What Is Genuine Method?

In the introduction to *What Is Science*?, James R. Newman writes:

> I hope this book helps to a more balanced view both of science and human values. I hope it helps counteract the malicious doctrines, flourishing once again in this age of insecurity, which belittle science and reason, exhort men to consult their hearts instead of their heads, depreciate the lessons of experience and proclaim the higher truth emanating from inner voices. "Science," said Adam Smith, "is the great antidote to the poison of enthusiasm and superstition." An ailing world would do well to reach for the right bottle in the medicine cabinet. (Newman 1961; ix)

The three elements of scientific inquiry are logic, causality and experimentation. Logic is classical or Aristotlean logic. Causality is contrasted with teleology. In the social sciences, ethical experimentation is quasi-experimentation. Classical logic is based on three axioms: identity, contradiction and excluded middle. It includes conception, judgment, reasoning and method. Method and demonstration are closely related. The demonstration of a truth consists of more often a chain of arguments than a single argument. Demonstration usually requires an ordering of arguments which uses what is clearly known to discover the less clearly known. Method is the ordering or arrangement of a sequence of thoughts or statements. The method for discovering truth which is unknown to us is analysis, resolution or invention. The method for proving to others a truth we already know is synthesis, composition or instruction.

Every question contains something unknown; otherwise, there would be nothing to inquire about. This unknown is designated by certain conditions so we know what to look for and we know whether we have found it. Analysis is inquiring into what is already known or better known in the questions that are asked. Skillful analysis is essentially isolating from the conditions of the question those assumptions sufficient to direct us to the as yet unknown or lesser known which we seek.

In both analysis and synthesis, we logically proceed from the better known to the lesser known. The genuine method of reasoning always proceeds from the better known to the lesser known, not from the known to the equally known. This rule cannot be omitted from any genuine method of reasoning. Historical information can be found in the following books: *The Logic*, Aristotle, 384-322 BCE; *The New Organon*, Francis Bacon, 1620; *Discourse on the Method of Rightly Conducting One's Reason and of Seeking Truth in the Sciences*, Rene Descartes, 1637; Antoine Arnauld, 1964 (1662), *The Art of Thinking: Port-Royal Logic*. Translated by James Dickoff and Patricia James. New York: Library of Liberal Arts, Bobbs-Merrill Company; and *The Function of Reason*, Alfred North Whitehead, 1929.

The fallacy of vicious circular reasoning is to assume as true the very thing in question. Since what serves as proof must be clearer and better known that what we seek to prove, vicious circular reasoning is totally opposed to genuine method in reasoning. To

attempt to prove the unknown on the basis of something equally unknown, or the uncertain on the basis of something equally uncertain, or the clear on the basis of something equally unclear, is vicious circular reasoning. Vicious circular reasoning is an inference drawn from a premise that includes the conclusion, and used to prove the conclusion. Inference is the deriving of a conclusion in logic by either induction or deduction. Vicious circular reasoning is a fallacy of reasoning. It is fatal and has no counter-example. It ends a logical argument.

Econometrics is a method of causal inference applied to economic systems, from economies to markets. Econometrics is statistical inference, inference is logic, and logic is reasoning. Going in the opposite direction, reasoning is logic, logic is science, and science is econometrics. An econometrics model can be expressed in a mathematical equation or in a verbal statement. Two widely used texts about statistical inference, linear regression analysis and econometrics are: *Basic Econometrics*, D.N. Gujarati, 2/e, 1988, McGraw-Hill Publishing Company, suitable for a course for the non-specialist; and *Introduction to Econometrics*, G. S. Maddala, 2/e, 1992, Macmillan Publishing Company.

Probability theory is part of statistical inference, which is part of linear regression analysis, which is part of econometrics, which is part of financial economics. Probability theory is a branch of mathematics. It goes back at least as far as James Bernoulli (1654-1705) and Daniel Bernoulli (1700-1782) who studied the casino games in Paris for rich patrons.

Comprehensive information can be found in a book by William Feller entitled *An Introduction to Probability Theory and Its Applications*, Volume I, 3/e, revised printing, 1968, and Volume II, 2/3, 1971, New York: John Wiley & Sons. Feller, Volume I, Summary, p. 4: “We are concerned not with modes of inductive reasoning but with something that might be called physical or *statistical* probability. … Our probabilities do not refer to judgments but to possible outcomes of a *conceptual experiment*.” [Italics are in the original.]

Most people know the difference between a constant and a variable in math, but many do not know the difference between a random variable and a deterministic variable. A random variable is represented by a probability distribution. The concept of random variable is defined and explained in Feller, Volume I, Chapter IX Random Variables; Expectations, p. 212ff.: “A function defined on a sample space is called a random variable. … In each case there is a unique rule which associates a number X with any sample point. The classical theory of probability was devoted mainly to a study of gambler’s gain, which is again a random variable; in fact, every random variable can be interpreted as the gain of a real or imaginary gambler in a suitable game. … The term random variable is somewhat confusing; random function would be more appropriate (the independent variable being a point in sample space, that is, the outcome of an experiment).”

The word classical has different meanings in different contexts. Classical probability is contrasted with Bayesian probability. The classical view of probability was first defined and studied by Gerolamo Cardano (1501-1576). The Bayesian view of probability was defined by Thomas Bayes (1763). Classical logic is synonymous with Aristotlean logic and is contrasted with all other systems of logic, which are collectively referred to as nonclassical. The fallacy of vicious circular reasoning goes by many names, and the most popular name was given by Aristotle, who named it "begging the question." Classical mechanics is contrasted with statistical mechanics. Gaussian, normal, standard, or general linear regression is classical in the sense that it was developed by Gauss in 1821 and Markov in 1900 and since then has served as the normal general standard. Diagnostic checking is done to detect fallacious, abnormal, *ad hoc* or non-standard econometric models.

D.N. Gujarati, *Basic Econometrics*, 2/e, 1988, Chapter 1 The Nature of Regression Analysis, Section 1.3 Statistical Vs. Deterministic Relationships, pp. 17-18, writes: "In regression analysis we are concerned with what is known as the *statistical*, not *functional* or *deterministic*, dependence among variables, such as those of classical physics. In statistical relationships among variables we essentially deal with *random* or *stochastic* variables, that is, variables that have probability distributions. In functional or deterministic dependency, on the other hand, we also deal with variables, but these variables are not random or stochastic." [Italics are in the original.]

For example, let *R* be a random variable with an infinite number of possible outcomes. The outcomes are mutually exclusive (no overlap) and totally exhaustive (no omission). Let *A* refer to one of these possible outcomes, and let not-*A* refer collectively to all of the other possible outcomes. The total probability or sum of the probability distribution function must equal unity, i.e., 1 or 100%. Thus, the probability of *A* occurring at a given time and place plus the probability of not-*A* occurring at the same given time and place must equal 100%. The total probability cannot be less than 100% because that would require a third possible outcome, but there are no possible outcomes other than *A* or not-*A*. The total probability cannot be more than 100% because that would require double-counting one or more of the possible outcomes. Therefore, *A* cannot occur with 100% probability at the same time and place that non-*A* occurs with 100% probability, because the total probability in this case would be 200%.

The Fama and French Three-Factor Model of return for stock-portfolio pricing attempts to prove that variations in the size-related and value-related risk factors explain, account for, or cause variations in expected total return. Total return, which is unobservable, is derived from observed prices, dividends and capitalization (shares) changes. The price and shares variables embedded in the explanatory size and value factors are *equally known* with the price and shares variables embedded in the explained return variable. Thus, the Three-Factor Model seriously violates the genuine method of reasoning. It is an irremediable fatal fallacy and must be rejected.