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Why quants fail

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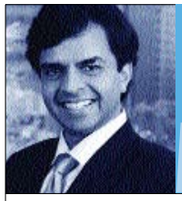

Manoj Thulasidas

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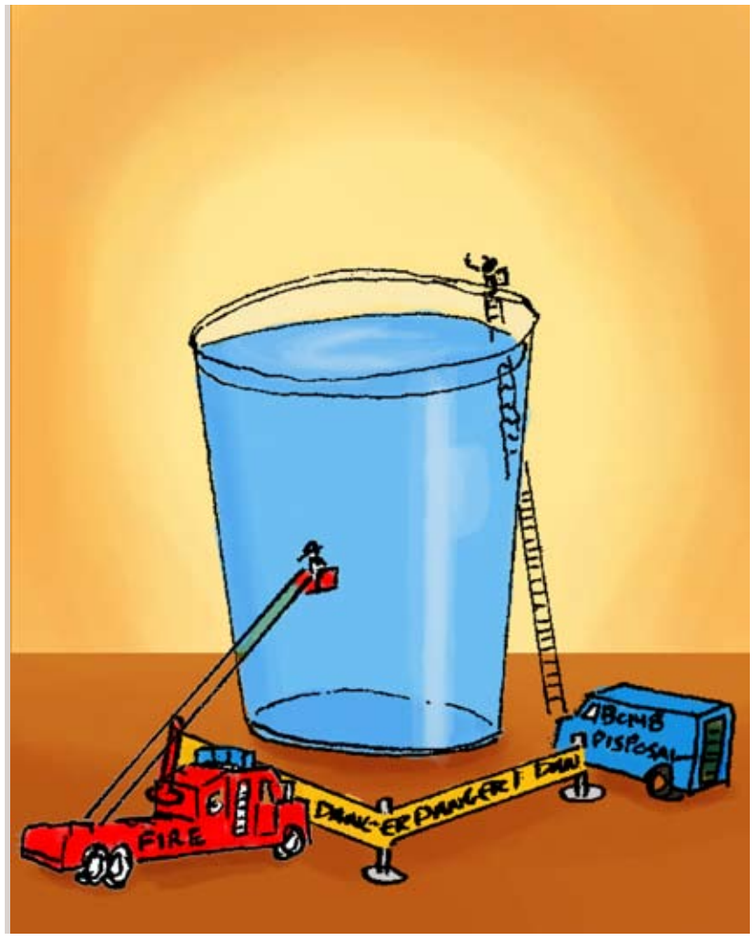
Lessons to be learned from spontaneously exploding glasses of water ...



Modeling the models

Mathematical finance is built on a couple of assumptions. The most fundamental of them is the one on market efficiency. It states that the market prices every asset fairly, and that the prices contain all the information available in the market. In other words, you cannot glean any more information by doing any research or technical analysis, or indeed any modeling. If this assumption doesn't pan out, then the quant edifice we build on top of it will crumble. Some may even say that it did crumble in 2008.

We know that this assumption is not quite right. If it was, there wouldn't be any transient arbitrage opportunities. But even at a more fundamental level, the assumption has shaky justification. The reason that the market is efficient is that the practitioners take advantage of every little arbitrage opportunity. In other words, the markets are efficient because they are not so efficient at some transient level.

Mark Joshi, in his well-respected book *The Concepts and Practice of Mathematical Finance*, points out that Warren Buffet made a bundle of money by refusing to accept the assumption of market efficiency. In fact, the weak form of market efficiency comes about because there are thousands of Buffet wannabes who keep their eyes glued to the ticker tapes, waiting for that elusive mispricing to show up.

Given that the quant careers, and literally trillions of dollars, are built on the strength of this assumption, we have to ask this fundamental question. Is it wise to trust this assumption? Are there limits to it?

Let's take an analogy from physics. I have this glass of water on my desk now. Still water, in the absence of any turbulence, has a flat surface. We all know why – gravity and surface tension and all that. But we also know that the molecules in water are in random motion, in accordance with the same Brownian process that we readily adopted in our quant world. One possible random configuration is that half the molecules move, say, to the left, and the other half to the right (so that the net momentum is zero). If that happens, the glass on my desk will break and it will make a terrible mess. But we haven't heard of such spontaneous messes (from someone other than our kids, that is).

The question, then, is, can we accept the assumption on the predictability of the surface of water even though we know that the underlying motion is irregular and random? (I am trying to make a rather contrived analogy to the assumption on market efficiency, despite the transient irregularities.) The answer is a definite yes. Of course, we take the flatness of liquid surfaces for granted in everything from the useless lift-pumps and siphons of our grade school physics books, all the way to dams and hydroelectric projects.

So, what am I quibbling about? Why do I harp on about the possibility of uncertain foundations? I have two reasons. One is the question of scale. In our example of surface flatness versus random motion, we looked at a very large collection, where, through the central limit theorem and statistical mechanics, we expect nothing but regular behavior. If I was studying,

for instance, how an individual virus propagates through the bloodstream, I couldn't make any assumptions on the regularity in the behavior of water molecules. This matter of scale applies to quantitative finance as well. Are we operating on the right scale to ignore the shakiness of the market efficiency assumption?

The second reason for mistrusting the pricing models is a far more insidious one. Let me see if I can present it rather dramatically, using my example of the tumbler of water. Suppose we make a model for the flatness of the water surface, and the tiny ripples on it as perturbations or something. Then we proceed to use this model to extract tiny amounts of energy from the ripples.

The fact that we are using the model impacts the flatness or the nature of the ripples, affecting the underlying assumptions of the model. Now, imagine that a large number of people are using the same model to extract as much energy as they can from this glass of water. My hunch is that it will create large-scale oscillations, perhaps generating configurations that do indeed break the glass and make a mess. Discounting the fact that this hunch has its root more in the financial mess that spontaneously materialized rather than any solid physics argument, we can still see that large fluctuations do indeed seem to increase the energy that can be extracted. Similarly, large fluctuations (and the black swans) may indeed be a side effect of modeling.

Group dynamics

When researchers and academicians move to quantitative finance, they have to grapple with some culture shock. Not only does the field of finance operate at a faster pace, it also puts great emphasis on teamwork. It cuts wide rather than deep. Quick results that have immediate and widespread impact are better than perfect and elegant solutions that may take time to forge. We want it done quickly, rather than correctly.

Coupled with this perfectionism, there is a curious tendency among academic researchers toward creating a "wow" factor with their results, as opposed to finance professionals who are quite content with the "wow" factor in their bonuses. This subtle mismatch generates interesting manifestations. Academics who make the midcareer switch to finance tend to work either alone or in small groups, trying to perfect an impressive prototype. Banking professionals, on the other hand, try to leverage on each other (at times, taking credit for other people's work) and roll out potentially incomplete solutions as early as possible. The intellectual need for a "wow" may be another factor holding back at least some quant deliverables.

Philosophy of money

Underlying all financial activity are transactions involving money. The term "transactions" means something philosophically different in economics. It stands for exchanges of goods and services. Money, in economic transactions, has only a transactional value. It plays the role of a medium facilitating the exchanges. In financial transactions, however, money becomes the entity that is being transacted. Financial systems essentially move money from savings and transform it into capital. Thus, money takes on an investment value, in addition to its intrinsic transactional value. This investment value is the basis of interest.

Given that the investment value is also measured and returned in terms of money, we get the notion of compound interest and "putting money to work." Those who have money demand returns based on the investment risk they are willing to assume. And the role of modern financial systems becomes one of balancing this risk–reward equation.

We should keep in mind that this signification of money as investment entity is indeed a philosophical choice that we have made over the past few centuries. Other choices do exist – Islamic banking springs to mind, although this practice has been diluted by the more widely held view of money as possessing an investment value. It is fascinating to study the history and philosophy of money, but it is a topic that calls for a full-length book in its own right. Understanding money at its most fundamental level may, in fact, enhance our productivity – which is, again, measured in terms of the bottom line, consistent with the philosophy of money that enjoys currency.

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ABOUT THE AUTHOR

The author is a scientist from the European Organization for Nuclear Research (CERN), who currently works as a senior quantitative professional at Standard Chartered in Singapore. The views expressed in this column are his own, which have not been influenced by considerations of his employer's business or client relationships. More information about the author and his forthcoming book (*Principles of Quantitative Development*, to be published by John Wiley & Sons Ltd.) can be found at his blog: http//www.Thulasidas.com.