

Mathematical Economics: A Satanic Religion

by Robert Ingraham

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May 18—In 1956, an engineer at Bell Labs in Murray Hill, N.J. published, in the *Bell System Technical Journal*, an article titled, “A New Interpretation of Information Rate.” The engineer’s name was John Kelly, and the article, which was prepared with the help of another Bell engineer, Claude Shannon—famous today as one of the founders of Information Theory—posed the question of whether a mathematical formula could be devised to ensure success in betting on horse races. Kelly answered the question in the affirmative, and his solution, the “Kelly Formula” or “Kelly Criterion,” not only became the basis for several gambling systems in Las Vegas and Atlantic City, but is also widely used today in financial options trading, where it is sometimes called the “Geometric Mean Maximizing Portfolio Strategy.” Use of the Kelly method, according to one options-trading authority, is intended to “maximize the value of the logarithm of wealth.”

In 1960, Claude Shannon introduced the Kelly Formula to Edward Thorp, a mathematics professor at MIT. Beginning in 1960, using an IBM Fortran 740 mainframe computer at MIT, Thorp programmed a statistical computer program to win at blackjack. In 1960 and 1961, Shannon and Thorp took several trips to Las Vegas to test their theories on blackjack and roulette. Subse-



From blackjack to “new financial instruments”

quently, Thorp presented his blackjack system in a paper, “Fortune’s Formula,” to the annual conference of the American Mathematical Association. Then, in 1962, Thorp issued a public challenge to casino owners that he could beat their games, traveled to Reno, Nev., and in two days, doubled his money playing blackjack. Later that year, Thorp published a more popularized version of his method and experiences in the best-selling book *Beat the Dealer*.

Shortly after these events, Edward Thorp relocated to the University of California at Irvine, and began to investigate how to use his winning blackjack strategy to make money in financial investments. During the next ten years, he became one of the pioneers in the emerging field of “new financial instruments,” particularly after the opening of the Chicago Board of Options Exchange in 1973.

In 1967, Thorp published a book on investment strategy titled *Beat the Market: A Scientific Stock Market System*. In this work he presented the first, basic version of what would be later known as the famous *Black-Scholes Formula*. In 1969, Thorp opened Convertible Hedge Associates, described as the world’s first market-neutral hedge fund. Later renamed Princeton Newport Partners (PNP), this hedge fund flourished until 1988, when it was raided and shut down as part of the U.S. government’s racketeering case against Michael Milken/Drexel Burnham. Thorp survived, creat-

ing a new hedge fund, Edward O. Thorp and Associates, in Newport Beach, Calif., which exists to this day.

In 1973, Thorp received a letter from Fisher Black, in which Black expressed his admiration for Thorp's work. Black included in the letter a copy of the Black-Scholes Formula, which was about to be published. This letter began a friendship between Thorp and Black which lasted until the latter's death in 1995. Later that year, Thorp presented a paper, "Extensions of the Black-Scholes Option Model," at the annual conference of the International Statistical Institute in Vienna.

Through the 1970s and '80s, Thorp continued to play a leading role in the initiation of new financial investment methods. In 1974, he developed the first mathematical solution to the American "put curve."¹ In 1979, Thorp and his team at PNP came up with the idea of "statistical arbitrage." According to Thorp, their intent was to "use the Brownian motion structure of stock prices to 'drain energy' [i.e., money] from the ceaselessly excessive fluctuations in stock prices."

Thorp is still very much active today. In 1997, he presented a paper, "The Kelly Criterion in Blackjack, Sports Betting, and the Stock Market," to the Tenth International Conference on Gambling and Risk Taking, in Montreal; and, in 2003, the *Quantitative Finance Review* published a piece by him, titled "A Perspective on Quantitative Finance: Models for Beating the Market."

During these last several decades Thorp's writings have moved back and forth seamlessly between the worlds of gambling and "mathematical economics," with a unity of approach that spans both.

Going Further

• At a 1963 conference on computer science, held in Las Vegas, computer programmer Harvey Dubner proposed a revision to the Thorp blackjack system, utilizing a method based on a "high-low" card count. Another computer programmer, Julian Braun, then played over 90 million simulated blackjack hands on an IBM 7044 computer until he had perfected Dubner's revisions to the Thorp system. Braun was an IBM engineer, with degrees in mathematics and physics. After leaving IBM in 1987, he became a day-trader in stocks and commodities. In 1967, a revised version of *Beat the Dealer*, including the Thorp/Braun combined method, was published. This work has remained the basis for all

1. In options trading, there are two types of contracts: 1) an option to buy a commodity at a future date, known as a "call" option, and, 2) an option to sell a commodity at a future date, known as a "put" option.

blackjack winning strategies down to the present day.

• The final development in successful blackjack strategy was the invention of team play, first by Ken Uston in the 1970s, and then, more spectacularly, by the MIT blackjack team in the 1990s. Uston, a magna cum laude graduate of Yale University, with an MBA from Harvard, was, by 1967, the vice-president of the Pacific Stock Exchange in San Francisco. He quit his job to take up blackjack full-time. He was the first to utilize team play, which he described in his 1977 book, *The Big Player*. In the 1990s a group of MIT mathematics and physics undergraduates created the "MIT Blackjack Club," and, using a method which combined the Thorp/Braun betting system and Uston's team strategy, over a period of several years won millions of dollars from the Las Vegas casinos. Their exploits were described in the 2002 book *Bringing Down the House—The Inside Story of Six MIT Students Who Took Vegas for Millions*.

One last figure in the field of blackjack worth mentioning is John Ferguson (a.k.a. Stanford Wong), who refined many of the betting methods of Thorp, Braun, and Uston. Ferguson, who holds a Ph.D. in economics from Stanford University, published *Professional Blackjack* in 1975, which to this day is considered the all-around best book on the topic.

• In 2001, Texas banker Andrew Beal traveled to Las Vegas for the express purpose of defeating the best professional poker players in the world. Beal's efforts, which continued for several years, are chronicled in the popular 2005 book *The Professor, the Banker and the Suicide King: Inside the Richest Poker Game of All Time*, by Michael Craig. Beal is the founder and president of the Dallas-based Beal Bank, which he created in 1988 on the wreckage of the Texas savings and loan industry. During the past 20 years, his bank has specialized in buying and selling "distressed properties," and, among other "investments," it provided some of the financial backing for Enron Corp. to move into the deregulated California energy market. By his own account, Beal spent thousands of hours writing and running computer programs in order to perfect a winning poker strategy. His poker games in Las Vegas still hold the record as the biggest high-stakes games of all time, where, in some games, there was as much as \$30 million on the table. Beal is also an amateur mathematician and student of number theory. In 1997, the American Mathematical Society published a paper by Beal, "Beal's Conjecture," which purported to contain a solution to Fermat's Last Theorem.

• In 1981, a group of physics and mathematic stu-

dents at the University of California at Santa Cruz formed a club named the Dynamical Systems Collective, but popularly called the Chaos Club. They studied chaos theory, played around with fractals, and decided to devise a method to win money at the roulette tables in Las Vegas. Their adventures were recounted in the 2000 book *The Eudaemonic Pie*, by Thomas A. Bass. Later, in 1992, the same group of now ex-students founded an investment firm, The Prediction Company, in Sante Fe, N.M. The idea for the company grew out of a series of conferences held between 1986 and 1991, where arguments centered around the view that financial markets were essentially stochastic² in nature, and that chaos theory provided the basis for predicting safe bets in chosen financial instruments. The seed money to create The Prediction Company came from David Weinberger, who began his career at Bell Labs, and went on to become a bond trader at Goldman Sachs. When Weinberger left Goldman Sachs, he was replaced by none other than Fisher Black, of Black-Scholes fame.

Between 1975 and 1985, the Black-Scholes methodology revolutionized finance—Everyone adopted it. Earlier, in 1969, Myron Scholes had created new financial strategies which led to the development of hedge funds and index funds. In 1973, the Black-Scholes Formula was published in the *Journal of Political Economy*. The formula assumes that stock prices follow a “geometric Brownian motion with constant volatility.” In 1973, the Chicago Board of Options Exchange opened options trading, based on the work of Black and others.

In 1985, while working for Goldman Sachs, Fisher Black developed the “Black-Derman-Toy” model, which led to the rapid expansion of the derivatives market. Perhaps the most important figure in this circle, however, was neither Black nor Scholes, but their friend and collaborator, Robert Merton. Merton received a Ph.D. in economics from MIT in 1970. In 1973, he published “The Theory of Rational Options Pricing,” in the *Bell Journal of Economics and Management*. Merton proposed a “stochastic calculus,” which, according to him, allowed the behavior of option prices to be described in the language of classic probability theory. Merton went on to work at Solomon Brothers, and then became a managing director at J.P. Morgan. He is often credited with opening the doors at Wall Street banking and investment firms for mathematics professors. In

2. I.e., random or aimless.

1997, Merton and Scholes were awarded the Nobel Prize in Economics.

Self-evidently, each one of these math nerds was a compulsive gambler. But—what is compulsive gambling? It is nothing but obsessive, continual, uninterrupted worship of Satan—or some equivalent devil. When dice are thrown into the air or dropped (or when a deck of cards is shuffled for a “game of chance,” or whenever you reach out to draw a card in such a game), you are delivering those dice, just momentarily, into the hands of an all-powerful demon (known in mathematical physics as “Maxwell’s Demon”). With his uncanny powers, that one fleeting moment of opportunity is more than enough for him. Working his will within a fraction of the wink of an eye, he subtly gives the dice a tiny extra spin as they shoot through the air, causing them to drop into a pattern which has a predetermined, unique meaning for you—for you, the compulsive gambler.

Gypsies tell fortunes through “random” drawings of Tarot cards, and through the random results of the throw of special, magical dice. But the compulsive gambler uses what appear (to you) to be ordinary dice, ordinary cards, and many other objects and events to the same effect. And always in deadly earnest.

Indeed—what is random? What is Randomness? Randomness itself, personified, is the object of worship for statisticians and other sorts of mathematical quasi-zombies.

The 20th-Century Austrian-American psychoanalyst Edmund Bergler, who treated compulsive gamblers with some success, wrote a famous article and a book about them, and generally pioneered this subject. Bergler rightly taught that the compulsive gambler is in a “rebellion against reason.” But there is more to it even than that; what he calls a “rebellion against reason,” would more truthfully be described as the rebellion of Milton’s Satan against God. Other psychoanalysts speak of a stage of development in which the infant conceives of his mother as an all-powerful witch, and of himself as her sorcerer. Saturated as it is with Satanism and magic, that pattern resonates with the facts of compulsive gambling.

But the great artists have picked up the trail where the psychoanalyst Bergler left it. Read Pushkin’s “Queen of Spades,” and Edgar Allan Poe’s “Le Duc De l’Omelette,” and “Never Bet the Devil Your Head,” among others. Learn to recognize and shun that sulphurous smell before you end up like the Mathematical Economists yourself.