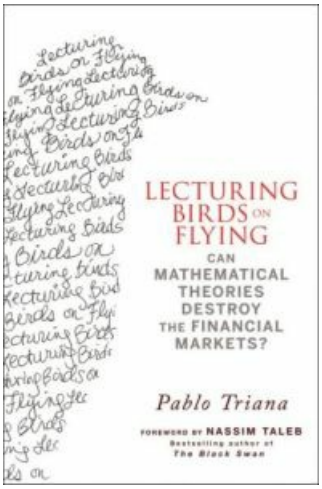

Book Lecturing Birds on Flying

Can Mathematical Theories Destroy the Financial Markets?

Pablo Triana
Wiley, 2009
Listen now

- play
- pause

00:00
00:00

Recommendation

This is a passionate attack on quantitative financial theory and its influence on business schools and the managers of financial institutions. Financial theorists, Pablo Triana says, are like ornithologists whose birdbrained formulas can't even come close to approximating the experience of flight. If you have maintained a regular acquaintance with advances in the financial markets, for example, by reading newspapers, you may already be familiar with Triana's analysis. He relies heavily on the ideas of Nassim Taleb and Emanuel Derman, who explain that people who have experienced improbable events overestimate the chance that such events will recur, while others underestimate it. In this rambling overview, Triana also refers to some of his own previous analyses. He presents a forceful summary of the problems with mathematical economic models. *BooksInShort* finds that he offers good and valuable insights, though not necessarily innovative ones, and recommends his book to investors, financial analysts and thick-skinned economists.

Take-Aways

- Predicting the future is impossible – even with mathematics.
- Quantitative financial theory has had an influence disproportionate to its real value.
- Academics have promoted theoretical finance because that's where the money is for aspiring scholars.
- The Black-Scholes option pricing model has caused major financial catastrophes.
- Financial economists have created a discipline that looks like physics but that does not reflect reality.
- Unlike physical particles, human beings have independent minds.
- The Nobel Prize in economics should come with a disclaimer saying that the work it recognizes has little real-world relevance.
- Economists working in the markets make more modest claims for their models than academics do.
- Extreme events are much more probable than most models predict.
- Financial models are not only inadequate but their premises are wrong.

Summary

People Aren't Particles

Financial economists have constructed a discipline in the image of physics, with similar mathematical models. However, the mathematical approaches that work in physics are irrelevant to finance, for one reason: Physicists study particles, and particles do not make up their own minds. Economists study the results of human decision making, and people are not predictable.

> "There is no theory in finance. There can't be."

Thus, the search for a science of finance is doomed to fail. Not only are people unpredictable, but the full consequences of their decisions are unknowable. The great stock market crash of 1929, the Latin American debt default of the 1980s and the global financial crisis that began in 2007 with faltering real estate prices are still playing themselves out.

> "In the markets, prices move for one reason only: human action."

Although people are unpredictable, they often appear to be quite the opposite. Much of the time, the outcomes of human decisions fall within a fairly narrow range. However, more often than financial economists and the managers of major financial institutions expect, the results of human decisions fall far outside that narrow range. Markets surge dramatically and inexplicably, and crash without warning. Financial models constructed on the assumption of normality – as most are – are useless in such situations.

> "Business is…a practical, nontheoretical discipline where the difference between having done it and not having done it can be the difference between real knowledge and make-believe."

A study that European Institute of Business Administration professors Spyros Makridakis and Michele Hibon conducted between 1979 and 2000 found that the complex statistical toolkits of econometricians do a poor job of predicting events. This suggests not only that econometricians may be wasting their time, but also that the theories and conclusions they develop may actually be harmful. Pseudoscience, in effect, crowds out the superior but unquantifiable wisdom of market experience and market folklore.

Academia Is the Problem

Universities must take the blame for the markets' excessive reliance on highly questionable mathematical models. Professors in business schools usually have little experience in the real world. Business schools are "akin to cooking schools having as teachers people who have never fried an egg." Business is relentlessly practical, but business school faculty members are relentlessly theoretical. The academy does not emphasize experience and may even penalize those who seem insufficiently abstract.

> "A fund may be deemed quant if it...allows computers and mathematical/statistical instructions, rather than humans, to select its investments and to dictate which positions should be taken."

Business schools weren't always ivory towers. However, in the early 1960s, the Ford and Carnegie foundations gave massive grants to business schools that pushed them away from practicality in the direction of business "science." As a result, the practical finance courses of the 1950s gave way to the "analytical make-believe" of the present. Young professors of finance have no incentive to buck the status quo, because if they do, they may lose the chance of tenure.

Enter the Quants

Although quants – quantitative analysts – are a minority of the entire population of professional financiers, their influence is out of proportion to their numbers. Their theories and models help to guide the trading decisions and market strategies of most major financial institutions. Quants first entered these institutions when computers did, because their technology skills made them useful to older, less computer-literate colleagues. As traders relied increasingly on computers, the role of the quantitative researchers grew more prominent. This was convenient for the quants, because the university science programs that might otherwise have employed them were dwindling.

> "You don't absolutely need advanced mathematical theorems in order to run a modern-day financial institution."

Quants differ from academics because they admit the inadequacy of their models. Financial economists in business schools are, as the saying goes, more Catholic than the pope: They have more confidence in the mathematics of the markets than the quants do. Quants do use models, but they discard those that don't improve their companies' bottom lines.

> "One of the most shocking aspects of the credit crisis is that many of the losses that dealers reported were derived from their holdings of senior and super senior [collateralized debt obligation] tranches, the ones that are assumed to be iron-cladly sheltered from turmoil."

Quant funds, whose trading decisions depend on computer programs rather than on human judgment, have played a major role in disasters such as the market swings of August 2007. One of the risks of quantitative investing is that any computerized strategy is relatively easy to copy. Therefore, the disclosure that some call for as a way of reducing risk may, on the contrary, increase risk by encouraging copycats.

Asset-Backed Securities and Subprime Mortgages

Statistician Nassim Taleb has proposed jailing the quants who brought about the mortgage-backed securities fiasco. Indeed, these events have led to something of a rethinking, if not of the value, then certainly of the risks of mathematical abstraction. Taleb is correct to assign a great share of the blame to quantitative models. The models assumed that a normal curve properly accounted for the distribution of default risks and that correlations would follow a Gaussian copula, or normal distribution. These assumptions guided risk-management decisions about mortgage-backed securities. The market received a shot across the bow in 2005, when Standard & Poor's rated the debt of General Motors and Ford Motor Company as junk. Later, the consequences demonstrated that these conventional hedging techniques had severe shortcomings.

> "The hugely sizable, hugely geared bets on subprime-related assets...were made possible by an industry-standard, regulators-endorsed, risk-management concoction with a habit for downplaying upcoming market turbulence and for recommending timid capital requirements."

However, the events of 2005 did not lead to abandoning the models but rather to explaining away the problem in technical language. Rating agencies and others continue to make risk-management decisions based on demonstrably unrealistic assumptions. In the credit crisis, even the putatively low-risk and low-return collateralized debt obligations lost immensely.

> "By voluntarily enslaving themselves to mathematical mechanics that are public knowledge, [value at risk] embracers...set the stage for meltdowns."

Extreme events are much more common in reality than the Gaussian model suggests. Some modelers are trying to include a "frailty factor" in their models to account for such events – but an accurate frailty factor would require an omniscient modeler. The very nature of extreme events is that no one anticipates them – such as when mortgage brokers extend credit to people with no jobs, no incomes, no assets and no credit ratings.

Value at Risk

Value at risk (VaR) is a quantitative metric that claims to measure the most that a portfolio of financial securities can lose. The measure depends on both data and assumptions. The data is historical, while decisions about which historical data is relevant and how much is necessary involve assumptions. VaR assumes a normal distribution in which extreme events are infrequent.

> "Could the pricking of the real financial bubble hasten the [pricking] of the educational bubble?"

Despite its shortcomings, VaR was ubiquitous among risk managers at major financial institutions. One of the consequences was a widespread underestimation of risk by investors in mortgage-backed securities and other collateralized debt obligations. Moreover, bank regulators had accepted VaR and used its methodology to set capital requirements for major financial institutions. VaR thus encouraged imprudent investing and contributed to the credit crisis.

> "The rationale for worshiping dangerous and far-from-robust machinations presents itself as less than enticingly compelling."

The problem with VaR is not that it doesn't work, but that it does – sometimes. It works often enough to make people feel they can rely on it more than they should. Most notably, it works in reasonably stable markets that are within the normal range, like most markets. But abnormal events still happen. For example, on February 29, 2008, Bear Stearns reported an aggregate VaR of only $62 million, but when the company collapsed, the loss was much bigger. The difference between the market value of the firm and the price the acquiring bank paid under pressure from the Federal Reserve was $8 billion. Lehman Brothers and Merrill Lynch also reported VaRs that failed dramatically to capture the true risk in the portfolios of those institutions.

> "Appearances are everything, even in the markets."

VaR had failed before, during the 1998 financial crisis that saw the collapse of the hedge fund Long-Term Capital Management, which raised the specter of global systemic collapse. Financial institutions reporting their VaR routinely include disclaimers pointing out its limitations. However, the disclaimers seem in practice to have been little more than routine. The acceptance and blind use of VaR makes future crises more, rather than less, likely.

Refusing to See

The collapse of Lehman Brothers is unthinkable in orthodox, abstract economic theory, which assumes an efficient market. Yet, it happened. Quantitative theoreticians could not predict the Lehman Brothers catastrophe because their models told them that such catastrophes were extremely unlikely – right up until a few months before the world nearly tipped into financial Armageddon. The quants claimed to know the distribution of probabilities but, in fact, the probability distribution is unknowable, because the range of possible outcomes is unlimited. However, even a massive collapse is not enough to make the fallibility of quantitative finance clear.

> "We need to hand over the keys to the risk kingdom back to free-thinking, gumption-honoring, innumerate chums."

Victor Niederhoffer is one of the most famous option sellers in recent history. He sold out-of-the-money put options, which committed him to buy securities at a price far below the current market if the buyers of the options chose to exercise their right to sell them. Only a severe market downturn, though, would result in that scenario. Niederhoffer, like Long-Term Capital Management, was selling options to pocket what seemed to be easy premium income before the 1997 Asian crisis. His losses in the crisis were so great that he had to auction off personal property to pay his debts. Yet, he did not turn from the strategy that had failed him so dramatically. In 2007, short options wiped him out again. Even Warren Buffett may be underestimating the likelihood of extreme market reversals. In 2008, he sold billions of dollars in equity put options.

Some theoreticians refuse to acknowledge the obvious. They claim their models will work if they improve them. However, they are so heavily invested in the dogma of economic modeling that prudent investors will take their assurances with a grain of salt. The Massachusetts Institute of Technology's Sloan School of Business has introduced a master of finance degree that promises to educate a new generation in the "sophisticated quantitative tools to assess and manage risks and returns."

Black-Scholes

The Black-Scholes option pricing model gets credit for revolutionizing the trading of options – in fact, more than it deserves. As early as 1981, the Yale graduate student Case Sprenkle anticipated the innovation and, in 1967, Edward Thorp and Sheen Kassouf published a book, *Beat the Market,* that offered rules for delta hedging. Fischer Black himself expressed misgivings about the unrealistic assumptions underlying the model he created with Myron Scholes. However, the Black-Scholes model is ubiquitous in trading rooms.

The model was partly responsible for the October 1987 stock market crash. Eric Rosenfeld, a quant who worked with Salomon Brothers and later with Long-Term Capital Management, recalled worrying that the 1987 crash (exacerbated by option trading strategies) would bring about World War III. Even such bold speculators as George Soros have called for banning exotic options, an indication of just how risky the legacy of Black-Scholes has been. Moreover, research by Nassim Taleb and Espen Haug has shown that option markets can get along without quantitative modeling and, in fact, have thrived without it. The popularity of the Black-Scholes model may have less to do with its real-world utility than with the fact that it seems to confirm and magnify the importance of quantitative finance, mathematical theory and the

academics capable of understanding them.

Finding a Better Way

People like certainty, and quantitative financial theory seems to deliver. However, the theory that investors have turned to for safety has instead made the world riskier. Quantitative tools and techniques have been responsible for most of the financial crashes of the 20th and 21st centuries.

Investors need to acknowledge the narrow limits within which mathematical models are useful and recognize that forecasting financial markets really is impossible. Treating finance, a pseudoscience, as if it were a true science leads to bad decisions. Investors must recognize the role of emotions in the market and use their street smarts rather than ivory tower abstractions.

Eliminating the Nobel Prize in economics might be a useful first step. Awarding prestigious prizes for work in such a dubious field as economics is dangerous. The Nobel Prize that went to the co-inventors of the Black-Scholes option pricing model helped to legitimize their creation. At the very least, the economics Nobel should carry a warning label.

About the Author

Pablo Triana is a derivatives trader and a frequent contributor to such publications as the *Financial Times* and Forbes.com. He is the author of *Corporate Derivatives*.