Book reviews

Craig Loehle, Thinking Strategically: Power Tools for Personal and Professional Advancement, C.U.P. Cambridge, 1996, $16.95, paperback.

This book is "clever" with all the connotations of this word. It is intelligent, insightful, incisive, but also "too clever by half", and not in the end very wise. The author is very much the child of the Enlightenment and of the "mind-body" dualism of Descartes. Our mental faculties are indulged like "imps of fun".

It is curious how very well versed the author is in current thinking, without applying any of these "power tools" to himself. His sketches of complexity, feedback loops, quality control, entropy and scenarios are well executed thumb-nail sketches. He clearly knows his field. The playful cartoons lend some charm and his sense of humour is engaging. He has clarity of exposition, as well.

But none of this feeds back to question the whole premise of this book, that conscious human purposes should rule the universe and we would all be better off if individuals reckoned consequences more cleverly. "Strategy", a metaphor borrowed from military endeavours, is never itself examined critically. The disembodied mind is like a "G-man", untouchable. There is no inkling that getting what we want could be part of the trouble. Here is an advocate of feedback which applies to what he studies, not himself. His view of science remains positivist, even Newtonian, with no concept of interactivity among knower and known or the self-fulfilling nature of his own assumptions. This is strategy-as-bricolage: "Everything You Always Wanted to Know about being Smart". Nothing disturbs the breezy confidence of this cerebral technician, "Man the Manipulator". Is it not possible that becoming absorbed in one's own machinations is a manifestation of narcissism, which gets between you and other sensate beings – customers, for example?

By conceiving of strategy as "technology for problem-solving" the author creates a world in which he haunts a mechanical universe of levers allegedly "causing" results. It is an odd vision, half bleak, half childlike in its construction.

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Peter L. Bernstein, Against the Gods. The Remarkable Story of Risk, Wiley, 1996, 384 pp.

1. The beginnings of the quantification of risk

There is no question that quantification pervades all aspects of our lives. Bernstein's book is only latest of a series of books which treat the subject of quantification in scientific and other communities. (See also: Alfred W. Crosby, *The Measure of Reality: Quantification and Western Society, 1250–1600*, Cambridge University Press, 1996, and Theodore M. Porter, *Trust in Numbers, the Pursuit of Objectivity in Science and Public Life*, Princeton University, 1995.)

Bernstein covers the whole spectrum from what he calls "the beginnings" of quantification (The earliest-known form of gambling was a kind of dice game played by Greeks and Romans. Those games were referred to as "hazard" from *al zahr*, the Arabic word for dice), right to its present use in the modern corporate world of the 1990s.

This book traces the history of numbers in a very comprehensive way. By the year 1000, numbering systems had to be used to organize meteorology and the sailing expeditions which started to explore new worlds. According to Bernstein, the story of numbers in the West begins in 1202 with Leonardo Pisano, also known as Fibonacci or son-of-Bonacio. He wrote a book called *Liber Abaci* "which made people aware of a whole new world in which numbers could be substituted for the Hebrew, Greek, and Roman systems that used letters for counting and calculating". We note that this book was entirely handwritten and was published three hundred years before the invention of printing which took place around 1450. A chapter is devoted to describe Fibonacci's creativity (we recall the famous Fibonacci numbers) and another to describe the masterwork of Luca Paccioli whose *Summa de Arithmetic, Geometria et Proportionalità* appeared in 1494. Apart from the basic principles of algebra and multiplication tables, *Summa* is known for the introduction of double-entry bookkeeping, which, it is reported, was already apparent in Fibonacci's work. Another great mathematician was Girolano Cardano who is known as the "quintessential Renaissance man". His great book on mathematics is the *Ars Magna* which appeared in 1545.

2. Three illustrious Frenchmen

Berstein tells us that "neither Cardano nor Galileo realized that he was on the verge of articulating the most powerful tool of risk management ever to be invented: the laws of probability". Galileo died in 1642. Twelve years later, three Frenchmen, Blaise Pascal, Pierre de Fermat and the Chevalier de Méré fashioned the systematic and theoretical foundations for measuring probability. It is impossible in this brief review to describe Bernstein's detailed chronicle of each of these mathematicians discoveries. The reader will enjoy reading details of how oddities such as Fermat's Last Theorem came about. We recall that it is only recently that this riddle was solved with a solution that involved the modern computer. It is the subject of a recent book by A.D. Aczel *Fermat's Last Theorem*. Four Walls Eight Windows, 1996.

Before entering the 18th century the author recounts the attempts of developing statistical sampling as far back as 1279 in England. Then followed the compilation health statistics, the reporting of the incidence of accidents, the introduction of tables breaking down population into an age distribution, efforts to calculate life expectancies (by Halley), and the first use of insurance in trade in the Netherlands, all of which anticipate the modern financial forms of risk management.

3. From Bernoulli to Bayes

Such is the importance of the Bernoulli's in the development of quantification and probability theory that the author devotes two entire chapters to this remarkable Swiss family of mathematicians.

We owe the Law of Large Numbers to Jacob Bernoulli. Daniel Bernoulli introduced his basic thesis that people ascribe different values to risk and introduced the idea that "the utility resulting from any small increase in wealth will be inversely proportionate to the quantity of goods previously possessed". (Cited by Bernstein, p. 105).

It is interesting to note that Daniel Bernoulli and his brother Nicholaus III worked in St. Petersburg in the court of Peter the Great which explains the name of the celebrated Bernoulli's Petersburg Paradox – a celebrated mathematical problem which, Bernstein reveals, only appeared in an English translation in 1954, i.e., 216 years after its original publication. Daniel Bernoulli's impressive achievement shows how hu-

man beings employ both measurement and intuition in making decisions when outcomes are subject to uncertainty. While Bernoulli's concepts of human rationality and of utility have changed in modern times, they were debated during nearly 200 years after their publication – a tribute to the importance of this mathematician in the history of the quantification of risk.

Jacob Bernoulli, Abraham de Moivre and Thomas Bayes "showed how to infer previously unknown probabilities from the empirical facts of reality". We are introduced to the genius of Laplace, Gauss, and others. We witness the introduction of the concept of variation and the now ubiquitous bell curve which Galton named the "Supreme Law of Unreason" because its regularity defied the intuitive form ascribed to a large sample of chaotic elements. Nowadays, the normal distribution forms the core of most systems of risk management.

According to Bernstein (p. 197):

"The essence of risk management lies in maximizing the areas where we have some control over the outcome while minimizing the areas where we have absolutely no control over the outcome and the linkage between effect and cause is hidden from us."

4. Modern times

Bernstein states that risk management became a practical tool only when we took "the measure of our ignorance". In modern times Keynes in England, Poincaré in France and Kenneth Arrow in the US are said to have contributed more than any others to the development of the theory of probability under imperfect information.

Bernstein indicates that when Galton (1911) and Poincaré (1912) died, it signaled "the end of the grand age of measurements" – an age which started with Paccioli (around 1494). Before the First World War, "classical economics had defined economics as a riskless system that always produced optimal results". However, it was up to Knight and Keynes to change all that. Keynes attacked traditional views of probability. He emphatically asserted that:

"There is little likelihood of our discovering a method of recognizing particular probabilities, without any assistance whatever from intuition or direct judgment... A proposition is not probable because we think so." (As cited by Bernstein p. 225.)

"Once we understand that we are not obliged to accept the spin of the roulette wheel or the cards we are dealt, we are free souls. Our decisions matter. We can

change the world. Keynes's economic prescriptions reveal that as we make decisions we DO change the world." (Emphasis in Bernstein's original.)

In *Against the Gods*, a chapter is devoted to Von Neumann and Morgenstern's *The Theory of Games*, a landmark in the field, which takes up again Bernoulli's original concept of utility and applies it to modern times. Then, the author devotes another chapter specifically to the problem of measuring risk when we invest in securities. He introduces:

- Markowitz's mathematics of diversification and his theory of "efficient" portfolio selection which revolutionized the profession of investment management thereafter, and
- Kahneman and Tversky's discovery of unrecognized behavior patterns which affect rational decision makers.

5. Conclusion

To conclude, Bernstein challenges his readers "to discover methods to mute the impact of the unexpected, to manage the risk of the unknown". In the spirit of Keynes, he urges us to be aware of the methods to quantify uncertainty and of the importance of the laws of probability as rational guides to action without being blindly dependent on them.

In spite of its wealth of detail, *Against the Gods* is an imminently readable book which we can highly recommend to all those who are in favor or not with the wholesale quantification of the contemporary methods of management decision making.

Wisely, the author tempers his enthusiasm for the quantification of uncertainty with a healthy dose of self-criticism and a non-too-subtle knowledge that, when it is faced with the realities of the stock market and other practical decision making situations, humankind is moved much more by the motivation of gain and greed than by the over-rational laws of the probability theory.

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