

REVIEW OF J. Scott Armstrong, ed. (2001), *Principles of Forecasting: A Handbook for Researchers and Practitioners*. Norwell, MA: Kluwer Academic Publishers

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Review by Daniel Byrd, reprinted with permission from *Risk Analysis*, 21 (6), 2001, 1121-1122.

My introductory lectures in risk analysis begin with a definition of risk. Risk decomposes into three topics: probability, loss, and prediction. Then, I usually cast about for examples of analogous subjects, such as predicting the probabilities of bad weather or stock market declines. Until I recently tripped over a marvelous book, however, I did not imagine that social scientists had so extensively studied the process of forecasting.

How silly of me! Obviously, business school faculties would not leave a subject that is so crucial to the success of their students to happenstance. Poor forecasting can lead to disastrous business decisions. Fortunately, the University of Pennsylvania's Wharton School has long supported J. Scott Armstrong in the study of this subject, and in turn he has contributed the *Principles of Forecasting: A Handbook for Researchers and Practitioners* to us. This book, which is part of the International Series in Operations Research & Management Science, systematically organizes 29 essays by 40 leading experts into 18 chapters (excluding the Introduction and Summary) that cover all aspects of forecasting.

Armstrong developed a structural model that organizes forecasting according to the integration of sources of information. The book repeatedly displays this model to orient the reader to the place of an essay within the overall organization. In addition, each new chapter (several with multiple essays) represents a node in Armstrong's model and has a short, separate introduction to the subsidiary topic. Outside reviewers and the other authors reconsidered each essay. As such, *Principles of Forecasting* represents an enormous undertaking, which has paid off in a clear, coherent, and consistent book.

*Principles of Forecasting* has apparent depth within its domain. Obviously, I would have preferred more coverage of topics outside the world of business and finance. However, based on my sparse familiarity, it appears that the coverage of several topics, including expert opinion, neural networks, time series, extrapolation models, econometric modeling, and populations, is thorough. The book was a wonderland of new information for me. The only thing I missed was more background about the basic practice of multivariate analysis.

Astonishingly, given the intellectual overlap of content, only two of the authors (5%) belong to the Society for Risk Analysis (SRA). In one of the essays about expert opinions, our colleague Donald MacGregor describes the principles of decomposing judgmental forecasts into more readily estimated components. Empirically, a decomposed judgment usually has less uncertainty than a global judgment, but only when the uncertainty in the global estimate is high. As an example, one of MacGregor's principles is, "When estimating quantities for which decomposition is appropriate, rely on more than one estimator" (p.118). The essay goes on to give a rationale for this principle, parse the evidence for and against it, and separately evaluate this evidence.

The other SRA member, Baruch Fischhoff, writes about the principles of learning from experience in a chapter about monitoring forecasts. He describes how the human ability to integrate information over time sometimes causes problems. Hindsight biases the subsequent belief in predictability at a prior time. In addition, efficient, but shorthand, communication and polite avoidance of quantitative statements in a relatively innumerate society motivate ambiguous forecasts. Ambiguous forecasts are particularly vul-

nerable to reinterpretation in the light of hindsight. The solution is better recording of more precise predictions, which applies to model inputs, and also the choice of models and model outputs.

These two essays alone were worth the price of the book for me. In addition, the publisher could charge as much for the “Forecasting Dictionary” appended to the book, and I would not complain. The 29 separate essays provide state of the art distillations about the separate topics within Armstrong's model.

Each essay begins with an abstract. The structure and indexing allow the reader to pick topics of interest, instead of reading serially, which means that the reader will find *Principles of Forecasting* a handy reference work. The abstracts facilitate quick inspection. You also can obtain a rapid overview of forecasting just by grazing through the book, reading the 29 abstracts, or separately, by reading the introductions to each of the 18 chapters.

Of necessity in a text about principles, the authors write in a condensed, theoretical style, which conveys a high density of information. The book consistently maintains an emphasis on principles, which are set out separately and highlighted within the text. Some authors even separate their views from the evidence in support of those views. Each essay ends following the same format: (1) implications for practitioners, (2) separate implications for researchers, (3) a summary (sometimes in bulleted format), and (4) references.

One task for the reviewer of any multi-authored text is to decide whether a book is a collection of separate essays or a coherent exposition. In addition to Armstrong's excellent editing and clever assembly of some related, high-quality essays, *Principles of Forecasting* clearly belongs in the latter category. Beyond the introduction, summary, and indexing, it reflects the intent of multiple authors to explicate a subject comprehensively by sharing the workload. Thus, I view Armstrong's *Principles of Forecasting* as an effort to develop and explain an important subject inclusively. The common format, extensive reviewing, and internal consistency, as well as the dictionary, and a “Forecasting Standards Checklist” appended at the end, all support this view.

From now on, when I introduce risk analysis, I will refer students to Armstrong's *Principles of Forecasting*, in defining risk, as a primary source of advanced information. Forecasting has many points of congruence to risk analysis, but business and finance are data-rich compared with the subjects that most SRA members study, such as health effects or natural disasters. So, we have much to learn from the forecasters. In addition, if you, as I, have not thought much about forecasting before, run – do not walk – to your browser and go directly to <http://forecastingprinciples.com> or <http://www-personal.buseco.monash.edu.au/%7Ehyndman/forecasting/welcome.htm> for an introduction to the field.