



# The Paradox of Skill

Why Greater Skill Leads to More Luck

Michael Mauboussin

Variation in batting averages must decrease as improving play eliminates the rough edges that great players could exploit, and average performance moves toward the limits of human possibility.

—STEPHEN JAY GOULD

Okay, you have gotten the memo on improving skill: 10,000 hours, hard work, deliberate practice, grit, and attentive teacher. We've all heard it. You also recognize that in many of life's activities, the results you achieve combine skill and luck. No debate there. Now, what if I told you that in many cases improving skill leads to results that rely more on luck? That's right. Greater skill doesn't decrease the dependence on luck, it increases it. If you have an interest in sports, business, or investing, this lesson is for you.

Stephen Jay Gould was a renowned evolutionary biologist at Harvard University who loved to write about baseball. One of his best essays was about why no player in Major League Baseball had maintained a batting average of more than .400 for a full season since Ted Williams hit .406 in 1941. Gould considered several conventional explanations, including more night games, demanding travel, improved fielding, and more extensive use of relief pitching. None checked out.

Maybe Williams was some sort of freak player, Gould thought, better than all of those who came before him as well as all of those who followed. That's implausible, he concluded, because in every sport where performance is measured versus a clock, including swimming and running, athletes have improved. Baseball players, too, are better than they were in the past: faster, stronger, more fit, and better trained.

So how do we solve the mystery of the vanishing .400 hitter? The best approach is to set up a simple model that explains how greater skill can lead to a greater reliance on luck. We'll then apply our model to other realms to see if it explains what we see there. In each case, we'll see that luck has more sway even as participants hone their skill. It's the paradox of skill.

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## The Jars of Success

Imagine two jars, one representing skill and the other luck, that are each filled with cards with numbers printed on them that comprise a bell curve. Bell curves are defined by a mean, or average, and a standard deviation. From the top of the bell, the curve slopes down the sides symmetrically with an equal number of observations on each side. Standard deviation is a measure of how far the sides of the bell curve are from the average. A skinny bell curve has a small standard deviation and a fat bell curve has a large standard deviation.

So most cards in each jar have values at or near the mean, and a few cards are marked with numbers that have values far from the mean. To determine an outcome, you draw one number from the skill jar, one from the luck jar, and add them. Relating this to batting averages, you could say that a player has a certain amount of hitting skill—the number he drew from that jar—and some luck. A great player can have an unlucky season that results in a batting average below his true skill, or a below-average player can enjoy substantial luck and hit at an average that overstates his skill. Hitting .406 as Williams did requires tremendous skill and terrific luck. He drew numbers from both jars that were far above average.

Let's put some numbers to the averages in each jar. Let's start with the luck jar. While for a season some players will have good luck and others bad luck, we can safely assume that luck is zero on average. That says that the average of the skill jar will approximate the batting average for all of the players combined, which has vacillated around .260-.270 in the last 75 years or so. The reason that average skill hasn't gone up, even though the hitters today are better than in the past, is that batting average represents a duel between pitcher and hitter. If pitchers and hitters improve roughly in lockstep, the overall skill can improve sharply even as the batting average remains steady. The arms war (pun intended) between pitchers and hitters creates the illusion of stability even as the players improve.

Here was Gould's crucial insight: the standard deviation of skill has gone down over time. Imagine the bell curve going from being fat to skinny. The extreme values are closer to the average. So even if the luck distribution doesn't change a bit, you should expect to see the standard deviation of batting averages decline over time. And that is precisely what Gould showed. The standard deviation of batting averages was .0326 in the 1940s, when Williams achieved the feat, and was .0274 in the first decade of the 2000s. In statistical terms, hitting .380 in 2011 is the equivalent to the .406 that Ted Williams hit 70 years earlier.

Why did the range of skill from the best to the worst narrow so much? Two factors can explain a great deal of the phenomenon. When professional baseball began, it drew only white players from the Northeastern part of the U.S. But over time, the league began recruiting players of all races, from all parts of the U.S., and eventually from all around the world. This greatly expanded the pool of talent. Hungry players from the Dominican Republic, Venezuela, and Japan brought a new level of skill to the game. In addition, training has improved greatly since the 1940s, which has certainly had an effect on this convergence of skills. Combine more access to talented players with sharpened training techniques and you get a higher, and more uniform, level of skill throughout the league.

That the bell curve in the skill jar gets skinnier over time while the bell curve in the luck jar remains the same means that as skill improves for the population, luck becomes more important in determining results. On average, players have greater skill today than they did in years past but their outcomes are more tied to luck. This extends to other realms as well.

A good theory makes predictions that we can test. The paradox of skill says that in fields where there is no offsetting interaction (for example, pitcher versus hitter) and no luck, we should see absolute results improve and relative results cluster. This is precisely what we see in events such as swimming and track and field.

Naturally, human physiology limits absolute performance—a man can run only so fast and a woman can swim only so swiftly. But we see improvement and convergence broadly. For example, the winning time for the men’s Olympic marathon dropped by more than 23 minutes from 1932 to 2012. As revealing, the difference between the time for the winner and the man who came in 20th shrunk from 39 minutes to 7 ½ minutes over the same period. Luck and interaction can partially obscure the paradox of skill, but the core elements are there in case after case.

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## Business: If You're Not Getting Better, You're Getting Worse

Now let's take a look at the business world. It's important to start with the acknowledgement that luck plays a large role in the results for business. Just as in baseball, where the difference between a hit and an out might be six inches of flight trajectory, business has a lot of randomness.

There are a few sources of that randomness. For one, you never know what your competitors are going to do. Sometimes companies compete in an orderly fashion and the outcome is good for the industry. Other times competitors may develop a strategy to drop prices, or add capacity, that forces a reaction. So even if you know what your plans are, you don't know those of your competitors. Game theory is a branch of economics that studies how players act and react to one another, and as you add players to the competition, the unpredictability rises quickly.

Customers are another source of randomness in business. Naturally, companies spend lots of time and effort anticipating what their customers want and need, but the success rate of new products shows that there's no easy way to do so. And even if a company can decipher its competitors and customers, it has to deal with changes based on technology. Consider the media business: how many executives in the newspaper, radio, and television industries properly anticipated the changes of the last couple of decades? Who knows where things are going from here? Business has its own version of the luck jar, and there's a wide range of numbers.



What about skill? The paradox of skill teaches a couple of lessons that executives sometimes ignore. Phil Rosenzweig, a professor at IMD Business School, provides a concrete example. In the mid-1990s, a large U.S. retailer set out the goal of improving its inventory turnover ratio, a crucial measure of capital efficiency. And its effort proved to be a rousing success, as its turns went from 3.4 times in 1994 to 4.6 times in 2002. Indeed, you might envision the board promising and delivering management bonuses based on such a nice improvement.

Here's the problem: the retailer's number one competitor also happened to be focused on inventory turnover and was able to take its ratio from 5.1 times to 8.1 times during the same period. So even as the first retailer strengthened its absolute performance, its relative position weakened. This is one of the lessons of the paradox of skill. Getting better in an absolute sense doesn't matter if it's offset by the competition. Hitters today are much better than they were in the past, but so are the pitchers. The improvement is obscured by the interaction. Likewise, the first retailer was better in 2002 than it was in 1994 but it actually lost ground relative to its prime competitor.

Research has pointed out the variance of quality in consumer goods has narrowed over time, another finding that's consistent with the paradox of skill. In years past, companies offered products across a wide spectrum of quality, and prices by and large reflected that quality gap. For instance, some automobiles were cheap and shoddy, and others were expensive but well made.

Over time, the gap in quality has narrowed. As a consequence, customers now rely less on price-quality trade-offs and more on other variables, including convenience, after-sale service, and store location. This can enhance the role of luck in securing the sale. In business as in baseball, the skill distribution has likely tightened allowing luck to play a growing role in outcomes.

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## Investing: A Random Walk Because of Skill

Perhaps nowhere is the paradox of skill more evident than in the world of investing. Luck is such a big deal that one of the industry's all-time best-selling books is called *A Random Walk Down Wall Street*. But it is a random walk only because investors are so collectively skillful. Companies, analysts, the government, and the media disseminate gobs of information that investors quickly incorporate into prices. Advances in technology mean that there is massive computing power available to crunch numbers. And the spoils of success are sufficiently high that many of the best and brightest students are drawn to the investment world.

The challenge is that most investment firms have access to the same information, whiz-bang computers, and sharp graduate students. Those things don't set you apart. Since stock prices generally reflect all of the information that's out there, it's only new information that moves prices. And because by definition you can't predict new information, stock prices tend to follow a random walk. The random walk story is not exactly true, but its emphasis on how hard it is to beat the market is well placed. Similar to baseball and business, as skill increases luck becomes more important.

*“ Even if it is not perfectly linear, improvement over time occurs. Efficiency grinds upward.”*

But in one important respect, investing is quite different than those fields. Take sports as a starting point. As time goes on, the ability of the athletes marches inexorably toward the limit of human performance. That last bit of performance improvement is hard fought because there's only so much a body can do. It's also why some athletes turn to chemicals to enhance their performance. But even if it is not perfectly linear, improvement over time occurs. Efficiency grinds upward.

Now compare sports to investing. In investing, efficiency means that value and price are one and the same. The price of a stock accurately reflects the present value of all of the cash flows in the future and news is rapidly and accurately assimilated. Indeed, economists have done lots of experiments to show that a group of investors will settle on an efficient price under normal conditions. The problem is the conditions are not always normal in investing. From time to time, investors follow one another in a herd, leading to prices that veer far from value.

The euphoric dot.com bubble that peaked in early 2000 and the acute fear that created a market low in early 2009 are but two recent examples. In these cases, it's still hard to beat the market but you'd be hard pressed to say that the market is efficient.

## What To Do About the Paradox of Skill

We may never see another .400 hitter in professional baseball. That's alright. It reflects "the spread of excellence," using Stephen Jay Gould's phrase. You'll see skill increasing and luck becoming more important in shaping results in many places that you look. So, what should you do about it? Here are three suggestions:

- **Find realms where the variance of skill is still wide.** If you compete in a field where the range of skill is wide, the more skillful will succeed at the expense of the less skillful.

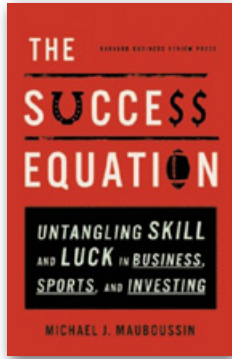
Investing is a good case in point. In developed markets, large and sophisticated institutional investors dominate the trading scene. The skillful players compete with one another and it's hard to gain an edge. In some developing markets, by contrast, large institutions compete with less sophisticated individuals. Research shows that, on average, the institutions earn excess returns at the expense of the individuals. But it's not always easy to know if you're the most skillful player. Warren Buffett, the famous investor and chairman and CEO of Berkshire Hathaway, makes the point in the context of poker: "If you've been playing poker for half an hour and you still don't know who the patsy is, you're the patsy."

- **Think relative, not absolute.** Essential to the paradox of skill is the idea that you can measure improvement in skill either on an absolute scale or relative to competitors. In activities where there is no direct interaction or luck—say, a 100-meter dash—absolute skill is all that matters. But when there is interaction and luck, you have to measure relative performance. Here's why this is so important, using business as an example. There are a slew of best-selling books that offer a simple formula for corporate performance improvement. These miss the mark because they fail to consider what competitors may do. Results are a combination of your actions with those of your rivals. If all companies are getting better in lockstep, no company is gaining an edge.

→ **Focus on process, not outcome.** If you want to become world-class as a violinist or a chess player, areas where little luck is involved, you need roughly 10,000 hours of deliberate practice. What's crucial is that your results, as you improve, will be a reliable indicator of your skill. As a result, feedback in these domains can be clear and unequivocal. If you compete in a field where luck plays a role, you should focus more on the process of how you make decisions and rely less on the short-term outcomes. The reason is that luck breaks the direct link between skill and results—you can be skillful and have a poor outcome and unskillful and have a good outcome. Think of playing blackjack at a casino. Basic strategy says that you should stand—not ask for a hit—if you are dealt a 17. That's the proper process, and ensures that you'll do the best over the long haul. But if you ask for a hit and the dealer flips a 4, you'll have won the hand despite a poor process. The point is that the outcome didn't reveal the skill of the player, only the process did. So focus on process.

One final thought. Once you've embraced the paradox of skill, you'll see that it's appropriate to have an attitude of equanimity toward luck. If you've done everything you can to put yourself in a position to succeed, you should accept whatever results appear. Some days you'll be lucky, and the results will exceed your expectations. Some days the results will be disappointing because of bad luck. **The best plan will be to pick yourself up, dust yourself off, and get ready to do it again tomorrow.** 📌

# Info



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**ABOUT THE AUTHOR** | Michael J. Mauboussin is an investment strategist and adjunct professor at Columbia Business School. Michael is the author of *Think Twice: Harnessing the Power of Counterintuition* and *More Than You Know: Finding Financial Wisdom in Unconventional Places-Updated and Expanded*, which was named one of “The 100 Best Business Books of All Time” by 800-CEO-READ, one of the best business books by BusinessWeek (2006) and best economics book by *strategy+business* (2006). He is also co-author, with Alfred Rappaport, of *Expectations Investing: Reading Stock Prices for Better Returns*. His most recent book is *The Success Equation: Untangling Skill and Luck in Business, Sports, and Investing*.

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