Insurance Regulation: The 1-Year 99.5% VaR Fallacy

By Sylvestre Frezal

Since 2016, the European insurance regulation, consumer protection, and strategic choices are based on one key benchmark: a 1/200 annual probability of bankruptcy. This probability is based on measuring, risk by risk, what would be the worst crisis in a 200-year return period in order to determine how tightly woven the safety net should be.

200 years ago, Europe was just ending the Napoleonic Wars. Since that time, we invented the automobile and apartment blocks have been built. Storms have become more intense, financial decisions are now digitized, legal systems have changed, and health care has evolved. We now have electricity, and the transport of goods is global. Furthermore, how could it be possible to calculate the worst crisis over a 200-year period when businesses, which merged and migrated their information systems at the end of the 1990s, only manage 15 years of archived data? How is this possible, now that contracts and the behavior of insured persons change daily due to the digital revolution?

European regulators have decided to do the opposite of Google, whose research director, Peter Norvig, said: "We don't have better algorithms. We just have more data." Since they did not have the data, they took refuge under models, aided by armies of actuaries, academics, and consultants, egged on by professional federations, public authorities, and many firms. The variations are without end, but the principle is simple: with 10 observations, the statistical distribution that fits best is deduced, and we end up with the 1/200 quantile. And in good faith, the actors defend the relevance of their methods, explaining that the quantile that results is scientifically proven, that "it's not perfect, but it's better than nothing." In short, they claim that insurance regulation in Europe is based on science and on appropriate risk measurement. Let us turn to four disciplines to explain why this is wrong.

PHYSICS FIRST

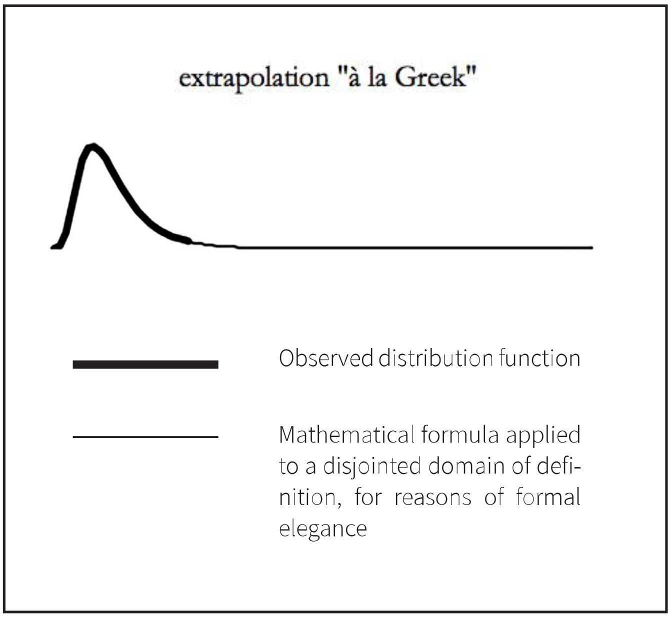
In electronics, mechanics, and in any signal-processing field, physicists use filters. These techniques work because high and low frequencies are orthogonal.[1] This is the basis for the Fourier series. If that were not the case, we could not listen to AM broadcasts which use a technology where the signal receiver must precisely distinguish between high frequency waves (carriers) and low frequencies (the signal).

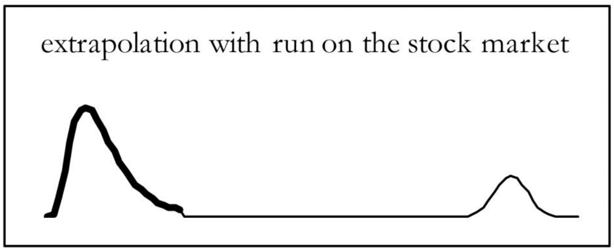
Thus, the dispersion provided by some dozen observations, which tells us something about the high frequency characteristics of a phenomenon, tells us nothing about its low frequency properties—i.e., events in the 200-year return period that regulators want to address.

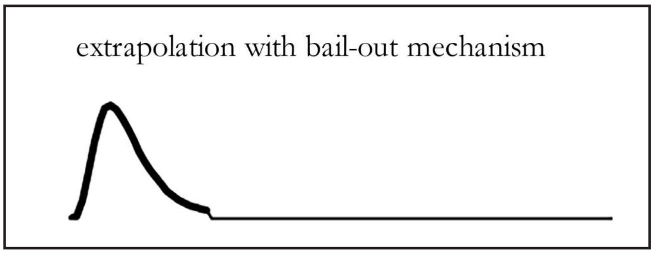
NOW MATHEMATICS

But most actuaries like math and went into insurance in order to flee physics. In this field, they don't think in terms of signal processing, but rather in terms of a distribution function, which they simply extend. A function, however, is determined by two characteristics: its output *and its domain of definition*.

In this case, we observe and extrapolate the function based on a limited domain, that of slight variations from expectation. There is no mathematical basis for assuming that with a different domain, that of distant variations from expectation, the mathematical formula would be the same.[2] With two distinct domains of definition, we are anyway dealing with two different mathematical functions. If we extrapolate the distribution function beyond the observations made for the sake of the mathematical formula unity, we end up reasoning like the Greeks: when they discovered geometric shapes, they in turn saw the heavens as nested celestial spheres. The elegance of a mathematical outline is not science.







ECONOMICS NEXT

Of course, we could test different probability extrapolations. But how could we justify any of these? Without empirical observation, we would have to rely on a causal relationship. For example, take the case of a stock market crash. What can we extrapolate from our dataset? Should we use a standard normal distribution? Or use the more cautious Pareto distribution? And why not say that if we hit a certain threshold, for example a drop of 50 percent over a year, a run on the stock market will then ensue and there will be a minimum drop of 80 percent? In this case, the proper distribution function would show, in the low frequencies, a bump around 80 percent. But we could also assume that in the case of a major drop, trading would be suspended and monetary policy would inject funds into the economy to prop it up; in this case, the correct distribution function would be equal to zero after the observation domain. Such causal discussions, because of their multiplicity, swiftly upends any pretentions of being able to mathematically extrapolate from observed phenomena.

EPISTEMOLOGY LAST

And, just as with mathematical extrapolations, causal arguments cannot substitute for data. In fact, given the return period under consideration, nothing is falsifiable: neither the argument nor the results. Math is no substitute for facts, and the calculation of an annual 1/200 quantile, in this ever-shifting world, cannot be scientific.

Therefore, European insurance regulation is currently based on calculations derived from a motley mass of conventions, sedimented practices, and short-sighted negotiations—not in any way from scientific measures. At best, they tell us something about the ripples in the water, but nothing about the tsunamis that regulations are supposed to tackle. They give us an illusion of comfort, wherein risks have been quantified and decisions are made based on scientific considerations. They are, as Wolfgang Pauli said, "not even false." They are worse, comfortably nestling us in blissful ignorance of the unknown. Instead of steering with our eyes glued to an off-kilter altimeter, we should take a look outside the cockpit. Let's be qualitatively vigilant towards and accountable for risks, and let's incorporate a more holistic view of the issues at stake.

Actuarial and financial researchers are greatly liable in this context. They built their credibility on effective volatility management technologies, but they will lose it if they continue to consider that these tools actually make it possible to manage danger. The task now is to quantify and make margins of error explicit, rather than to force a square peg into a round hole by using these technologies for things beyond which it is relevant. Only in this way, without putting the cart before the horse, can a science slowly bloom to later produce its technological fruit. ■

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ENDNOTES

1 This is the basis for the Fourier series.

2 A function can be defined piecewise.