Concepts...

"Concepts" is published by Daedalus Oversight to raise as many questions as it answers. It is driven by the belief that the industry, its products and its services are ever evolving. The ideas reflect the challenges faced in the continuous journey of innovation and improvement

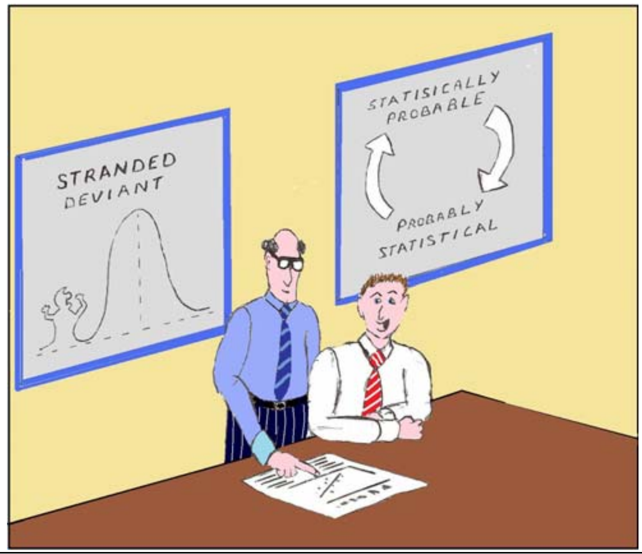
Lies, Damn Lies & Statistics

The title comes from the Benjamin D'Israeli quote popularized by Mark Twain. Statistics is a confusing topic and just as un-weighted averages can be used incorrectly in percentage calculations; the fundamentals of statistics are open to misinterpretation, or worse, manipulation. That statistical methods are powerful and useful is not in doubt. Statistical processes have been used to raise the quality for industrial manufacturing spectacularly yet have caused spectacular failures in financial risk management. How can this be?

The fundamentals of statistics are built around the "normal" bell curve which shows the probable outcomes of random behavior. Populations related to the monitored process are categorized in "deviations", notated as σ (sigma), which represents differences from the mean or average. 1σ either side of the mean represents 68% of the population, 2σ approximately represents the pervasive 95% of the population and 6σ (Six Sigma) represents 99.99966% of the population. The latter truly represents an error rate of 3.4 parts per million as the implied target on many incorrectly named Six Sigma quality drives.

When using statistics, it has to be recognized that you are *applying an ideal model to derive the likelihood of probable outcomes in a real situation*. Therefore, any quoted probabilities and confidence levels are based on the model's ideal assumptions, *not* reality. Furthermore, data manipulation or errors by blatant act or ignorance can drastically affect the results. Another critical point is that within truly random situations the events need to be *identical* and *independent*. This means that they are the same (rare in market trades) and that one event does not affect any future events. There is a good reason why the phrase "past investment performance is not a guide to future performance" is a regulatory required caveat for investment advertizing.

True statistical analysis, by its own definition, cannot affect and therefore, predict the future. Statistical analysis works best where the events are non-scalable. Within Statistical theory, the population of events decreases the greater



Great! We can justify our decisions AND explain away our mistakes!

the difference is to the mean. Think of the variations in male height. The total span of the heights is within certain limits and the further you are from the average height the fewer taller or shorter men there are. Problems occur when you have a scalable, power-law-driven situation like people's wealth. Although the number of very wealthy or very poor people diminish as you move away from the average wealth, at one end, is someone under a mountain of debt and at the other is Bill Gates. The difference of Bill Gates' wealth to the average wealth as compared to the difference in the height of the tallest man to the average male height demonstrates the difference between scalable and non-scalable situations. Nassim Nicholas Taleb refers to these examples as "Extremistan" and "Mediocristan" and explains the dangers of confidence in statistical methods in his lucid book, *The Black Swan*.

Industry uses Statistical Process Control (SPC) for manufacturing processes. These are finite non-scalable environments with minimal variations. As pieces are

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made in a factory, they could be measured every time and the machine could be adjusted for variations every time, but this would be inefficient and damaging as it does not take into account the natural variations within the process. However, if a sample population of the manufactured parts (say, 5) is measured at set intervals (defined by the throughput population); the average of that sample should fit within a tighter tolerance band. As long as the sample averages stay within those tighter tolerances you can have a high degree of confidence the whole population is within the process-defined, target tolerances. If the sample averages go outside the tighter tolerances or show a consistent trend up or down then it does not mean parts are being made outside the targeted tolerances but that the likelihood that they will has gone up dramatically and it is time to re-adjust the machine. Actually this method would be better referred to as Statistical Process "Correction" rather than "Control". These methods have been successfully used to create all our reliable cars, washing machines and electronic devices. Financial operations seeking improved quality could do well to review SPC methods and particularly binomial analysis to assess binary outcomes.

Risk Management uses statistical measures to review and project market movements but this is a scalable, power-law-driven environment. Not taking the extreme situations into account and applying an ideal random model, it works most of the time very well but then is overwhelmed by the extreme events. Statistical analysis allows us, to the degree that our model matches reality, to guess where, within defined bands, a population of events should occur. A more realistic description of a risk engine providing a 95% confidence on expected results should read: Based on an approximation to a perfect-scenario theory, we can misleadingly appear to guess correctly where a population of events should occur 19 times out of 20 while underestimating the frequency and, worse, potential impact of the 1/20 or fewer situations. The approximation of the model also implies that the extreme events could happen greater than 1 time in 20. Who wants that risk engine?

The danger with models is that the market builds products that perform optimally *or* assesses company financial reports within the models' parameters. Also a firm's management may forget the Achilles' heel that the model does not cover all eventualities. Finally, statistical models do not allow market or product interdependence as that, by definition, is not truly "random" behavior. As the model assumptions are approximate, diluted and selective, there is a danger and a history of being surprised by extreme events.

What is the solution then? It would be wrong to abandon statistical financial models altogether; they do work well within certain parameters. However, it is better to recognize their limitations and treat them as a guide but not a guarantee. Monte Carlo, or similar techniques supposedly introduce "random" scenarios for extreme events but these are within the construct of the statistical assumptions and can risk being self serving in wrongly underlying the soundness of any model. Extreme scenario planning can help but the danger is that these become entrenched as the *only* possible extreme events. How many groups take market moves down 20%-30% as their extreme event? To avoid prior knowledge (just like reality), group brainstorming by an independent team should develop a list of events, interdependent factors, revolutionary market, client or regulatory changes against which the investment portfolios should be assessed. This will augment the potential outcomes analyzed by the statistical model; provide better perspective on what to prepare for beyond the limited, understated outcomes of the model and better attune the management to real potential risks. However, this also leads to the need for greater control and understanding process dynamics. That is the topic for the next newsletter and has a very counter intuitive solution.

Daedalus Oversight would be pleased to discuss the realization of these concepts with you further. We thank you for your consideration.

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