Book Reviews

Jeremy RIFKIN
Entropy
Viking Press, New York, 1980, 305 pages

Energy is the unifying concept of all physical sciences which associates with any system a capacity for work. Entropy is a quantity which measures the fraction of the total energy of a system that is not available for doing work. An entropy increase means a decrease in available energy. Since energy can neither be created nor destroyed but only transformed one way toward a dissipated state, pollution is just another name for entropy. Every time you light a cigarette, the available energy in the world decreases.

Human systems must be based on a new set of values which reflect our awareness of the entropy process. This is the message of this beautiful book.

Rifkin is a harbinger of a new age, the so-called solar age, whose prophet is Georgescu-Roegen. In an afterword, Georgescu-Roegen develops again his famous thesis that because the entropic abundance of the last two hundred years is rapidly approaching its end, we must reasses and remodel our approach to economic, politic, and social evolution.

Rifkin sees the entropy law as the truth that can set us free. By minimizing the energy flow, the entropy process slow down (it can never be stopped) and the disorders slow down as well. The institutions responsible for transforming energy can be maintained in a steady low-growth state. Only when the human system attempts to get more and more energy out of its environment do the institutions (and technologies) grow correspondingly in both complexity and control.

All technologists believe that technology should be applied to minimize the risk of possible shortcomings in human systems. Rifkin is pessimistic with regard to technological possibilities. He believes that most problems are manmade and therefore should be solved by changing habits, motivations, and rules of behavior. The emperor isn't wearing any clothes — this is the way Rifkin feels what technology really is. The faster we streamline technology the more we speed up the transforming process of energy from

nature's storehouse, the faster available energy is dissipated, and the more the disorder mounts.

Like Georgescu-Roegen, Rifkin notes that there is no room in classical economic analysis for the entropy law. Almost all economists assume that new technology can always find a way to locate and exploit previously untapped resources. The resource base itself is considered inexhaustible. According to Rifkin, most economists are wedded to the idea that human labor creates greater value, not less. In fact — says he — every time any form of energy is expended to make something of value, it is done at the expense of creating even greater disorder and waste in the overall environment. Thus, there is no such thing as material progress in the sense of accumulating a permanent store of usable goods, for everything we make eventually ends up as dust in the wind. Seen in this way, the gross national product is more accurately the gross national cost, since every time resources are consumed they become unavailable for future use.

Today we are being forced to make a transition from the industrial age of nonrenewable resources to a new and still undefined age based once again on renewable sources of energy. There will be no time for polite debate, subtle compromise, or momentary equivocation. To succeed will require a zealous determination and militancy of herculean proportions.

A special chapter in this book is devoted to values and institutions in an entropic society. In a high-entropy culture the overriding purpose of life becomes one of using high-energy flow to create material abundance. Human liberation is thus equated with accumulation of greater wealth. A primary value is placed upon transforming the environment to extract its riches. In this way we have become creatures struggling to maintain ourselves in the midst of growing chaos. There is no doubt, for Rifkin, that we are in for a massive institutional realignment. Our social structure, geared for a maximum energy flow, will no longer be sustainable.

The governing ethical principle of a low-entropy world view is to minimize energy flow. A low-entropy human system deemphasizes consumption. The ultimate purpose of human life is not the satisfaction of all material desires, but rather the experience of liberation.

In other words, the low-entropy and high-entropy

cultures differ in their approach to human systems management. The rules that are used to exploit nature are diametrically opposed to those used to conserve nature. Private ownership of resources, increased centralization of power, greater reliance on technology, the refusal to set limit on consumption, the reductionist approach to understanding life, and the concept of progress as a process of continually transforming the natural world into a human-made environment have long been considered as valid goals in the modern world. Everly single one of these goals, and scores of other, are inimical to the principles of ecology, low-energy economic framework, and the stewardship doctrine.

Stewardship requires that human systems respect and conserve natural order. Questioning the equation of material prosperity and technology with progress, Rifkin appreciates some old points of view not long ago considered as backward. The reason is clear: the entropy worldview challenges our most commonplace assumptions about our environment, our culture, and our biological being. The trappings of modern culture — our great urban areas, our mechanized agriculture, our massive consumption, our weapons, and our medical technology — are all revealed in a radical new light. Rifkin demonstrates that the entropy law shatters our view of material progress, reorients the foundation of economics, and strips technology of its mystique.

The entropy law governs only the physical world. The way human systems interact with its laws in establishing a framework for physical existence is of crucial importance to whether human spiritual journey is allowed to flourish or languish. Rifkin considers a thorough comprehension of the entropy law as crucial for understanding of the physical context from which all spiritual sojourns must start. Even if he was right in maintaining, like Max Weber or Arnold Toynbee, that the fantastic structure of western technology clearly continues to be a product of protestantism — and I have strong reservations on that score — his judgment clearly does not apply to the orthodox east. According to the eastern anthropology, love and freedom do not only demand action, but also quiet; the productive quiet by which man manages to avoid many forms of alienation. This message could be a norm for management renewal.

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Gérard COLSON and Milan ZELENY
Uncertain Prospects Ranking and Portfolio Analysis Under the Conditions of Partial Information
Oelgeschlager, Gunn & Hain, Cambridge, MA, 1979, 213+xxvii pages

The concept of *risk* is central to existing theories of economic decisionmaking, but a standard definition of risk has not yet been established. Most agree that risk is associated with uncertainty about future consequences of events or decisions. The problem arises in trying to quantify risk, since different investors exhibit different types of attitutes toward risk, from the highly speculative to the highly conservative. Economists and decision theorists have approached this problem in several different ways: Classical portfolio analysis deals with financial risk by comparing expectations and variances of alternate investments in a two-dimensional space, thus allowing a tradeoff between the conflicting goals of maximizing return and minimizing risk. However, as Colson and Zeleny point out in this monograph, empirical studies have shown that variance is not an adequate representation of risk. Though a number of modified risk measures have been proposed, such as semivariance, it is doubtful that risk can be explicitly quantified without reference to the decision-maker's subjective perceptions. A second school of thought has attacked this difficulty directly by attempting to determine the decision-maker's expected utility with respect to the various possible outcomes. However, assessment of utility functions is often impractical, while the axioms of utility theory are quite restrictive and often violated in real life. A third approach, using the concept of stochastic dominance, would be preferable to the others provided that full knowledge were available of the probability distributions of the outcomes. It appears that there is a need for a practical instrument that will provide a satisfactory representation and ranking of the riskiness of alternative prospects when only partial information is available about their probability distributions.

During the past six years Colson and Zeleny have developed a new approach to portfolio analysis based upon a multi-dimensional measure of risk, and in this exposition they describe their approach and compare it against existing methods. Their basic argument is that each investor innately has a speculative pole and a conservative pole, and that any investment decision involves a reconciliation between a desire for high

gains and an aversion to high losses. Accordingly, they propose a three-dimensional 'prospect ranking vector', or PRV, to represent the risks associated with any prospect. The vector consists of the following components: PRV1 is the probability of realizing a return which does not fall below a certain minimum threshold; PRV2 is the expected value of the return; PRV3 is the probability of achieving a return which equals or exceeds an upper target. Thus, the PRV incorporates information about the two tails and the mean of the return distribution. In the general case of continuous, unbounded distributions for which only the mean and the variance are known, the PRV is computed by assessing two coefficients, k and k', which express the investor's optimism about high or low returns. Essentially these coefficients estimate the number of standard deviations between the mean and the upper and lower targets. For example, a very optimistic investor would choose a large value of k for the upper target and a small value of k' for the lower target.

To analyze a portfolio of prospects using PRV, it is necessary to collectively determine the maximum upper target over all prospects and the maximum lower target (which is at least as great as the investor's required minimum return). Any two prospects may then be compared by evaluating their positions relative to these two targets as well as their expected values. One prospect is said to *dominate* another if it has a greater PRV vector, and the authors show that PRV dominance is consistent with first-order stochastic dominance in the case of perfect information. Moreover, under partial (mean-variance) information, the use of probabilistic bounds allows pairwise comparisons of prospects by simple numerical rules. The ranking of two prospects may be either certain, probable, or infeasible depending upon their k values. In particular, the PRV1 component produces some non-comparable cases due to the complexities introduced by the minimum return requirement. The authors explore the properties of the PRV rules under various conditions, and show that in some cases PRV

analysis contradicts the classical mean-variance analysis. They also find that the concept of a certain equivalent (i.e., a 'safe asset') leads to some paradoxical results under PRV analysis. Their detailed dissection of prospect ranking subject to various assumptions demonstrates very well how differing interpretations of the available information can lead to different conclusions about risk.

The book is largely theoretical in content, since the authors go through a rigorous and meticulous derivation of the PRV approach. As a result, the notation and the expository logic are rather laborious, but the authors have considerately included summary sections which recapitulate their major theoretical findings and implications. By providing a thorough description of the background literature, they clarify the contribution of PRV to risk and portfolio analysis, and they are candid about the short-comings of PRV as well as its advantages. The major issue that remains to be resolved is whether a risk analyst or an investor can successfully evaluate the k coefficients which are at the heart of PRV. No application experience is cited in this book, and one wonders whether the k values may not be as elusive as utility functions in practical situations. There seems to be substantial room for confusion due to the dual interpretations of these k values: On the one hand they represent the investor's *belief* about the possible extreme returns, and on the other hand they represent his *attitude* concerning risk preference. Moreover, the choice of k values will affect the reliability of the resulting PRV ranking, and the authors often advise that adjusting the k values may improve one's confidence in the prospect comparison. It will be interesting to see whether PRV will become a viable tool for portfolio analysis. In the meantime this book provides a challenging and thought-provoking excursion into the multiple dimensions of risk.

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