On Pablo Triana's "The Flawed Math of Financial Models"

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January 2011

Posted at
http://www.quantnet.com/steve-shreve-on-pablo-triana

In his article "The flawed math of financial models," *Financial Times*, November 29, Pablo Triana seeks to fix a large portion of blame for the world-wide financial crisis on "quants" in the finance industry and the programs that educate them. Mr. Pablo recommends radical reform in such programs. Others, carrying these ideas farther, call for a diminished role for quants in finance.

Any discussion of quants in finance must begin with the recognition that the global integration of economies and the associated complexity of our financial system has made the use of mathematical models an indispensible tool. Rules-of-thumb and intuition will not suffice when multi-national firms face exchange rate risk, funding risk and commodity price risk, when insurance companies and pension funds face longevity risk, when financial institutions are called upon to mediate these risks, and when regulators are charged to oversee these institutions. This was recognized in the recent U.S. financial reform legislation, which authorized a government Office of Financial Research whose task in 2008 would have been to alert policy makers to the ridiculously large naked position in credit default swaps held by AIG and to predict the consequences of the failure of Lehman Brothers. Such an office must necessarily be populated by quants, people who can build models into which information about financial institutions is fed.

What then is the appropriate training for quants? I believe we should focus on three aspects.

Most importantly, a quant must be competent in the technical disciplines of mathematics, statistics and computer programming, and she must be knowledgeable about financial markets. Achieving competence across this broad spectrum is a tall order. But it must be done because a well-intentioned incompetent quant is as dangerous to the financial system as a well-intentioned incompetent doctor is to personal health. The primary focus

of the educational programs at Carnegie Mellon will remain the creation of competent graduates. This is what we do best.

But a good quant also needs good judgment. A wise quant takes to heart Albert Einstein's words, "As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality." All models are wrong. Judgment is needed to know when an admittedly wrong model can be helpful and when it is dangerous. This kind of judgment is acquired primarily through experience, but we can begin teaching it in the classroom. Since the financial crisis, we have invited participants in the crisis to speak in detail to our students about deals that went bad, describing how the deal was analyzed, why it was approved, and what was overlooked.

Finally, we need people with integrity managing our financial systems. Teaching ethics is difficult, and guaranteeing that listeners will implement those teachings is impossible. It is not easy for a quant to sound the alarm that his models are being stretched beyond their limits, knowing that if he is taken seriously it will result in the loss of business to competing firms and may result in the loss of his job. We cannot instill in sixteen short months behavior that properly requires years of nurturing and mentoring. We do what we can, leading by example, penalizing students for academic dishonesty, setting and enforcing rules for ethical conduct when interacting with potential employers, posing ethical dilemmas for classroom discussion, and encouraging our graduates to consult with fellow graduates when facing tough ethical decisions.

A lesson that can be learned from the present crisis is that if everyone implements the same good idea, their collective action can invalidate the assumptions that made the idea good. If everyone assumes that U.S. housing prices cannot decline and makes large bets based on that assumption, their collective action will ultimately bring about a decline in housing prices. This is not a new lesson; it is the lesson of every bubble. A feature of the most recent bubble is that quantitative analysis contributed to a false sense of security that encouraged firms to scale up risks. In some cases senior managers and even quants themselves did not appreciate the limitations in the models on which they based their risk analysis. Our students do not begin their careers at the level where the disastrous decisions were taken, and only a handful of them will ever reach those positions of power. Nonetheless, in the short time they are in our care, we seek to the extent possible to make them competent quants who exercise sound ethical judgment.