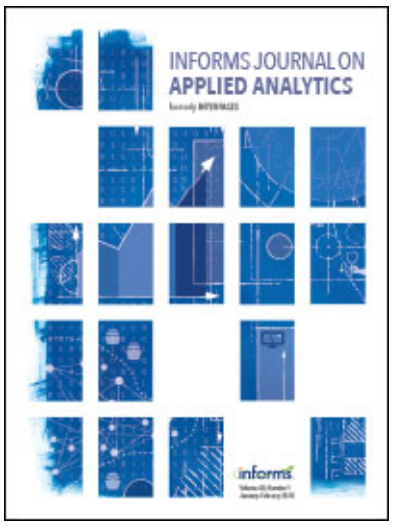

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Book Reviews

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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 e-mail 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*, 44(2), March–April 2014: *Efficiency and Logistics*, Uwe Clausen, Michael Ten Hompel, and Matthias Klumpp; *Managing Safety of Heterogeneous Systems*: *Decisions Under Uncertainties and Risks*, Yuri Emoliev, Marek Makowski, and Kurt Marti; *Principles of Business Forecasting*, Keith Ord and Robert Fildes; *Supply Chain Planning*: *Practical Frameworks for Superior Performance*, Matthew J. Liberatore and Tan Miller; *Multicriteria Portfolio Management*, Panos Xidonas, George Mavrotas, Theodore Krintas, John Psarras, and Constantin Zopounidis; *Handbook of Networks in Power Systems* I (*Energy*), *Handbook of Networks in Power Systems* II (*Energy*), Alexey Sorokin, Steffen Rebennack, Panos M. Pardalos, Niko A. Iliadis, and Mario V. F. Pereira, eds.; and *Antifragile*: *Things that Gain from Disorder*, Nassim Nicholas Talib.

Clausen, Uwe, Michael Ten Hompel, Matthias Klumpp, eds. 2012. *Efficiency and Logistics*. Springer. 380 pp. $179.00.

Efficiency and Logistics is a collection of 32 short articles reporting on the results of various projects undertaken at EffizienzCluster LogistikRuhr (http://www.effizienzcluster.de/en/index.php), a comprehensive research center in Germany. Since its start in 2010, the center has initiated enough projects to make it the largest overall logistics research project in Europe. Its goal is to develop innovative logistics solutions for a wide range of current and anticipated problems. From these 32 articles, we can clearly see that this research center has combined the efforts of academics and industry to find real and practical solutions; many of the articles discuss software or other solutions being developed to address specific problems.

The first article, Logistics Research and the Logistics World of 2050, discusses five major challenges the logistics community will face by 2050, including sustainability, supplying to increasingly congested megacities and urban areas, security, demographic changes, and integrating information technology (IT) systems.

The following 31 articles discuss a wide range of projects that address different aspects of the five challenges. I cannot cover each article in detail in this review; however, I have included samples of the impressive number of projects and topics.

Two projects discuss the benefits of developing better navigation systems for the logistics industry. These systems would improve the integration of information about real-time traffic, traffic patterns, and vehicles on the road. The research points out that the GPS navigation systems in our cars and on our smartphones can provide basic directions. However, the logistics industry requires more coordination among these systems; to help reduce congestion, costs, and carbon dioxide (CO_2) emissions, they need better information.

At the local level, some projects deal with deliveries to retail stores in densely populated urban areas, systems for securing proof of delivery for products delivered to homes, and research on decreasing the congestion impact of construction projects. As congested megacities arise throughout the world, new logistics practices will have to be created. One research project investigates what it calls tray cycling

or urban mining—designing logistics systems to efficiently recycle as much as possible from urban centers.

The research project on making air cargo terminals more efficient concludes that looking beyond the terminal and considering the entire air cargo supply chain is necessary. Some articles discuss how to improve other logistics facilities and integrate new technologies (e.g., image recognition) within them.

Several reports argue that the logistics function must be more flexible. They propose that we should think about logistics as a service (e.g., software as a service) to meet this need for flexibility. In addition to making the physical assets more flexible, IT systems will need to interact with each other in a more flexible way.

Because the logistics function is directly responsible for CO_2 emissions through transportation, terminals, warehouses, plants, and other facilities, several projects address improving the sustainability of the supply chain, and one project tackles the problem of developing a standard code of conduct for suppliers to ensure they are in compliance with regulations.

Some projects address the educational challenges of developing the proper logistics skills in the workforce. They note that growing markets (e.g., India) will require a large number of new logistics workers to be trained and educated; thus, new systems for educating this workforce will be necessary.

Although most of these research project focus on Germany, the majority of the projects are applicable worldwide, as these examples illustrate.

Hopefully, I have given a sense of the wide range of topics that this research center covers and this book discusses. Each article describes one project and is relatively short (i.e., about seven to eight pages of text)—sufficient to introduce the problem, discuss the research methods, and show some initial results and next steps. Each article also includes an extensive bibliography. The articles were not intended to provide in-depth coverage of the topics. Rather, the book is meant to expose readers to the breadth of this research effort in Germany.

This book would be a good reference for readers who are doing research in the areas mentioned, are interested in the broad range of topics covered in an ambitious research project, or are practitioners looking for new ideas. As a logistics practitioner based in the United States, I found the topics interesting because they helped me to more clearly understand the efforts of the logistics community in Germany. Other such large logistics research centers would benefit from learning about the EffizienzCluster Logistik-Ruhr, as described in this book.

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Emoliev, Yuri, Marek Makowski, Kurt Marti, eds. 2012. *Managing Safety of Heterogeneous Systems*: *Decisions Under Uncertainties and Risks*. Springer. 401 pp. $129.00.

The literature on risk-based decision support is wide, covering many different areas of mathematical and statistical modeling, and almost every field of business activity. *Managing Safety of Heterogeneous Systems* takes a relatively unusual perspective by combining stochastic optimization techniques with technical and economic systems modeling. It is the product of the 2009 Workshop on Coping with Uncertainty that took place at the International Institute for Applied Systems Analysis (IIASA) in Austria, and is part of the Springer Lecture Notes Series in Economics and Mathematical Systems. It is unfortunate that the word "safety" appears so prominently in the title, because this may suggest incorrectly that the book's focus is on safety risks. This is certainly not the case; the editors are clearly using the word in a technical sense (i.e., similar to robustness). Indeed, they chose robust rather than safety in the title of their introductory chapter. In addition, the book's chapters do not all easily lend themselves for use as lecture notes, as indeed is quite common for the Lecture Notes series.

Participants of the 2009 IIASA Workshop on Coping with Uncertainty contributed 17 chapters, which are grouped into the following five themes.

- Decisions under systemic risks and uncertainties;
- Modeling uncertainties of heterogeneous systems;
- Uncertainty and optimization;
- Analysis and optimization of technical systems and structures under stochastic uncertainty;
- Analysis and optimization of economic systems under uncertainty.

Conceptually, the book deals with problems of uncertainty that arise in the use of models designed to support decision making. We know that all models are wrong and some are useful; but how do we take a model that is not completely wrong and make it more useful? This book takes two general positions (although various authors take different positions).

1. The optimal solution to a complex real-world problem must meet many requirements to be robust (against uncertainties in modeling, specification, and the demands of various interest groups). This is best modeled by optimizing a fairly simple utility function (possibly representing monetary values) while imposing constraints on other functions, in particular, constraints on exceedance probabilities.

2. The uncertainties over which an expected utility is to be calculated may themselves by uncertain; for example, it might be possible to specify only imprecise probabilities or sets of distributions.

Therefore, a conventional expected utility maximization is not possible; instead, a maxmin utility optimization under constraints is performed so that the optimal decision chosen is the one that maximizes the worst-case probability distribution, subject to the constraints. Clearly, when the distribution is certain, this gives the expected utility subject to constraints as a special case.

Developing this further depends on the application domain and the model under consideration. However, an important recurring theme is the use of quantiles, both as the outcome of the optimization problem and as part of the constraints: as the mean value of a distribution can be defined as the quantity that minimizes the expected quadratic loss, so the qth quantile can be defined as the quantity that minimizes the expected loss of a bilinear loss function, where q is the ratio of the two slopes of the bilinear loss function. By judicious reformulation, it is possible to ensure that the optimization problem remains convex.

Part I, *Decisions Under Systemic Risks and Uncertainties*, contains four chapters. The first chapter gives an overview of how a number of different classes of problems can be formulated to use the general stochastic optimization approaches discussed previously. These include decision support for catastrophic (natural) risks and as principal agent problems and defensive solutions to attacking agents. The second chapter looks at the problem of determining robust tail mean values when the underlying probability distribution is imprecise. The third chapter considers the problem of solving utility maximization problems in the presence of qualitative constraints on utility functions and (or) probabilities. The final chapter of Part I uses the maxmin expected utility model to interpret consumer data about appraisal risk for earthquake insurance and shows a better fit than a conventional expected utility model.

Part II, *Modeling Uncertainties of Heterogeneous Systems*, deals with diverse examples of heterogeneous systems. The first chapter looks first at the uncertainties involved in the emergence and adoption of competing technologies and then combines this with a stochastic optimization approach to model decision-maker approaches to the risk. The combined approach provides a much more general framework than conventional net present value or real-options approaches. The second chapter applies the book's stochastic optimization methods to the principal-agent problem, looking particularly at problems under uncertainty, for example, situations in which the principal has incomplete knowledge of the agent, and considering applications to licensing. The last two chapters of Part II are on modeling socioeconomic risks for food supply in the Ukraine and on multicriteria decision making in water management in the Narew National Park in Poland.

Part III, *Uncertainty and Optimization*, has three chapters, each of which lies slightly outside the book's main themes; they cover methods for global optimization, fuzzy linear programming, and data clustering.

Part IV, *Analysis and Optimization of Technical Systems and Structures Under Stochastic Uncertainty*, looks at problems related to civil and mechanical engineering modeling. The first chapter considers stochastic optimal open-loop feedback control of dynamic structural systems under stochastic uncertainty; it finds conditions under which optimal (i.e., expected-cost minimizing) control methods are robust to parameter uncertainties and applies stochastic optimization methods to determine the optimal controls. The second chapter develops fuzzy randomness concepts for use in civil engineering; however, the only example given of why this is required would appear to be

adequately modeled by considering a probability distribution for measurement error. The final chapter of the section looks at optimization of trusses under uncertainty, and discusses it as a discretized recourse problem.

The final section, Part V, *Analysis and Optimization of Economic Systems Under Uncertainty*, has three chapters, each with a different economic theme. The first compares four scenarios to reduce the nitrogen impacts of agriculture in China. Their relationships to the main topics of the book are given in the two appendices, which discuss applying stochastic optimization, and particularly the reformulation of the objective functions, to ensure that a relatively straightforward optimization problem is obtained. The remaining chapters discuss catastrophe bond valuation under safety constraints.

The key messages of the volume concern the applicability of the stochastic optimization framework to risk management problems, particularly that quantile constraints, which are natural ways of imposing a tolerable level of risk, can with some careful reformulation be included in a way that is numerically tractable.

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Ord, Keith, Robert Fildes. 2013. *Principles of Business Forecasting*. South-Western College Publishing. 528 pp. $139.99.

The authors of *Principles of Business Forecasting* seek to provide the tools and insights to allow users to make effective forecasts by drawing on the latest research ideas. The object of forecasting may be summarized as to minimize uncertainty and identify and evaluate risk; therefore, forecasting has significant impact on many decisions in business.

The first author, Professor Keith Ord, McDonough School of Business at Georgetown University, is doing research in business forecasting and the statistical modeling and analysis of business processes. He has been published in a number of (very) highly ranked journals, is author (and co-author) of important books, and has served as editor of the *International Journal of Forecasting*. The second author, Professor Robert Fildes, Lancaster University, is well established in scientific society; he co-founded the *Journal of Forecasting* in 1981 and the *International Journal of Forecasting* in 1985, served as editor-in-chief of the *International Journal of Forecasting* from 1988 to 1998, and remains an associate editor. In his research, he undertakes comparative evaluation of different forecasting methods, the implementation of improved forecasting procedures in organizations, and the design of forecasting systems.

Both authors have a great deal of teaching experience; therefore, they have written this book to be useful to readers who have just taken a first course in applied statistics (or who have an equivalent background); but, they also cover difficult mathematical topics.

The book starts with a discussion of the need for forecasts and introduces basic concepts, such as exponential smoothing with and without a trend, double exponential smoothing, and seasonal series, including decomposition. In Chapters 2–6, the underlying statistical models for exponential smoothing are developed by discussing state-space models and the autoregressive integrated moving average (ARIMA), because the use of the ARIMA models or the state-space models are two principal approaches to modeling single (univariate) time series. This allows users to explore extensions of exponential smoothing.

The procedures mentioned capture patterns within single time series. In Chapters 7 and 8, the relationships between the variables of interest and other factors, independent of whether the data of interest are cross-sectional or defined over time, are investigated. Therefore, these chapters describe linear and multiple regression.

The (statistical) modeling of forecast problems is critical, especially for applications in the industrial practice. In Chapter 9, different approaches are discussed, especially autoregressive models or models with both autoregressive and regression components. In addition, structural changes of models (e.g., from a constant to a linear model), nonlinear models, and outliers are explored.

The advanced methods for forecasting, discussed in Chapters 10 and 11, are used widely in applications, although they are more complex. As in other books, the authors first distinguish between forecasts based on the judgment of individuals and those based on quantitative analysis. They describe some judgmental methods and demonstrate why they are preferable.

The many examples, which address typical problems, the exercises, and the mini cases, which are based on real data, should be helpful to all readers, and particularly to those in industrial practice. Moreover, two chapters (12 and 13), *Putting Forecast Methods to Work* and *Forecasting In Practice*, discuss the use of the methods in practice.

Unfortunately, the authors appear to have been let down by their publishers. Online instructor material is advertised; however, neither the book review editor nor I were able to find it.

Overall, the authors present the topic in such a way that both students and forecasting practitioners can benefit significantly. Because it is mathematically precise, it is a good starting point for readers, including researchers, who are interested in the mathematical theory of the forecast of time series.

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Liberatore, Matthew J., Tan Miller. 2012. *Supply Chain Planning*: *Practical Frameworks for Superior Performance*. Business Expert Press. 137 pp. $29.95.

In contrast to many books, especially textbooks that focus on supply chain management, *Supply Chain Planning*: *Practical Frameworks for Superior Performance* focuses on the planning activities rather than the management functions, as its title suggests. Although both authors currently hold academic positions, each has extensive industry background and experience in supply chain planning; one author has held leadership positions in the operations area of several large consumer products companies. This experience is invaluable because, as the title suggests, the book's focus is on the practice of supply chain planning, not the theory. Most chapters conclude with case examples from the authors' experiences with companies as varied as American Olean Tile Company, Pfizer, and Warner Lambert before its merger with Pfizer.

Chapter 1 sets the stage for the rest of book and makes the case for implementing a supply chain planning framework. Throughout the book, the authors stress the importance of a hierarchical (i.e., strategic, tactical, and operational) planning approach, as developed by Robert Anthony (Anthony 1965). Chapters 2 and 3 focus on this hierarchical framework. Chapter 4 introduces the concept of decision support systems for supply chain planning, and Chapter 5 discusses performance metrics. Finally, Chapter 6 presents concluding comments.

In Chapter 2, the fundamental concept is to align the supply chain activities with the overall business strategies and activities. This is true, independent of whether the product is functional (i.e., has stable demand and low margins) or innovative (i.e., has unpredictable demand and high margins). In this aspect, the authors provide a clear linkage between mission, objectives, and strategy. That is, after defining the supply chain's mission, the planning team must derive objectives that support the mission and develop strategies to achieve these objectives. The next step is to select projects (e.g., expand supplier relationship-management programs) that support the strategies. The authors illustrate this linkage using the analytic hierarchy process (AHP) developed by Thomas Saaty on the Zenith example. These examples are the book's strength because they provide a clear direction on implementing strategic planning, a somewhat abstract topic.

Chapter 3 presents the details of the hierarchical framework for supply chain planning and the importance of integration among the levels of the framework. That is, the outputs to strategic planning are constraints on the tactical level and outputs to tactical planning are constraints to the operational-level decisions. The primary distinguishing feature of the levels is the planning horizon (time dimension) of the decisions. A key aspect of the hierarchical framework is feedback loops because, if infeasibility arises, this information must be fed back to the higher level to alter the plans. Such infeasibility results because the time dimension and aggregation level differ in each planning level. The authors illustrate their concepts using an actual case from American Olean Tile Company.

Chapter 4 presents the concept of using decision support systems to support supply chain planning and its operations. Again, the authors present the material in the context of the hierarchical framework, illustrating the decision support tools at the various levels. Because of the complexity of modern supply chains, they stress the importance of using sophisticated tools based on optimization and simulation

models rather than using simple spreadsheet models, which ignore many of the constraints and complexity. The authors review two cases by describing the use of these types of tools in supply chain planning; one case focuses on a tool for the strategic and tactical-level decisions and the second case focuses on a tool for supporting operational-level decisions; however, they provide little detail in the model formulation of the problem and the algorithms used to solve the problem. They focus more on the higher-level use of the tools (e.g., types of decisions, inputs, outputs). Chapter 5 focuses on developing key performance indicators to measure the effectiveness (external measures) and efficiency (internal measures) of the supply chain operations. The authors describe several frameworks to aid in developing the key performance indicators, including the supply chain operations reference (SCOR) as proposed by the Supply Chain Council.

In summary, the authors have written a book that describes an effective practical framework for supply chain planning. Given the many case examples presented, it is suitable for practitioners and as a textbook for the core course on supply chain and operations commonly taught in business schools. However, because most engineering courses on supply chains focus on the details in the modeling and methodological approaches, this book should only be used as a supplementary textbook for these courses.

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Xidonas, Panos, George Mavrotas, Theodore Krintas, John Psarras, Constantin Zopounidis. 2012. *Multicriteria Portfolio Management*. Springer. 130 pp. $109.00.

To best understand this book, reviewing some history on multiple objectives in portfolio selection is helpful. In standard portfolio selection, in accordance with mainstream finance's focus on wealth maximization, an investor is assumed to have only one objective—to maximize portfolio return. However, portfolio return is a random variable. This makes portfolio selection a stochastic programming problem, and solving a problem with a stochastic objective requires an interpretation on how to go forward. One way to proceed is to replace the stochastic objective with one or more deterministic objectives that are deemed equivalent (Caballero et al. 2001).

Although this strategy is of a more recent vintage, Markowitz (1952) instinctively pursued it by substituting for the stochastic objective the two deterministic objectives of maximizing expected portfolio return and minimizing the variance of portfolio return. These, of course, are the objectives of mean and variance (i.e., return and risk). The protocol for solving the stochastic programming problem is then to compute first the mean-variance Pareto front, which in finance is the efficient frontier, and then let the investor select from its graph the point that best balances risk and return for him or her.

In applying some assumptions to expected utility theory, the elegance of Markowitz's approach is that the efficient frontier is the set of all contenders for optimality of the stochastic programming problem. That is, if a solution optimizes the stochastic programming program, it is on the efficient frontier; however, if a solution is not on the efficient frontier, it cannot optimize the stochastic programming problem. Therefore, for a given level of risk, an investor can see how to maximize expected return, and for a given level of expected return, that investor can see how to minimize risk. This revolutionized finance and ushered in the era of modern portfolio theory (MPT); see Elton et al. (2009). Although mean variance has endured many criticisms in its 60 years of existence, it is still the predominant model in portfolio analysis; yet, the term modern in MPT might be getting somewhat outdated.

A standard investor's utility function has only the (single) argument of portfolio return, and the mean-variance formulation is bi-objective in nature; so, how should we view multicriteria portfolio management? We can view it as either an extension or an offshoot of MPT. Soon after Markowitz proposed the mean-variance approach, some researchers began to show interest in whether Markowitz's model could be enhanced by additional criteria. That level of interest has increased substantially since 2000.

Note that when a mean-variance model has criteria beyond risk and return, the Pareto front becomes a surface, and the task of finding the best point on the surface takes a jump in difficulty. At this stage, *Multicriteria Portfolio Management* becomes useful. It introduces the reader to techniques, many of which are from multiple-criteria decision making (MCDM), that are helpful in carrying out the task. MCDM is an area of operations research that began in the 1970s and is concerned with the methods and procedures by which multiple conflicting criteria can be formally incorporated into the management planning process of any problem area, including finance.

What makes a portfolio problem a multicriteria problem? It is when the number of objectives in the deterministic formulation of the problem is three or more (and the efficient frontier becomes a surface). In addition to risk and return, the criteria studied include skewness, liquidity, dividend yield, sustainability, and number of securities in a portfolio. However, skewness differs from the other criteria. It is the third moment of portfolio return; therefore, the investor's utility function still takes the same single argument as in the bi-criterion case. In this way, skewness is embraceable by mainstream finance, but the others are not because they suggest additional arguments to an investor's utility function. That is, investors gain utility from other criteria, and many people are reluctant to accept this, because they believe that everything is priced; however, understanding how an attribute such as the number of securities in a portfolio can be priced is difficult.

The book is organized as follows: Chapter 1 introduces multicriteria portfolio management and discusses the potential benefits of more robust models. Chapter 2 provides a review of the literature and a roadmap for the approximately 250 references at the end of the book, which comprehensively cover multiple criteria in portfolio analysis from its inception, that is, since researchers first thought of it as a possibility. Chapters 3–5 strive for an integrated coverage of multicriteria portfolio management. Chapter 3 deals with security analysis and evaluation, and discusses various MCDM methodologies, including AHP, multiattribute utility theory, and ELECTRE.

At this point, mentioning the a priori, progressive articulation, and a posteriori classification of methods for solving a multicriteria optimization problem (Hwang and Masud 1979) is helpful. The classifications are based on when preference information is elicited from the decision maker. In an a priori method, information is elicited before an optimization problem is solved to generate a targeted point on the efficient surface. In such a method, no premium is placed on providing the decision maker with any other information about the efficient set. In a progressive articulation procedure (i.e., an interactive procedure), phases of information elicitation are interleaved with phases of computation to progressively sample the efficient set. Unfortunately, in such a method, large portions of the efficient set may never be sampled. In an a posteriori method, the objective is to generate, or at least densely characterize, the whole efficient set. Difficulties include the substantial amount of time required to do so and managing the information that a large volume generates.

However, if an a posteriori method is possible, it should be used, because in portfolio decision making, recognizing an optimal solution in the absolute is generally not possible. The solution chosen is typically selected only because all other solutions are worse; the only way to know this is by using an a posteriori method. Note that the mean-variance approach of Markowitz is an a posteriori procedure, whereas the safety-first point of Roy (1952) is the result of an a priori approach.

Chapter 4 discusses the multicriteria optimization problem, which must be solved to locate an optimal or near-optimal solution. As a solution procedure, the chapter emphasizes mostly the e-constraint method, in which all objectives except one are converted to constraints with e right-hand sides. In an a posteriori fashion, the chapter discusses the AUGMECON method for repetitively solving e-constraint problems to develop a discretized representation of the efficient set (of any desired density) without wasting optimizations. To manage the information generated, a filtering technique is applied to converge to the most preferred Pareto point generated.

Chapter 5 covers portfolio performance evaluation. After discussing some practical matters in Chapter 6, the book gives conclusions in Chapter 7. *Multicriteria Portfolio Management* is easy to read and a handy reference. It should be useful both to readers who are just curious and to those who plan to enter the field

of portfolio management. In my opinion, this book does a better job of covering the expanse of multicriteria portfolio management than any book published to date.

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Sorokin, Alexey, Steffen Rebennack, Panos M. Pardalos, Niko A. Iliadis, Mario V. F. Pereira, eds. *Handbook of Networks in Power Systems* I (*Energy*). Springer. 600 pp. $239.00. *Handbook of Networks in Power Systems* II (*Energy*). Springer. 220 pp. $239.00.

Given the increasing appreciation of the importance of operations research in power systems, often branded as smart grids, it is timely that Springer has published a two-volume handbook addressing recent developments in optimization and forecasting in power systems. Volume I is dedicated to electricity transmission and distribution; Volume II is dedicated to gas networks.

As with all but the best of edited handbooks, the assumptions, breadth, depth, origins, and style of the chapters vary widely. In contrast to most handbooks, these volumes have no clear hierarchical structure, no progression from one chapter to another, and few references between the chapters. Seemingly, the authors were invited to contribute based on authoring a single recent paper, which was often merged with other papers and extended into a chapter. This approach seems sensible, given the focus on recent work; however, each contributor did not put the same amount of effort into rewriting his or her article for these volumes. Some of the best-regarded authors may have declined the offer, because the volumes include no chapters by authors such as Babonneau, Hobbs, Martin, and Vial. At least two chapters read like computer programming manuals, in particular, manuals for freely available programs (e.g., ECOTOOL and MASCEM). This is in contrast to some of the well-researched, well-organized, and well-written contributions, such as the chapter on flexible transmission coauthored by Richard O'Neill, the chief economist at the Federal Energy Regulatory Commission. One could argue that in the respective subfields (e.g., forecasting of energy prices and multiple-agent simulation), little theory has been developed so far and describing an implementation is the best approach. Nevertheless, it seems somewhat extravagant considering the price per page of the handbook.

The breadth of Volume I is considerable; it ranges from bidding in electricity markets to the spread of flexible transmission. Some of the quirkiest subjects (e.g., pricing based on reliability guarantees in Lithuania, issues of the Andes interconnect) are some of the most interesting. However, a number of areas are not covered; examples include the following:

- Dynamics (e.g., fault propagation), including cascading blackouts in the transmission system or sequences of blown fuses and recloser actions on a distribution feeder;
- Automation, including FACTS devices, reclosers, sectionalizers, and various switches and their allocation, reallocation, and operations;
- Reliability, except for one chapter by Warren Powell et al. on the allocation of transformer spares.
- Modeling of power flows, either within alternating current optimal power flows (AC OPF), or in combination with hybrid high-voltage directed current (HVDC), using frequency-domain theories of power or similar equilibrium—semidefinite-, PDE-, and ODE-constrained optimization, which may play a prominent role in the field in the future.

However, this lack of coverage is a minor complaint compared to the comments I could make about Volume II.

Volume II contains two informative papers on natural gas market clearing and network operations in the Australian state of Victoria and one on genetic algorithms for the same problem, complete with a plot entitled convergence characteristic. It seems to

ignore much of the recent developments in modeling nonlinearities (Babonneau et al. 2012, and recent PhD dissertations at the University of Darmstadt) and time-dependent aspects of related problems (Steinbach 2007, Koch et al. 2011). In addition, three papers, which can be at best described as very forward looking, address the integrated operations of power and gas distribution networks.

Surprisingly, many chapters do not start by explaining basic principles. Within Volume I, Chapter 1, *Strategic Bidding in Electricity Markets*, for example, assumes that the reader has an understanding of Cournot, Stackelberg, Bertrand, and Forchheimer models, which are 19th century game theory, and conjectured supply function models, which are 21st century game theory (Hobbs and Pang 2004), but are covered only in a precious few undergraduate curricula. One chapter covers real options theory for investment in wind power generation; however, the volume does not include a general introduction to options pricing or optimization with risk measures. In part, this is an inherent problem, given the diverse authorship and readership: As with most handbooks co-edited by Panos Pardalos, it has authors from mathematical optimization, local search, and the application domain.

Overall, compared to the classics in power system analysis (Wood and Wollenberg 1984, Momoh 2009, Machowski et al. 2007), there is very little overlap, much novel material, and some palpable excitement throughout Volume I. Compared to the excellent 2010 two-volume *Handbook of Power Systems* (Rebennack et al. 2010), which was also co-edited by Iliadis, Pardalos, Pereira, and Rebennack, this is less of an authoritative work. Having said that, however, Volume I is a good starting point for junior researchers interested in understanding smart grids.

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Talib, Nassim Nicholas. 2012. *Antifragile*: *Things that Gain from Disorder*. Penguin. 544 pp. $30.00.

Antifragile: *Things that Gain from Disorder* is a continuation of the theme Talib laid out in his book *Black Swan* in which he addressed the problem of essentially immeasurable, large risks that cannot be anticipated. In this book, he offers his solutions to personal, economic, and governmental black swans, using concepts from financial-options theory. Because some of his recommendations are very close to what I tell my students in my spreadsheet-of-life lecture, I found this book to be a valuable, yet irritating, read. It is valuable because it is thought provoking, raising more questions than answers. It is irritating because the author peddles personal prejudices as products of research, has a hyperventilated writing style, and displays an overinflated ego.

The issues Talib raises are central to decision making and the book can be a useful addition to a course on making decisions, if only to force students to understand the deeper issues in making serious life and public policy choices beyond the analytics. If his assertions are read with an open mind and as questions, the ideas the author presents could feed several rewarding research careers. Furthermore, his views on the underlying issues of the recent financial disaster are more profound than those of almost any other author.

Here are his key points: Volatility cannot be eliminated and it creates winners and losers. People, organizations, and societies can be characterized by their ability to avoid the downsides of risk as fragile, robust, or antifragile. The fragile take big hits and lose, the robust absorb the hits, and the antifragile profit when bad things happen. Losses as a function of volatility can be convex (i.e., provide large positive payoffs and small negative payoffs) or concave

(i.e., provide large negative payoffs and small positive payoffs). His advice is to make choices so that your outcomes are convex. However, if you cannot follow this advice, have the reserves to be robust.

He is essentially analogizing the models of financial options to the rest of life, sometimes well and sometimes less well. In his views on life, he is definitely a carnivore and not an herbivore. One can place this book in the stream of writings, which began in the Victorian era, on seizing the opportunity for success rather than the complementary stream of expressing a concern for unfortunates. He is a social Darwinist, without the intellectual baggage of 19th-century social Darwinists.

He addresses what is not knowable and how causes of events are obvious after the fact but not obvious before, a piece missing in too many discussions on how to prepare for black swans. He uses the writings of Nobel-prizewinning economist Joseph Stiglitz as one example of an economist who wrote a report declaring that Fannie Mae and Freddie Mac had minimal risk of bankruptcy prior to 2008 and then claimed he foresaw the crisis after it occurred. Another misplaced cause is blaming the mess on greed, rather than addressing the institutions that enabled greed to be so destructive, because greed is a constant.

He includes the story of the philosopher Thales, who made a fortune cornering the olive-press market by buying options on pressing capacity in the spring and selling them at a premium as the harvest came in. He adds to the story by including Aristotle's commentary that Thales correctly forecasted the large harvest. Talib points out that Thales could not have known about the size of the harvest, and Aristotle was using ex post facto knowledge. Thales won because he took a low downside risk by buying the rights before the press owners knew what they were worth and had a large upside reward. (He also cornered the market and was a monopolist.) Talib's point is that anybody can come out well by understanding risks and structuring payoffs for high gain, not by betting on a forecast; that is, problem framing is more important than building a forecast. Based on my experience, I agree with this.

The issue of knowability should be central to research and teaching in decision making and in public policy. Governments always want to patch the immediate problem and declare the world safe, and politicians want forecasts to have a false sense of control. However, the reality is that bad events cannot be avoided; they will happen, but in a different form than we would expect, while being obvious in retrospect. As operations research professionals, we facilitate this belief by producing analyses that do not include the reality of not having a handle on the true range of possible outcomes.

Talib gives many examples of fragility, robustness, and antifragility, and describes how he would handle those situations. Here are some examples: Two brothers choose different careers. One chooses to drive a black taxi in London; the other gets a job in human resources at a London bank. Although the first brother faces daily risk on fare income, he will be able to drive his taxi well into retirement. The second brother faces no risk to his immediate paycheck; however, he faces life-altering risk if he is laid off in his 50s. Talib's advice is to avoid being a "suit" and take a lot of little risks, such as the taxi driver does. I give my students similar advice: make sure they have a career asset value beyond the organizations at which they work. Talib notes that restaurants are fragile; however the ecology of restaurants in a city is antifragile because although they close at a high rate, new restaurants open to fill unmet niches, adapting to the market.

He also points out that governments that are too centralized become fragile by losing the ability to experiment with programs on a small scale, with one political district learning from the actions of another. He notes that Fannie Mae and Freddie Mac are structured to make small profits repeatedly, while risking infrequent big losses; thus, they are choosing the wrong side of the option.

Having explained what is in the book and what I like about it, here is what I find irritating about it: First, the author picks unnecessary fights, disparaging the construction of theories and constructing his own. Second, he invents his special, unnecessary vocabulary for things to create an insider-outsider framework. The problem these two points raise is that this is what cult leaders do to create a group identity among followers, not what thought leaders do. Third, he marshals evidence to support his pet peeves, especially toward academics and medicine, rather than approaching issues with wisdom. In doing so, he

wastes the reader's time and irritates some of his best potential customers.

He often does not have his facts correct. He talks about early computers as database machines, not realizing that this is a much later use for them than their original function of doing scientific calculations. He complains about how few cancer drugs have come out of the National Institutes of Health (NIH) versus the pharmaceutical firms. Yet, he fails to understand that NIH purposely chose to fund the basic science that allowed the pharmaceutical firms to make these drug discoveries. This information becomes clear when we read the references in the drug patents. (He should have complained about the U.S. Department of Energy; after 40 years and spending a trillion dollars, that department has not led the development of a single major energy technology that is currently profitable without a subsidy.) He claims mathematics makes people optimize excessively and causes fragility. He is right when we apply it to the long-term credit and capital bankruptcy. However, civil engineers traditionally optimize the steel in a bridge and then double the amount to provide a safety margin. Context is important.

He regularly uses the expression "Soviet-Harvard fragilistas" to denigrate professors and then liberally quotes professors in support of his arguments. He complains that academics take credit for practitioners' ideas because practitioners did the work before the academics wrote about the subject. Yet, he misses the point. Should I get credit for the antifragile concept because I have told my students about managing career and life risk? No. Talib should, simply because he articulated a useful framework for expanding notions for managing risk in life, work, and public policy based on ideas that we have known about for a long time. Good theory begins with good observation. Therefore, when professors learn from and use real experiences, we should celebrate and not denigrate their work.

In short, this is a deeply flawed but thought-provoking book that is definitely worth reading if one keeps an open mind. Nevertheless, my advice is to not take his absurd medical advice, except for one notion that he took from a non-Soviet-Harvard-fragilista professor and cognitive psychologist Gerd Gigerenzer: "never ask a doctor what you should do. Ask what he would do if he were in your place" (p. 389).

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