INTRODUCTION

SORTING THE SOURCES OF SUCCESS

MY CAREER WAS LAUNCHED by a trash can.

Like many seniors in college, I wasn't sure what I wanted to do for a living, but I knew that I needed a job. Drexel Burnham Lambert, an investment bank that was hot at the time, came on campus to recruit students for a new training program. My interview went well enough that I was called to the firm's headquarters in New York City. I put on my best suit and tie, polished my shoes, and headed to the Big Apple.

Early the next morning, we candidates gathered in a vast conference room and listened intently as the leader of the program told us what to expect for the day. "You will have full interviews with six members of our staff," she informed us, "and then each of you will have *ten minutes* with the senior executive in charge of our division." When it was clear that she had everyone's attention, she added, "If you want the job, you'll have to shine in that interview."

My half dozen interviews went as well as could be expected. When they were over, a member of the staff led me down a long corridor to an office paneled in dark wood, with deep wall-to-wall carpeting and a picture window overlooking a panorama of downtown Manhattan.

A sharp-eyed administrative assistant ushered me in, and the senior executive greeted me warmly. Then I saw it.

Peeking out from underneath a huge desk was a trash can bearing the logo of the Washington Redskins, a professional football team. As a sports fan who had just spent four years in Washington, D.C., and had attended a game or two, I complimented the executive on his taste in trash cans. He beamed, and that led to a ten-minute interview that stretched to fifteen minutes, during which I listened and nodded intently as he talked about sports, his time in Washington, and the virtues of athletics. His response to my opening was purely emotional. Our discussion was not intellectual. It was about a shared passion.

I got the job. My experience in the training program at Drexel Burnham was critical in setting the trajectory of my career. But after a few months in the program, one of the leaders couldn't resist pulling me aside. "Just to let you know," he whispered, "on balance, the six interviewers voted against hiring you." I was stunned. How could I have gotten the job? He went on: "But the head guy overrode their assessment and insisted we bring you in. I don't know what you said to him, but it sure worked." My career was launched by a trash can. That was pure luck, and I wouldn't be writing this if I hadn't benefited from it.

The Boundaries of Skill and Luck

Much of what we experience in life results from a combination of skill and luck. A basketball player's shot before the final buzzer bounces out of the basket and his team loses the national championship. A pharmaceutical company develops a drug for hypertension that ends up as a blockbuster seller for erectile dysfunction. An investor earns a windfall when he buys the stock of a company shortly before it gets acquired at a premium. Different levels of skill and of good and bad luck are the realities that shape our lives. And yet we aren't very good at distinguishing the two.

Part of the reason is that few of us are well versed in statistics. But psychology exerts the most profound influence on our failure to identify what is due to skill and what is just luck. The mechanisms that our minds use to make sense of the world are not well suited to accounting for the relative roles that skill and luck play in the events we see taking shape around us. Let me start with some examples that are clearly controlled by either luck or skill.

The drawing for Powerball, a multistate lottery, went off uneventfully on the evening of Wednesday, March 30, 2005. The first five balls came through the clear tubes: 28, 39, 22, 32, 33. The final ball, which came from a separate machine, clicked into place: 42. The whole process took less than a minute.

Sue Dooley, the staff member who was overseeing the drawing that night, rolled the machines back into the vault and drove from the television studio to the Powerball headquarters five miles away. Based on the statistics, she expected that perhaps one ticket would take home that day's jackpot of $84 million and that three or four people would have picked five of the six numbers correctly, winning second place.

She turned on her computer and waited for the states to report their results. The trickle of winners she had expected was actually a torrent. In total, there were 110 second-place winners. The statisticians employed by Powerball had warned that six or seven times the predicted figure was well within the realm of chance, but an outcome nearly thirty times the expectation appeared statistically impossible. Another oddity was that nearly all of the winning tickets had the same sixth number, 40. Truth be told, the officials at Powerball would have preferred it if the winners had picked all six numbers correctly, because the jackpot is split evenly among them. No matter how many people win, it costs Powerball the same amount. But each winner of the second prize receives a set amount, which meant that in this case, Powerball had to pay out $19 million more than it had anticipated.

Dooley called her boss and together they puzzled over possible explanations, including numbers shown on television, pattern plays,

lottery columns, and even fraud. None of them checked out. The next morning, they got their first inkling of what had happened. When a staff member at a prize office in Tennessee asked a winner where he had gotten his numbers, he answered, "From a fortune cookie." Later a winner in Idaho said the same thing, and shortly thereafter winners in Minnesota and Wisconsin echoed the reply. Jennifer 8. Lee, a reporter from the *New York Times*, jumped on the story and traced the fortune cookies with the winning numbers back to the factory of Wonton Food in Long Island City, New York. Derrick Wong, a vice president at the company, explained that they had put numbers in a bowl and randomly picked out six of them. Since generating the number sequences takes time, the company printed the same numbers on different fortunes so as to save labor on the 4 million cookies the factory produced each day.[1] Each of those very lucky winners took home between $100,000 and $500,000, according to how much they had bet.

Marion Tinsley won a lot, too, but it wasn't because he was lucky. Tinsley was known as the greatest player of checkers (also known as draughts) in the world. In 1948 he was crowned as the United States champion; shortly before his death in 1994, he tied Don Lafferty and a computer program named *Chinook* for first place. In the intervening forty-five years, Tinsley lost only seven individual games for a near-perfect record. In two of those games he was defeated by *Chinook*. Despite the fact that he didn't play for long periods of time (he was a professor of mathematics at Florida State and Florida A&M Universities), he reigned as world champion in three separate decades.[2]

Tinsley's success resulted from years of deliberate practice. In his youth, Tinsley spent eight hours a day, five days a week, studying checkers, and he continued to study the game, though less intensely, throughout his life. He cultivated a prodigious memory that allowed him to recall the flow of games he had played decades earlier. Tinsley was fiercely competitive and claimed that he could beat all comers, man or machine, as long as his health didn't fail him.[3]

The Sources of Success

Both those who won the Powerball lottery and Marion Tinsley enjoyed great success. But it's easy to see that the causes of the two types of success differed markedly. The lottery outcome that day was a matter of pure good luck for the 110 winners and pure bad luck for Powerball. But Tinsley's success was almost entirely the result of skill. With all the luck in the world, you would have almost no chance of winning if Tinsley were across the table from you. For practical purposes, we can regard Tinsley's success as all skill. Unfortunately, most things in life and business are not that clear. Most of the successes and failures we see are a combination of skill and luck that can prove maddeningly difficult to tease apart.

The purpose of this book is to show you how you can understand the relative contributions of skill and luck and how to use that understanding in interpreting past results as well as making better decisions in the future. Ultimately, untangling skill and luck helps with the challenging task of prediction, and better predictions lead to greater success.

Skill, Luck, and Prediction

Shortly after winning the Nobel Prize in Economics in 2002, Daniel Kahneman, a retired professor of psychology at Princeton, was asked which of his 130-plus academic papers was his all-time favorite.[4] He chose "On the Psychology of Prediction," a paper he cowrote with the late Amos Tversky that was published in *Psychological Review* in 1973. The paper argues that intuitive judgments are often unreliable because people base predictions on how well an event seems to fit a story. They fail to consider either how reliable the story is or what happened before in similar situations. More formally, Kahneman and Tversky argue that three types of information are relevant to statistical prediction. The first is prior information, or the base rate.

For example, if 85 percent of the taxicabs in a city are green, then 85 percent is the base rate. Absent any other information, you can assume that whenever you see a taxicab there's an 85 percent chance that it will be green. The second type of information is the specific evidence about an individual case. The third type of information is the expected accuracy of the prediction, or how precise you expect it to be given the information you have.[5]

I had a conversation with a doctor that illustrates these three types of information. He mentioned that he had a treatment for improving a specific ailment that succeeded about 50 percent of the time (the base rate). But he added that he could induce almost any patient to undergo the treatment if he simply told them, "The last patient who was treated this way is doing great!" (specific evidence about an individual case). For the patients who were evaluating the treatment, the story of success swamped the statistics.

The key to statistical prediction is to figure out how much weight you should assign to the base rate and specific case. If the expected accuracy of the prediction is low, you should place most of the weight on the base rate. If the expected accuracy is high, you can rely more on the specific case. In this example, the doctor gave the patient no reason to believe that the procedure had better than a 50/50 chance of working for him. So the patient should place almost no weight on the specific evidence that it worked for one patient, and should rely instead on the base rate in making his decision.

Here's how the weighting of the base rate and the specific case relate to skill and luck. When skill plays the prime role in determining what happens, you can rely on specific evidence. If you're playing checkers against Marion Tinsley, you can easily predict the winner on the basis of your knowledge of Tinsley's deadly skill. In activities where luck is more important, the base rate should guide your prediction. If you see someone win a million dollars, that doesn't change the odds of winning the lottery. Just because someone wins at roulette, it doesn't help you to guess where the ball will end up on the next spin.

Unfortunately, we don't usually think this way. When we make predictions, we often fail to recognize the existence of luck, and as a consequence we dwell too much on the specific evidence, especially recent evidence. This also makes it tougher to judge performance. Once something has happened, our natural inclination is to come up with a cause to explain the effect. The problem is that we commonly twist, distort, or ignore the role that luck plays in our successes and failures. Thinking explicitly about how luck influences our lives can help offset that cognitive bias.

Quantifying Luck's Role in the Success Equation

The starting place for this book is to go beyond grasping the general idea that luck is important. Then we can begin to figure out the extent to which luck contributes to our achievements, successes, and failures. The ultimate goal is to determine how to deal with luck in making decisions.

This book has three parts:

- Chapters 1 through 3 set up the foundation. I start with some working definitions of skill and luck, examining the types of interactions where luck is relevant and noting where our methods to sort skill and luck may not work. I then turn to why we have such a difficult time comprehending the influence that luck exerts. The basic challenge is that we love stories and have a yearning to understand the relationship between cause and effect. As a result, statistical reasoning is hard, and we start to view the past as something that was inevitable. The section finishes by looking at the continuum from all-luck to all-skill. I examine a basic model to help guide intuition. These ideas include the paradox of skill and what determines the *rate* of reversion to the mean.
- Chapters 4 through 7 develop the analytical tools necessary to understand luck and skill. I open with methods for placing

activities on the luck-skill continuum. Where an activity falls on that continuum provides a great deal of insight into how to deal with it. I then look at how skill changes over time. Simply put, skill tends to follow an arc: it improves for some time, peaks, and then glides lower. Next, I turn attention to the distributions—or the range of values—of luck. In activities where the results are independent of one another, simple models effectively explain what we see. But when a past result affects a future result, predicting winners becomes very difficult. The most skillful don't always win. I close this part by showing the difference between a useless statistic and a useful one. Useful statistics are persistent (the past correlates highly with the present) and predictive (doing well or poorly correlates strongly with the desired goal). As we will see, many statistics fail this basic test.

- Chapters 8 through 11 offer concrete suggestions about how to take the findings from the first two parts of this book and put them to work. I begin by outlining ways to improve skill. Where little luck is involved, deliberate practice is essential to developing skill. Where luck is rampant, we must think of skill in terms of a process, because the results don't provide clear feedback. Checklists can also be of great value because they improve execution and can guide behavior under stressful circumstances. I then look at how to cope with luck. When you are the favorite, for example, you want to simplify the game so that you can overwhelm your opponent. If you are the underdog, you want to inject luck by making the game more complex. Because luck is in part what remains unexplained, controlled tests allow for a more accurate reading on causality. If you want to know if an advertisement worked, for example, you need to consider the purchasing behavior of those who saw the ad versus those who didn't. This part also includes an in-depth discussion of reversion to the mean, an idea that most people believe they

understand, even though their behavior shows that they don't. The book finishes with ten concrete tips on how to overcome the psychological, analytical, and procedural barriers in untangling skill and luck.

This analysis of skill and luck will focus on business, sports, and investing because these are the areas I know best. Naturally, these realms are quite different. Sports are the easiest activities to analyze because the rules are relatively stable over time and there is lots of data. Other social processes, including business, have fewer rules and boundaries than sports and therefore tend to be more complex. Still, many of the same analytical methods are valid.[6] Markets in general are the most difficult to analyze because prices are established through the interaction of a large number of individuals. Here again, the nature of the problem may be somewhat different from sports, but many of the tools for sorting out the relative influence of skill and luck still apply.

Part of the fun and challenge of analyzing skill and luck is that it's a multidisciplinary endeavor. Statisticians, philosophers, psychologists, sociologists, corporate strategists, professors of finance, economists, and sabermetricians (those who apply statistical methods to the study of sports) all have something to contribute to the discussion.[7] Unfortunately, the people within these disciplines don't always reach outside their fields. You will see ideas from each of these disciplines, and I'm hopeful that bringing them together will lead to a sounder and more balanced approach to analyzing decisions and interpreting the results.

Untangling skill and luck is an inherently tricky exercise, and there are plenty of limitations, including the quality of the data, the sizes of samples, and the fluidity of the activities under study. The argument here is not that you can precisely measure the contributions of skill and luck to any success or failure. But if you take concrete steps toward attempting to measure those relative contributions, you will make better decisions than people who think improperly

about those issues or who don't think about them at all. That will give you an enormous advantage over them. Some statisticians, especially in the world of sports, come across as know-it-alls who are out of touch with the human side of things. This characterization is unfair. Statisticians who are serious about their craft are acutely aware of the limitations of analysis. Knowing what you can know and knowing what you can't know are both essential ingredients of deciding well. Not everything that matters can be measured, and not everything that can be measured matters.

While there are wide swaths of human activity where the ideas in this book are hard to apply, the ideas have concrete application in some important areas and should serve as a template for thinking about decisions beyond the scope of this book. Luck may explain that you met your future wife after your buddy lured you out on a Thursday night, but this book will have little to directly say about that or other issues of love, health, and happiness. We need to define the activity we're talking about and what measures we need to use to evaluate that activity effectively.

In his book *The Theory of Gambling and Statistical Logic*, Richard Epstein, a game theorist trained in physics, notes that there is no way to assure that you'll succeed if you participate in an activity that combines skill and luck. But he does say, "It is gratifying to rationalize that we would rather lose intelligently than win ignorantly."[8] Luck may or may not smile on us, but if we stick to a good process for making decisions, then we can learn to accept the outcomes of our decisions with equanimity.