1974

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Joshua Ronen

George H. Sorter

Volume 2 Selected Papers

Objectives of Financial Statements

AICPA

American Institute of Certified Public Accountants

May 1974

The Descriptive and the Normative

Joshua Ronen and George H. Sorter

Definitions

Prescriptive models are those which are designed to help people make "better" decisions, in the sense of aiding them to behave consistently, with an a priori set of requirements or rules with which they want their choices to conform. These models are "prescriptive" or "normative" insofar as they *prescribe* how one *should* behave; that is, they set ideal norms. Descriptive models, on the other hand, are designed to describe how people actually behave. Both types of models allow for the assessment of expectations or beliefs about the structure of the environment, and about utilities which refer to personal tastes.

In a treatise on the problem of measurement of values and probabilities for the purpose of predicting behavior, Churchman[1] ties together the prescriptive and the descriptive aspects of choice in decision situations, maintaining that prescription should emanate from prediction:

> The present suggestion is to assert that the "ought" in a recommendation can be stated as follows: "X ought to do A in this environment" means "X would do A in the standard environment that defines value measurement." If a scientist states that an executive should follow a certain course of action, he says in effect, "I have measured the values of the executive—or his organization—for the various outcomes that may result from his decisions." These measurements predict what he would do if he were making his decision under the standard conditions of value measurements. When I say he ought to exhibit such-and-such behavior, I mean that this is the behavior he would exhibit if these standard conditions held. Of course, he may not do what he ought to do; that is, the standard conditions may not hold in this environment.

[1] C. W. Churchman, *Prediction and Optimal Decision* (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961), pp. 17-18.

If the prescriptive models were to take into consideration the human capability to process information and the tendency to "simplify" and eliminate part of the stimuli in the environment—then the "prescriptive" model becomes a descriptive model of actual behavior, as Becker and McClintock[2] indicate. They note that "imposing a requirement that a prescriptive model be realistic in its demands upon the users' capabilities tends to make the distinction between prescriptive and descriptive models ambiguous."[3]

The descriptive and the normative models of behavior may require a common set of accounting data. However, they may differ in their input requirements. If so, accounting objectives based on descriptive behavior would require sets of data that are different on occasions from those required for accounting objectives based on normative or prescriptive models of behavior.

Illustrations—Investment Analysis

To illustrate the above, the discussion is restricted to one sub-set of users—security analysts.

Many aspects of investment analysis are viewed as psychological in nature and one of these aspects is certainly the appraisal of man's capabilities for integrating information into a judgment or a decision. The analysts are called upon to make predictions, forecasts, diagnoses and evaluations on the basis of fallible information and with respect to parameters such as expected returns, growth rates, variability and volatility. These tasks are said to be facilitated by means of the statistics discipline. Very often, however, individuals bypass formal statistical procedures when making judgments. When they do this, they are acting as "intuitive statisticians."

The normative aspect of investment analysis relates to decision rules that should be applied to a variety of investment situations taking advantage of theoretically derived or empirically determined quantitative relationships between market factors and security performance. Do security analysts use these normative models as prescribed?

While research in this area is almost nonexistent, related questions have been studied extensively within psychology and other disciplines (primarily medicine). Various techniques from these other disciplines were employed to identify and describe the descriptive models of financial decision-making. Geoffry Clarkson[4] simulated the portfolio selection processes of a bank's trust investment officer. Clarkson studied the officer's verbalized reflections as he was asked to think aloud while reviewing past and present decisions. Using these reflections as a guide, the investment process was translated into a sequential branching computer program. A remarkable correspondence

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[2] Becker and McClintock, "Behavioral Decision Theory," *Annual Review of Psychology* (1967).

[3] Ibid, p. 241.

[4] G. P. E. Clarkson, *Portfolio Selection: A Simulation of Trust Investment* (Englewood Cliffs, New Jersey: Prentice-Hall, 1962).

was found between the simulated portfolios and the actual future portfolios selected by the trust officer. Similar research plans were used by Cohen, Gilmore, and Singer[5] in simulating the decision processes of bank officers who granted loans. Other attempts to analyze the judgment process in medical diagnosis are described by Kleinmuntz[6] and Rimoldi.[7]

Techniques that are less complex than Clarkson's simulation but more sophisticated than the naïve approach of simply asking the decision-maker how he makes his judgments were developed. These are discussed by Goldberg,[8] Slovic and Lichtenstein,[9] Hoffman,[10] Hammond, Hursch, and Todd.[11] This approach requires making quantitative evaluations of a large number of cases each of which is described by various cue dimensions. Thus the financial analysts could be asked to predict price appreciation for securities that are defined in terms of P/E ratios, earnings, dividend yields, etc. Hoffman and Hammond, Hursch, and Todd suggested fitting a regression equation to analysts' judgments to capture their personal weighting policy, within the framework of a *linear model.*

Also, information processing sometimes utilizes cues in a variety of nonlinear ways (e.g., in curvilinear functions). When analysts associate good investment decisions with complex and interrelated decision rules they probably are thinking in terms of *configural* relationships rather than linear.

Studies of Probabilistic Processing

Some attempts to detect deviations of the descriptive from the normative centered on the prescriptive models of decision theory which assert that opinions about the world should be cast in probabilistic terms. For example, according to the prescriptive model, rather than predicting that a stock will sell at a specific price, we should estimate a probability distribution across a set of possible prices. These probabilities can be used together with the

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[5] K. J. Cohen, T. C. Gilmore, and F. A. Singer, "Bank Procedures for Analyzing Business Loan Applications," *Analytical Methods in Banking* (Homewood, Illinois: R. D. Irwin, 1966), pp. 218-251.

[6] B. Kleinmuntz, "The Processing of Clinical Information by Man and Machine," *Formal Representation of Human Judgment* (New York: Wiley, 1968), pp. 149-186.

[7] H. J. A. Rimoldi, "Teaching and Analysis of Diagnostic Skills," *The Diagnostic Process* (Ann Arbor: Malloy Lithographing, 1964), pp. 315-346.

[8] L. R. Goldberg, "Simple Models or Simple Processes? Some Research on Clinical Judgments," *American Psychologist* (1968), Vol. 23, pp. 483-496.

[9] P. Slovic and S. Lichtenstein, "Comparison of Bayesian and Regression Approaches to the Study of Information Processing in Judgment," *Organizational Behavior and Human Performance* (in press) and *Human Judgment and Social Interaction* (New York: Holt, Rinehart, & Winston, in press).

[10] P. J. Hoffman, "The Paramorphic Representation of Clinical Judgment," *Psychological Bulletin* (1960), Vol. 57, pp. 116-131.

[11] K. R. Hammond, C. J. Hursch, and F. J. Todd, "Analyzing the Components of Clinical Inference," *Psychological Review* (1964), Vol. 71, pp. 438-456.

information about the payoffs associated with the various decisions and states of the world to satisfy an objective criterion such as the maximization of expected value or expected utility.

When new information is gained the probabilities are revised. The *normative* model that prescribes how such revision is to be made is Bayes' theorem. However, psychologists, led by Ward Edwards and others[12] found experimentally that men are conservative processors of information. While upon receipt of new data, subjects revised their posterior probability estimates in the same direction as prescribed by Bayes' theorem, the revision was typically too small; subjects responded as though the data were less diagnostic than they truly were. Edwards suggested that while they perceive each datum accurately, men are unable to combine its meaning properly with the prior probabilities when revising their opinions.[13]

Assessments of Probability, Variability And Co-variability

The prescriptive portfolio models require that analysts estimate the variances and co-variances of expected returns which are then combined to optimize the investors' utility.[14] For such a model to be actually used, therefore, estimates of probabilities and variances must be provided. But if it is found that the estimation of such parameters is affected by factors that are not specified by the normative models or if they are distorted systematically as a result of intervening psychological variables, then the prescribed portfolio model in which such estimates are to be used may no longer be the optimal model. In this case, modification of the prescriptive model will be required to accommodate the human tendencies. In such a case the information requirements implied by the first normative model may differ from those implied by the modified descriptive model.

Such distortions were indeed found. For example, Tversky and Kahneman[15] identified an "availability bias" in that judgments of an event's probability were found to be determined by the number of instances of that event that are remembered and the ease with which they come into mind. The

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[12] W. Edwards, "Conservatism in Human Information Processing," *Formal Representation of Human Judgment* (New York: Wiley, 1968), pp. 17-52. W. Edwards, H. Lindman, and L. D. Phillips, "Emerging Technologies for Making Decisions," *New Directions in Psychology: II* (New York: Holt, Rinehart, & Winston, 1965), pp. 261-325. W. Edwards and L. D. Phillips, "Man as a Transducer for Probabilities in Bayesian Command and Control Systems," *Human Judgments and Optimality* (New York: Wiley, 1964), pp. 360-401. W. Edwards, L. D. Phillips, W. L. Hays and B. C. Goodman, "Probabilistic Information Processing Systems: Design and Evaluation," *IEEE Transactions on Systems Science and Cybernetics* (1968), Vol. SSC-4, pp. 248-265.

[13] Edwards, "Conservatism in Human Information Processing," pp. 17-52.

[14] See, for example, William F. Sharpe, *Portfolio Theory and Capital Markets* (New York: McGraw-Hill Book Company, 1970).

[15] A. Tversky and D. Kahneman, "The Judgment of Probability by Retrieval and Construction of Instances," *Oregon Research Institute Research Bulletin* (1971).

availability of instances is affected by such factors as recency, salience, and imaginability—all of which may not be related to the correct probability.

In addition to this distortion, numerous other systematic biases in assessments of probability were found such as misperceiving the probabilities of compound events (Cohen and Chesnick[16] and Slovic[17]). Assessments of variability were found to be affected by the mean of the sequence and its regularity (Lathrop[18]). Thus people somehow judge absolute variability in terms of variability relative to the mean. Also, greater irregularity gives an illusion of greater variability.

In addition to all the above, a great deal of experimental research on risk-taking behavior exists. This research may be relevant for investment decision-making and the information requirements for such decision-making. In this set of research (which is not discussed in this paper), subjects are asked to indicate their preferences and opinions among various gambles. Gambles are studied because they represent in an abstract form important aspects of real-life decisions. They contain elements such as probabilities, incentives and risks which are also the elements of real-life decisions. By using gambles, basic dimensions of risk situations can be manipulated, and hypotheses can be rigorously tested. Whether one can generalize that the results of such experiments simulate real-life decisions under uncertainty must be established by further research.

To illustrate, Slovic[19] found that perceived risk was not a function of the variance of a gamble. Instead riskiness was more likely to be determined by the probability of loss and the amount of loss. This result is congruent with Lorie's[20] complaint that it was absurd to call a stock risky because it went up much faster than the market in some years and only as fast in other years, while a security that never varies in price is not risky at all—if the variance is used to define risk. If indeed descriptive models imply that either the amount of loss or the probability of loss is the main determinant of risk, would it not be concluded that at least from the standpoint of descriptive behavior, accounting information should concentrate on providing estimates for those two parameters?

Summary and Conclusions

In the above analysis, an attempt has been made to illustrate, with a few examples, some of the implications of the vast literature which describes

[16] J. Cohen and E. I. Chesnick, "The Doctrine of Psychological Chances," *British Journal of Psychology* (1970), Vol. 61, pp. 323-334.

[17] P. Slovic, "Manipulating the Attractiveness of a Gamble Without Changing Its Expected Value," *Journal of Experimental Psychology* (1969), Vol. 79, pp. 139-145.

[18] R. G. Lathrop, "Perceived Variability," *Journal of Experimental Psychology* (1967), Vol. 73, pp. 498-502.

[19] P. Slovic, "The Relative Influence of Probabilities and Payoffs Upon Perceived Risk of a Gamble," *Psychonomic Science* (1967), Vol. 9, pp. 223-224.

[20] J. H. Lorie, "Some Comments on Recent Quantitative and Formal Research on the Stock Market," *Journal of Business* (1966), Vol. 39, Part II, pp. 107-110.

human behavior in relation to decision models that are actually used. If accounting information is to provide inputs to what people actually use, there is no doubt that a significant amount of research still remains to be conducted.

Normative or prescriptive models are those which should be used, whereas descriptive models are those that are actually used. Given the circumstances underlying the task of the Study Group on the Objectives of Financial Statements, it is believed that an investigation of normative models utilizing accounting information deserves priority.

First, the literature that is relevant to the investigation of descriptive models is both fragmented and indirect. Thus, to gather sufficient evidence that allows the formulation of a unified framework for descriptive models would be both difficult and overly time-consuming, thus placing severe limitations on this approach.

Second, the choice of models that are actually used may also be affected by the set of available information. Thus, to determine what information is required for a specified goal would require identifying the decision model employed; but, at the same time, the information provided to a decision-maker may affect the decision model that is used. The circularity is particularly crucial inasmuch as the Study Group is considering the possibility of enlarging or at least changing the available accounting information. Therefore, the new information may change the descriptive models.

These complexities make the exploration of descriptive models particularly difficult and lengthy. While such an investigation is potentially very useful, it is nevertheless suggested that primary emphasis be devoted to normative models at this stage.