DEALING WITH DOWNTURNS: STRATEGIES IN UNCERTAIN TIMES

A Convoco Edition

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CHAPTER 10

SIMPLE SOLUTIONS FOR COMPLEX PROBLEMS

GERD GIGERENZER

The search for certainty is an ancient human endeavor. It has produced magic rituals, fortune-tellers, and authority figures who know what is right and wrong. Similarly, for centuries many philosophers have gone astray as they searched for certainties where there are none or, as the distinguished proponent of philosophical pragmatism John Dewey demonstrated, equated knowledge with certainty and belief with uncertainty.

The problem is that false certainty can cause a great deal of damage. As we shall see, blind belief in tests

and financial forecasts can, under certain circumstances, lead to a life of poverty and misery. Not only can it ruin our physical and mental health, but it can also ruin our bank account and the economy as a whole. We must learn to live with uncertainty and it is time we faced up to it. A first step is to clarify the difference between known and unknown risks.

The twilight of uncertainty contains a variety of different nuances and gradations. Since the 17th century the probabilistic revolution provided people with methods of statistical thinking that enabled them to triumph over fate. But these methods were designed only for the palest shades of uncertainty, for a world of *known risks*, or, simply, of *risks*. I am using this concept to describe a world where all alternatives, consequences, and probabilities are known. This is the case, for example, with lotteries and games of chance. However, most of the time we live in a changing world where some of these factors are unknown, so we have to deal with unknown risks or *uncertainty*.

By comparison with the world of risk, the world of uncertainty is enormous. Whom should we marry? Whom should we trust? What shall we do with the rest of our lives? In an uncertain world it is impossible to determine what the optimal course of action

should be by means of an exact calculation of the risks. We have to deal with "unknown unknowns." Surprises are inevitable. But even when calculations provide no clear answers, we have to make decisions.

Alongside mathematical probability there is a second concept that is often overlooked: the rule of thumb or, in scientific terms, heuristics. Making good decisions requires two types of mental tools:

RISK: if the risks are known, good decisions need logical and statistical thinking.

UNCERTAINTY: if some risks are unknown, good decisions also require intuition and clever rules of thumb.

In most cases a combination of the two is needed. Some things can be calculated, others cannot, and what can be calculated is often only a rough estimate. In an uncertain world statistical thinking and the communication of risk is not enough. Good rules of thumb are vitally important for good decisions. A rule of thumb or *heuristic* allows us to make a decision quickly without much searching for information but nevertheless with a high degree of accuracy. This is completely different from a balance sheet approach that lists the pros and cons: it tries to single out the

most important pieces of information and disregards the rest.

Every rule of thumb I know of can be used consciously and unconsciously. If it is used unconsciously, we talk about intuitive judgments. An intuition or a gut feeling is a judgment

1. That appears directly in our consciousness
2. That has underlying reasons we are not fully aware of
3. That is strong enough to act upon.

A gut feeling is neither a whim, nor a sixth sense, nor clairvoyance, nor the voice of God. It is a kind of unconscious intelligence. The assumption that intelligence is necessarily conscious and considered is a huge mistake.

In my opinion the basic principle of intuition consists of two elements:

1. Simple rules of thumb that take advantage of
2. The brain's evolved abilities.

This means that the mind can discover simple solutions for complex problems. Here intuition exploits an evolved ability of the brain called recognition memory. Experts often search for less information than novices do, and confine themselves to heuristics.

What is important here is that ignoring information can lead to better, quicker, and more reliable decisions.

One would think that research into intelligent heuristics would be a central part of many disciplines—but not at all. Curiously, most theories of rational decision-making, from economics to philosophy, look for answers by asking questions that only refer to known risks. In the social sciences a lot of thought is devoted to complicated logical and statistical systems, but almost none to heuristic thinking, and if it does happen then it is above all to show that heuristics are a cause of human errors and catastrophes.

After the probabilistic revolution we need a second revolution that will take heuristics seriously and that will finally equip people with the skills they need to deal with the entire range of uncertainties.

I call this next step the "heuristic revolution." In this we must learn to act in uncertain worlds using intelligent rules of thumb.

In order to make good decisions in an uncertain world we must disregard some of the information, and this is precisely what happens when we use rules of thumb. This saves time and effort *and* leads to better decision-making.

To summarize:

RULES OF THUMB ARE NOT STUPID. In an uncertain world simple rules of thumb can lead to better results than sophisticated calculations.

LESS IS MORE. Complex problems no longer need complex solutions. Look for simple solutions first of all.

I believe in the effectiveness of simple rules in a real, unmanageable world. Even if sometimes they do not always help, the first question should be: can we find a simple solution for a complex problem? We rarely ask this question. Our first reflex is to look for complex solutions, and when they do not work we make them even more complicated. The same applies in the world of investments. After turbulent times on the finance markets that not even experts were able to predict, simple rules of thumb offer an alternative. Let us look at a complex problem that many of us face. You have a certain amount of money you want to invest. You do not want to put it all on one horse, and are considering buying some shares. You want to diversify, but how?

Harry Markowitz was awarded the Nobel Prize in Economics for his work solving this problem. The solution is called a *mean-variance portfolio.* The portfolio maximizes the return (mean) and minimizes the

risk (variance). In short the model tells you how you can expect to gain the highest return for the lowest risk. Many banks rely on this and similar investment methods, and warn their customers against trusting their intuition.

You might think that Markowitz, when he set up his own investments for his social security, would have used his Nobel Prize-winning method. But, no, he stuck to the simple rule of thumb of "1/N" which means you *allocate your money equally to each of N funds.*

Why did he rely on a heuristic rather than on calculations? In an interview Markowitz explained that he wanted to avoid blaming himself: "I thought, if stocks go up and I'm not in, I'll think I'm stupid. And if they fall and I'm not in, I'll think I'm stupid. So I decided to invest 50/50." He followed the motto of many investors: make it simple! And 1/N is not only simple, it is also the purest form of diversification.

How good is this rule of thumb? In a study it was compared with the mean-variance portfolio and a dozen other complex methods. Seven investment problems, such as investments in ten US industrial funds, were analyzed. In the mean-variance portfolio the stock data from the last ten years was consulted, while 1/N needs no data. And the result? In most of

the seven tests 1/N scored better according to the usual performance criteria than the mean-variance method. Moreover, none of the other twelve complex methods consistently predicted the future value of the stocks more accurately.

So is the Nobel Prize-winning method a con? No. It works best in an ideal world of known risks, but not necessarily in the uncertain world of the stock market where so much is unknown. In this case the parameters of the portfolio must be extrapolated from earlier data. However, as we have seen, ten years is too short a period to produce reliable estimates. Let us suppose you invest in fifty funds. How many years of financial data would the mean-variance method need to perform better than 1/N? A computer simulation provides the answer: around 500 years! That means that in the year 2500 investors can progress from the simple rule to the higher math of the mean-variance model and thus hope to make a profit. But this only works if the same stocks—and the stock market—still exist.

The moral of the story is that in a world of known risks that corresponds to the mathematical assumptions of the mean-variance portfolio, it is worth doing the calculation. However, in the real of world of investments, simple intuitive rules can be smarter.

The same generally applies in uncertain worlds. How can a simple rule of thumb beat a Nobel Prize-winning method? Was that simple coincidence? No. There's a mathematical theory that tells us why and when simple is better. This is called the *bias-variance dilemma*. The essence of this theory is expressed in a quote that is attributed to Albert Einstein:

Everything should be made as simple as possible, but not simpler.

How far we should go in simplifying things depends on three attributes. First, the greater the uncertainty, the more we should simplify. The lower the uncertainty, the more complex the method should be. Second, the more alternatives there are, the more we should simplify; if there are fewer alternatives, it is possible to be more complex. This is because complex methods have to estimate risk factors, and a greater number of alternatives means that more factors must be estimated, which leads to more errors in estimation.

High uncertainty	Low uncertainty
Many alternatives	Few alternatives
Small amount of data	Large amount of data
Make it simple	**Make it complex**

All this helps us to understand a general rule—the bias-variance problem, as the statisticians call it. When we use a particular method to make a prediction, we call the difference between the prediction and the actual outcome (which we could not know in advance) "bias."

In an uncertain world, bias is inevitable (in which case a happy accident helps). But there is also another kind of error, which we call "variance." Unlike 1/N, complex methods predict the future by means of previous observations. The prognoses depend on the specific sample of already established observations, and thus can be unstable. This instability (the variability of its mean value) is a called variance. Thus the more complex the method, the more factors must be estimated and the higher the number of variance errors becomes. 1/N always delivers the same stable recommendation, as the method needs no past investment data. For this reason it is not compromised by variance. If the quantity of data is very big—for example covering 500 years—instability is reduced to the extent that the complexity eventually pays off. Einstein's rule is a general formulation of the fact that, in an uncertain world, less can be more.

Taking intuition seriously means accepting the fact that it is a form of intelligence that one cannot articu-

late. If someone having good and long experience also has a bad gut feeling, don't ask why.

In my own research I have come to the following conclusion:

1. Intuition is neither a whim nor the source of every bad decision. It is unconscious intelligence that makes use of most parts of our brain.
2. Intuition is not inferior to logical thinking. In most cases both are necessary. Intuition is inevitable in a complex, uncertain world, while logic can be sufficient in a world in which all risks are known with certainty.
3. Intuition is not based on faulty mental software, but on intelligent rules of thumb and a lot of experience that lies hidden in our unconscious.

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