative Law

Authors:	Donald P. Rothschild, LL.M. Harvard 1965, Professor of Law, George Washington University Charles H. Koch, LL.M. Chicago 1975, Professor of Law, College of William and Mary	
Pages:	950	
Enrollment:*	Percentage of students with opportunity	0.9269
	Percentage of students enrolling	0.1202
	Estimated national enrollment	12,929
Books in field:†	10 case, 3 text	

Proposal Three: Casebook in Criminal Law

Authors:	Robert Misner, J.D. Chicago 1971, Professor of Law, Arizona State University	
Pages:	450	
Enrollment:*	Percentage of students with opportunity	0.9407
	Percentage of students enrolling	0.2798
	Estimated national enrollment	30,544
Books in Field:†	14 case, 6 text	

* First Percentage is the percentage of all law students attending those schools that offer a course for which the book is suited.

Second percentage is the average percentage of those students with the opportunity who actually enroll in the course.

Estimated national enrollment is the total enrollment at all American Bar Association–approved law schools (116,047) multiplied by the two percentages.

† Number of comparable books, including this one, competing for adoption in this subject area.

of the statutory output of state legislatures. Having submitted a winning bid to perform this service for a state, a law publisher generally became the only source from which attorneys in that state could obtain an up-to-date copy of the state code—a necessity for general legal practice. As there was relatively little turnover among code publishers, the business tended to be characterized by consistent and predictable profitability.

Exhibit 2 Ed Troy's Assessment of First-Year Sales

		Fractiles				
Proposal	*Proposed Retail Price*	*0.05*	*0.25*	*0.50*	*0.75*	*0.95*
1. Schoenbaum & Yiannapoulos	$35	10	400	600	1,000	2,000
2. Rothschild and Koch	$30	200	800	1,000	2,000	6,000
3. Misner	$25	10	200	500	1,100	4,000

In 1968, AL merged with the Tinline-Geary Publishing Company of Cincinnati, Ohio, and shortly thereafter the activities of both companies were consolidated in Boston. Among the Tinline-Geary properties were an existing line of casebooks and treatises for the law school market, including several titles under contract but not yet published.

In contrast to code publishing, law school publishing proved to be a strikingly unpredictable business. It was quite possible for the large prepublication investment in a new title (frequently in the range of $30,000 to $50,000) to be lost through an indifferent sales response. Moreover, whereas AL was a major publisher of state codes and a monopoly supplier in most of its markets, the law school course markets were commonly saturated with many published offerings of a number of much larger companies.

West Publishing Company of St. Paul, Minnesota, and Foundation Press of Mineola, New York, dominated the law school publishing business. West owned Foundation, and together they held an estimated 60–65 percent of the total law school market. Little, Brown of Boston accounted for another 15 percent and was the publisher of choice for many Harvard Law School professors. The third largest firm, The Michie Company of Charlottesville, Virginia, held about 5 percent of the market. AL was the largest of several small firms that made up the remainder of the estimated $15 million annual law school market.

In addition to code and law school books, AL also published what were referred to as author books. These books were written on law-related subjects and were sold primarily to practicing lawyers. AL found author books an attractive way to smooth the demand on its production facilities. Whereas code and law school books required rigid time schedules, author books could be published at any time.

Genesis of a Law School Publication

Law school curricula offered publishers an astonishing variety of publishing options. While only six to eight courses (such as contracts or torts) were required at all schools, many others (e.g., evidence or future interests) were tested on most state bar examinations and were therefore widely attended. Enrollment in the hundreds of other subject areas could range from dozens in an admiralty course to a handful studying Zairan tribal legal systems.

Courses might be taught with one or more teaching approaches, including traditional lecture methods. The "case" approach was the study of court cases with their judicial decisions and opinions. The "problem" approach was akin to the case method used in graduate business schools. In the Socratic method, professors attempted to stimulate intellectual curiosity and tenacity among students by directing repeated and probing questions toward individual class members.

Reliance on a particular teaching method strongly influenced a professor's choice of type of book. Most prevalent in law schools was the "casebook" or "coursebook" containing edited cases and opinions linked by the author's commentary and questions. "Problem" books were used less commonly and primarily in courses with a practical bent, such as tax or estate planning. Textbooks, "treatises," "hornbooks," and "handbooks," the distinctions among which were not rigorous, were most often used as supplemental materials.

The initial inspiration to write—for example, a casebook in environmental law—most frequently arose with a professor who was dissatisfied with existing teaching materials in that field. His or her proposal, which ranged from single paragraphs to 1,000-page typed manuscripts, could reach the publisher's office in several ways. First, "law school travelers" visited campuses to promote good will and solicit new manuscripts. At AL, Donald Layton, the administrative editor for law school publications, performed this function.

Second, AL employed an advisory board of prominent legal academicians who reviewed proposals, suggested authors, and occasionally submitted proposals. Finally, and most often, professors who had assembled sets of teaching materials for their own courses mailed proposals to one or more publishers. Such unsolicited proposals were received at AL several times each week.

Many proposals could be rejected immediately. To illustrate, a book might be proposed for an arcane field not currently studied in American law schools (e.g., French administrative law). Alternatively, the subject area might be already dominated by one or more universally acclaimed works. Occasionally, sample chapters would exhibit a dismaying lack of clarity or grammatical accuracy.

Proposals that offered initial promise were subjected to review by advisory board members, by their colleagues, and by the AL staff. Since this process could last several months, it was not unusual for many proposals to be "under consideration" at any given time.

Production of a Law School Publication

Unlike many publishing houses, but in common with West/Foundation, AL maintained its own in-house composition, pressroom, and bindery facilities. This total production capacity was believed to provide AL advantages in cost and quality control, as well as considerable scheduling flexibility.