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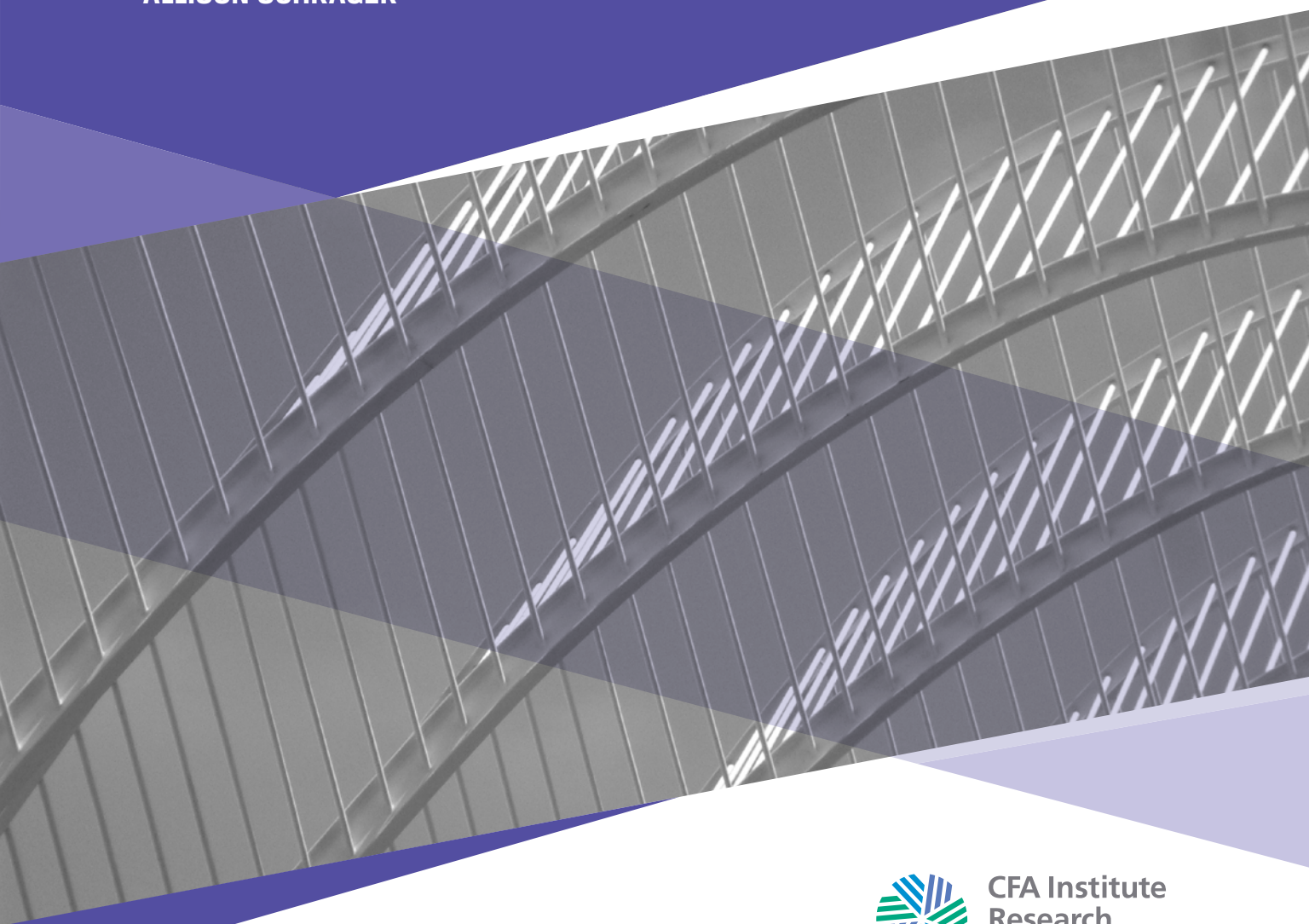
# LEARNING ABOUT RISK MANAGEMENT
## INSIGHTS FROM UNCONVENTIONAL RISK-TAKERS

**ALLISON SCHRAGER**



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Insights from Unconventional Risk-Takers

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# LEARNING ABOUT RISK MANAGEMENT: INSIGHTS FROM UNCONVENTIONAL RISK-TAKERS

Allison Schrager
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With the COVID-19 pandemic, people around the globe received a terrible reminder of how risky life can be. Individuals and families experienced the risk of losing their health, their freedom of movement, and their savings and income—all at once. In a period of weeks, investors saw years of returns wiped out as stock markets fell, only to rise again, and unemployment soared.

The experience provided a hard reminder of the nature of risk and uncertainty and the importance of understanding how to manage them. The future is always unknowable, but risk can be measured, so you have a sense of potential downsides and the costs of reducing them. Uncertainty is what you never saw coming because it was unimaginable, or at best immeasurable. Markets fell in response to extreme uncertainty about the novel coronavirus (SARS-CoV-2) and how long the economic disruption would last. Reducing uncertainty is expensive because it requires access to the most risk-free and liquid assets available. As more information becomes available, however, uncertainty turns to risk, and we gain more control and predictability.

We also saw how critical communication is for alleviating anxiety and turning uncertainty into manageable risk. As more data about the virus became available, the situation felt less uncertain and overwhelming. To anyone working in finance, the challenges of data and risk management are familiar. A primary function of your job is to manage risk. When markets are not in extreme turmoil, we do this every day and have many tools for putting a price on risk and transforming it by reducing it or transferring it to someone else. Risk in finance involves the possibility for higher return and the chance to receive more for less, as well as the possibility of loss. Or, if you are uncomfortable with risk, you can pay to reduce it.

But risk is managed, priced, bought, and sold in industries outside of financial markets. The tools we use in finance are the same as those that help us weigh trade-offs and decide how much risk reduction is worthwhile in any industry. Risk management is also the job of policy makers. During boom times, we forget that—even those of us in the financial industry. For many years, the goal appeared to be beating the market and achieving more asset growth; this activity was always fruitless because no strategy works in all market conditions. And when the markets are up, we can easily forget that an unanticipated event can destroy wealth in an instant.

The year 2020 shows why, even as the economy and markets recover, the financial industry

needs to return to its fundamentals, where the objective is helping clients identify and manage risks. It also highlights why communicating risks, uncertainty, and the value of risk reduction are so important. The ability to explain and measure and then manage risk can greatly reduce uncertainty, thereby transforming uncertainty into risk. This process makes the world feel more manageable and helps people understand the value of risk management, even when times are good.

But communicating risk is hard. It involves abstract concepts that rely on probability and statistics that not everyone fully understands. Storytelling is a valuable way to communicate these complex ideas. Everyone connects with stories about people. A financial risk model—or any risk model—is in many ways a parable, an abstraction of the world that offers insight into an important lesson or relationship. Looking ahead, we can use parables to better communicate financial risk and the value of risk management.

This brief consists of parables about risk-takers I met in some unusual places: Hollywood, the world of professional poker, and a big wave surfing risk conference. The people I describe use the same risk management strategies we use in financial markets—taking in data and weighing risk and reward. Telling their stories offers two important benefits.

1. Seeing what we do every day in a new context deepens our understanding of risk management. We can see new subtleties, which helps us to better use the tools we already have and to develop new ones.

2. Communicating with clients about risk, uncertainty, and the trade-offs of reducing these variables can be difficult. The value of risk reduction is often underestimated when times are good and seems obvious only in hindsight when times are bad. Any miscommunication not only poses a challenge when dealing with clients but also provides a reason for many people to question the value of financial services. We can use these parables, or others that you discover, to help explain risk to clients.

Stories are tools that financial professionals can use to improve both practice and communication. They are as valuable as any quantitative model. Once you see risk in other markets, crafting your own stories as part of your toolkit becomes possible.

The first story took me to Hollywood. Investing in movies is an especially difficult risk problem because so much is unknowable. Hollywood profit-seekers are constantly trying to find ways to make the unpredictable predictable. Moviemakers often use the same models we use in finance to measure risk, but it never ends well because movie data are especially challenging to work with. The story of Ryan Kavanaugh offers a cautionary tale on why you should never be seduced by the power of your own model or, even more importantly, never fall for someone else's model.

## THE LAND OF BROKEN RISK MODELS

Every day, young, hopeful, talented people come to Hollywood hoping to make it big. But few realize these dreams and instead leave with bitterness and regret. Often called the land of broken dreams, Hollywood could also be called the land of broken risk models. Investors, including banks, hedge funds, and insurance companies, also have a long history of coming to Hollywood thinking they can tame the market with science and data, which likewise often ends in tears—or

lawsuits. A well-known saying in Hollywood's financial circles counsels that the secret to making lots of money there is to start with three times as much.

A recent casualty is Ryan Kavanaugh, a Los Angeles native who charmed Hollywood with talk of his Monte Carlo simulation that lived in an elaborate Excel spreadsheet and promised to make the unpredictable predictable. He claimed his model could forecast which movies would do well and which ones would bomb. It was a seductive pitch.

Such predictability is appealing because it is so elusive in Hollywood. If past performance is any predictor of success, investors would stay far away from most film projects, but everyone in Hollywood is looking for the next big thing in a sea of random outcomes. Like others before it, Kavanaugh's model eventually failed, but not before many investors had bought into it.

People in the movie business explain that predicting which movies will be blockbusters and which will be flops is impossible. Each film is like a small business with hundreds of moving parts. You cannot predict the winners. The only way to manage risk is to make lots of movies; most will not make money, but a few will hit it big and cover the costs of the others. This approach is a risky way to run a business, and it also explains why so many bad movies, with terrible, derivative plots, are made, then fail at the box office. Every year brings both a notorious clunker that cost hundreds of millions of dollars to make and an independent drama, with a great script, that cost only $10 million and earned $300 million.

Predicting winners is an especially difficult risk problem. In finance as in any business, decision makers often rely on data from the past to help them identify more fruitful investments that will pay off in the future. A good risk estimate requires data that can do two things: (1) reveal lessons from the past that will be relevant in the future and (2) predict that certain past outcomes are more likely than others.

The nature of moviemaking means its data are unable to facilitate either of those things. If someone could devise a way to scientifically pick winners, then a well-functioning moviemaking market would be ripe for the taking. Enter Ryan Kavanaugh.

Kavanaugh grew up as part of a privileged Los Angeles family and after college started a venture capital fund with his father that raised money from the biggest players in Hollywood to invest in start-up companies during the 1990s. The firm fell apart after the dot-com bust in 2000, and Kavanaugh was sued by his investors.

Just a few years later, he made a comeback and cofounded Relativity Media in 2004, just before he turned 30. Armed with a team of number crunchers, Kavanaugh marketed himself as a math whiz in jeans who could provide the predictability Hollywood craved. His timing could not have been better because movie studios needed a new source of financing in the mid-2000s. For years, they had depended on a German tax shelter to attract investors and offload the considerable financial risk involved with making movies. But Angela Merkel's coalition government nixed the shelter after she took office.

The German tax shelter had given investors and studios some financial incentive to invest in films, so losing it left studios unsure how to secure financing. In the meantime, hedge funds were looking to invest in high-yield risky assets as interest rates fell. It was a perfect match. Kavanaugh jumped at the opportunity, especially because hedge funds, with roots in the finance world, have to put a number on any

risks involved in their investments. He offered investors the two things they wanted (data and predictions) and gave them the glamour they craved. And most critically, Kavanaugh claimed he could put a reliable number on risk, which is precisely what institutional investors needed to hear before they would put their clients' money on the line to make movies. Kavanaugh would go to New York, visit the banks and hedge funds there, talk the finance talk, and write equations on a whiteboard to put precise odds on whether or not a movie would make money.

## The Movie Business: Skew You

Typically, measuring risk in the movie business is difficult because pinning down a reasonable range of likely scenarios is nearly impossible. Forecasting movie profitability is like estimating how much time you need to get to the airport when the trip typically takes anywhere from 10 minutes to 2 hours.

A plot of the ratio of box office revenues to production costs looks totally different from the normal distribution shape we often assume in finance to make volatility estimates. **Figure 1** shows the ratio of box office revenues (foreign and domestic) to production costs for all movies released[1] and shown in at least 100 US theaters between 2008 and 2017. Any value less than 100% means ticket sales did not cover the costs of production. To cover marketing and additional costs not related to production, a good rule of thumb is that a movie must make double its production costs to be profitable.[2]

For decades, box office returns have had the same risk profile despite the introduction of innovations such as IMAX as well as competition from streaming services and better-quality TVs. The economists Arthur De Vany and W. David Walls[3] looked at box office receipts for 2,015 movies between 1985 and 1996 and plotted almost the exact same shape.

The distribution is skewed because a large share of movies lose money at the box office or barely break even. Slightly more than half (53%) of movies shown in Figure 1 do not earn back production budgets at the box office, and most movies aren't shown in many theaters. Even if they do make a profit at the box office, the movies' earning potential remains a crapshoot, with only a few big winners. The extreme skew makes getting reliable risk estimates difficult because so many data points lie in the tail. It also explains why investors bet on many films knowing that most will lose money. They just need one film to fall in the upper part of the tail to be made whole.

Actually, the investment strategies of venture capital firms, which put their money into start-ups, are similar to those of movie studios. Many of their investments lose money, but the odd unicorn pays off to make up for the losers. Kavanaugh's history in venture capital served as good preparation for convincing people to invest in long shots.

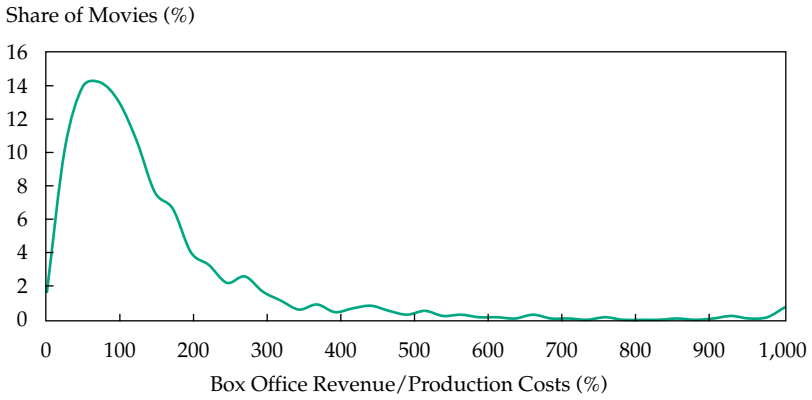
But Kavanaugh claimed his model could generate a reliable estimate of risk even when the data are heavily skewed. He selected certain movie characteristics (such as actor, director, genre, budget, release date, and rating) and estimated which ones would make a winner in the future by analyzing data for the same characteristics from previous films. The model

[1]Data are from Nash Information Services.

[2]This figure does not include marketing costs or revenue from DVD sales, streaming, and TV; it measures only the proportion of production costs recouped at the box office.

[3]Arthur De Vany and W. David Walls, "Uncertainty in the Movie Industry: Does Star Power Reduce the Terror of the Box Office?" *Journal of Cultural Economics* 23, no. 4 (November 1999): 285–318.

## FIGURE 1. BOX OFFICE REVENUES, US AND INTERNATIONAL THEATERS, 2008–2017




*Source:* Nash Information Services.

produced a range of potential profits based on how these characteristics had performed in the past. Picking which movies to invest in based on certain factors can mean less risk because the distribution such a strategy produces is more normally distributed.

For example, you would think action movies are riskier investments because they are more expensive to make than other genres. From 2008 to 2016, the average production budget for an action movie was about $104 million, versus a more modest $19 million for the average horror movie.[4] Only about 35% of action movies earned back their production costs at the box office, however, compared with 67% of horror movies. You would therefore think Hollywood makes more horror movies, right? Wrong. Between 2007 and 2016, more than twice as many action films were produced than horror films (216 versus 103).

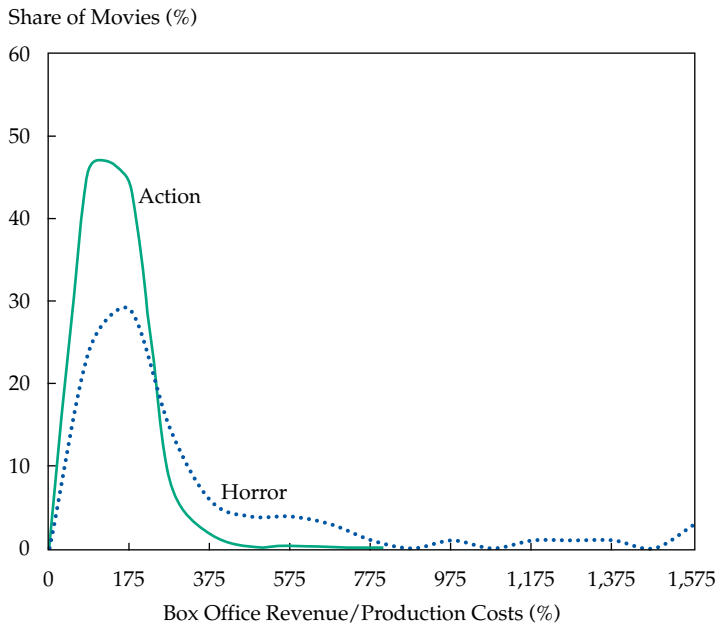
**Figure 2** plots the range of payoffs for both action and horror movies. More action movies get made for many reasons: They tend to do well internationally; they offer the possibility of franchising and merchandising; and because their box office returns are less skewed, their performance is more predictable. In terms of predictability, therefore, action movies are less risky investments. Horror movie returns, on the other hand, have a very long tail: Many lose money, and there is a wide range of payoffs for the winners. Even if they are profitable more often than action films, they are in some ways riskier because that profitability is less predictable.

If Kavanaugh estimated that 70% of his earning scenarios were associated with enough profit, he told investors to invest in the film as part of a slate of other movies he handpicked. Studios were so enthusiastic about the potential for financing that they shared their full, and normally secret, data on their profits with Kavanaugh.

Investors plowed hundreds of millions of dollars into the movies Kavanaugh selected. In 2005 and 2006, he financed 36 movies with Universal and Sony and made money for his investors. Hedge

[4]The average horror movie estimate is based on data from Nash Information Services.

**FIGURE 2. US ACTION AND HORROR MOVIE PROFITS, 2008–2016**




*Source:* Nash Information Services.

fund investors earned a $150 million profit on one of his early slates, a return of between 13% and 18%.[5] Kavanaugh was paid millions of dollars per movie and received producer credit despite having had no role in production.

But then Kavanaugh grew greedy. Elliott Management, a $21 billion hedge fund, paid $67 million for 49.5% of Relativity Media in 2008. This deal gave Kavanaugh access to the money he needed to start investing in movies himself. His spending went out of control: He brought exotic animals into the office, and he started to work out of a lavishly decorated airport hangar. What was worse, his magic model stopped working, selecting bombs such as *The Warrior's Way*, which cost $42 million to make and brought in $5.7 million in the United States, and *Machine Gun Preacher*, a $30 million production budget with US earnings of only $539,000.[6] Elliott Management pulled out in 2010. Kavanaugh managed to find more financial backers, but he continued to struggle as his spending accelerated and he picked more duds. Relativity Media was bankrupt by 2016.

Once again, Hollywood had broken a risk model.

## The Past Is a Lousy Way to Predict the Future

Skewness is not the only reason making money in movies is so hard. The other reason is that

[5]Tatiana Siegel, "Gun Hill Slate a Sound Investment," *Variety* (14 October 2007). https://variety.com/2007/film/markets-festivals/gun-hill-slate-a-sound-investment-1117974039/.

[6]Benjamin Wallace, "The Epic Fail of Hollywood's Hottest Algorithm," *Vulture* (24 January 2016). https://www.vulture.com/2016/01/relativity-media-ryan-kavanaugh-c-v-r.html.

movie data get stale fast. Kavanaugh had access to the best data in the industry, but even that advantage became worthless because the movie market keeps changing and data on past success fail to keep pace with those changes.

In the past 10 years alone, DVD sales dried up, China became a bigger market, and franchise movies about comic-book characters became more profitable. Streaming services and better TVs mean people are less inclined to go to theaters. Online reviews such as those on the Rotten Tomatoes website undermined even the best-laid marketing plans. And then the novel coronavirus (SARS-CoV-2) hit, movie theaters closed, and summer blockbusters were shelved. When and if people will ever return to theaters in large numbers is unknown—and by then, tastes may have changed.

Maintaining a dataset that is accurate and can pick which movies will be winners is difficult, if not impossible, when the data change so quickly. While comic-book franchise movies looked like a sure bet in 2019, another fad will come along.

Kavanaugh overpromised because perfect risk estimates do not exist. This is a lesson we constantly relearn in finance. Financial data may be more plentiful than movie data, but asset returns are also often not normally distributed, making risk estimates less reliable. The world of markets also changes, rendering past data less useful. Extraordinary skill and judgment are required to know which data are most relevant and how to make reliable risk estimates from tail cases.

Kavanaugh's story reminds us that risk, a measurement of uncertainty, is a human construct that attempts to bring order to an unknowable future. Risk is meant to help us understand what we are up against and plan for what might happen, good or bad. It also helps us weigh different options and see which ones bring us closer to our goals. But no matter how skilled you are or how well your model seems to work, eventually it will fall short.

Although using past data may be a terrible way to predict the future, it remains the best approach because it is all we have. Data's limitations are in some ways becoming clearer than ever in a rapidly changing world that can instantly render past data useless. At the same time, data are becoming more powerful tools to measure risk. Endless amounts of data exist on what we buy, what we watch, and who we know.

More data and estimation techniques, such as machine learning, can mean more-reliable risk estimates. Soon, determining things that once seemed immeasurable, such as the odds a movie will be successful, could be more possible than ever. For instance, Netflix can recommend a movie for you based on the odds that someone with your demographic profile finished viewing the same movie. Rather than making decisions based on a rough estimate derived from your past moviegoing experiences, you can make decisions based on millions of other people's experiences, and movie studios know all. These new data techniques may mean more accurate estimates of what people will like, and perhaps less skewed data. But these techniques also mean the business model is changing and will continue to change quickly.

Changing data opportunities open the door for the next Ryan Kavanaugh to come along with promises of an even better model. And indeed, that model may offer some improvement. But when tastes and technology change quickly, even big data cannot produce perfect estimates. Odds are, the next magic model will fall short, too.

## OVERCOMING OUR BEHAVIORAL BIAS: PHIL HELLMUTH

We often hear that humans are hopeless at understanding risk. We are told people cannot make sense of probabilities, tending to take too much risk when they should not and tending to hide from risk when they should be taking more. But lots of evidence is also available that people *can* make good risk decisions. We get better at doing so as we age, and so people who face the same kind of risk problems regularly (e.g., traders, gamblers) tend to make smart risk choices in their domain, consistent with how economists predict that people will behave. Not only that, framing is often critical to explaining risk in a way that people understand, so that they can deal with risk in a logical, consistent way.

Risk management suggests that we need not be slaves to our emotions. We can learn to make smart risk choices and weigh probabilities thoughtfully. Take world champion poker player Phil Hellmuth. He is known not only for his volatile behavior but also for being very disciplined and patient at the table. If he can be rational and in control when faced with risk, we all can.

No one likes to lose. It feels terrible. When we face a risky situation, the desire to avoid loss can lead us astray from what financial economics predicts we should do. And this behavior sometimes means we make decisions we regret and lose even more. But if we go into a risky situation armed with more knowledge and experience, we can improve our behavior, even if we still hate to lose. Hellmuth's success depends on overcoming his emotions. He has spent years learning certain tricks to manage his behavior. When it counts, he has learned to stay rational and in control, waiting until later to explode.

Professional etiquette usually dictates a certain measure of civility. In competitive fields, it requires being a gracious loser. Losing is hard, especially when adrenaline is flowing, yet we must grit our teeth, shake our adversary's hand, and congratulate them on a hard-won victory.

Hellmuth has no patience for such niceties. When he loses a poker tournament, he throws a tantrum. He gets up from the table, paces, yells expletives, and insults the winner's intelligence (especially when his opponent is an amateur). To be fair, he reserves his harshest criticism for himself. As he paces, he mutters to himself, reliving every hand, what he played, what he let go, and how he could have done better against the idiot "who can't even spell 'poker'!"

Hellmuth owns his behavior—he even titled his autobiography *Poker Brat*, after his industry nickname. You can find a montage of his meltdowns on YouTube. One of his most notorious tantrums followed a close loss to Annie Duke at the 2004 World Series of Poker Tournament of Champions, an invitation-only event for the game's top 10 players, with the winner poised to take home $2 million (but no money for second place). After knocking out the other players, Hellmuth and Duke cut a deal behind the scenes—each would take home $750,000, so they were guaranteed something. They returned to the table to play for the $500,000 still up for grabs. Duke prevailed, and Hellmuth went nuts, pacing and yelling expletives.

Hellmuth told me that he knows the keys to good play are patience and control. But his interpretation of this fact is different from what you might expect. He explained a highly disciplined style of play to me: "Playing good poker means only playing 12% of your hands. You can't make money if you play more than 30%, and if you play 100%, you'll go broke every day."

Research from online poker games estimates that most people play way more hands than Hellmuth, between 25% and 50% of the hands they are dealt. Hellmuth's success comes from his ability to overcome his emotions, called "tilt" in the poker world, and choose the right hands to play.

Great poker players are not only patient but also calm, collected, and aware of others around them and how they process information. Given Hellmuth's volatile nature, the fact that he is considered one of the world's best players is remarkable. To date he has won 15 World Series of Poker gold bracelets, a record number, and he tells me he is worth more than $20 million.

Hellmuth realized early that he had to overcome his natural tendencies to succeed: "I guess what it all meant was that I needed to have the discipline of a monk if I was to succeed in poker. I needed to exercise patience relentlessly and to allow no negative emotion to affect my mood."

He took the monk part literally: In the years leading up to his first World Series win, he did not drink and was celibate. Getting his emotions in check was a constant battle. He would sometimes play impulsively, was cheated, and would berate himself for any mistakes he made. He also experienced huge swings in his wealth, winning hundreds of thousands of dollars at one tournament and losing almost all of it at the next.

Keeping control of his emotions was all-consuming; he even passed out from exhaustion during a poker tournament early in his career. Although self-control is an ongoing struggle for Hellmuth, he admits that over the years, checking his impulses has become easier. He still loses his cool sometimes but has willed himself to be a master of risk-taking under pressure. Behind the scenes, a thoughtful strategy is at work: Hellmuth not only overcomes his behavioral quirks but also channels them into a winning brand.

But what is most extraordinary is how he has overcome what behavioral economists call the break-even effect, which is a corollary of loss aversion, the well-known behavioral bias first explained by Daniel Kahneman and Amos Tversky. Classical economic theory and the models we use in finance assume that people are consistently risk averse. If we are up $100 in a poker game, we will bet the same as if we were down $100. But Kahneman and Tversky's research shows that losing feels so bad, people tend to take more risk when they are down in hopes of recouping the loss. They will take less risk when they are up to keep their gains. The break-even effect, attributed to behavioral economists Richard H. Thaler and Eric J. Johnson,[7] argues that people bet more when they are down to get back to breakeven. But this approach is not a good way to take risk: Statistically, you are just as likely to win or lose, no matter what happened in earlier hands.

Hellmuth developed his philosophy after seeing how often the break-even effect destroyed players in high-stakes poker. "Generally, it is human nature when losing to not want to quit and gamble a little bit more on that particular session," he told me. "Lots of great pros gamble a bit when they are down and play hands they shouldn't, [thinking] they can climb out [if they] rely on [their] skills. Maybe it works 30% of the time."

Hellmuth sees players get lucky when they play aggressively, which leads them to believe that if they play that way when they are down, they will

[7]Richard H. Thaler and Eric J. Johnson, "Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice," *Management Science* 36 (June 1990): 643–60.

win their money back. Most of the time, 70% by his estimation, it does not work out—they lose even more. Hellmuth credits his success with not falling into this trap.

Economists at Pomona College[8] noticed the same thing after studying behavior in an online poker room where gamers play Texas hold 'em. They recorded what happened in games of more than 500,000 hands with 1,609 players from January to May 2008. They looked at cases when players won or lost $1,000 and how they played the subsequent 12 hands.

The economists estimated that after a loss, approximately two-thirds of players are more likely to bet to stay in a game than after a win. The pattern held across all table sizes. The results were even stronger with regard to aggressiveness, or how often a player raises a bid. Most played more aggressively after a loss.

A later study[9] of online poker gamers found similar results. Players were observed taking bigger risks when they were down and betting less than 20% of the time when they were up. The researchers also noticed that more-experienced gamers, such as Hellmuth (who plays his hand only 12% of the time), were able to overcome this pattern and play consistently, whether up or down.

To succeed at poker or in any risky situation, you must not get too emotional or aggressive when losing. You might develop rules for yourself to avoid this behavior, such as promising yourself to walk away from a bet when you are down $100. But realize that sticking with these rules is difficult when emotions are riding high and the next hand could win back everything you have lost.

You can also hone the skills you need so that when it really matters, you stay calm and wait for the right hand. This approach is how Hellmuth, notorious for his meltdowns, managed to become a poker champion. Even after 30 years of playing professional poker, Hellmuth still struggles with his emotions. Here are the strategies he uses to keep his emotions in check, allowing him to make the best decisions possible to increase the odds of a winning hand.

## 1. Never Have Too Much of Your Own Money at Stake

Hellmuth has a firm rule that whenever he goes into a tournament, his own personal stake never exceeds $10,000. He often participates in high-stakes poker tournaments where the minimum buy-in is tens of thousands of dollars. He learned the hard way in his 20s, when he would begin with good intentions of limiting his bankroll (his budget for gambling) but then lose and end up betting more than he had planned on, thinking he could win his way back.

Despite these bad habits, Hellmuth became rich by the time he was in his 30s. He started to notice other players his age hit a wall—they had the skills to win but were overconfident and lost overall. Hellmuth resolved that once his net worth fell to $1 million, he would limit the amount he could possibly lose. From then on, he went into large tournaments "staked" (when outside investors put up money for you to play and then receive a share of your winnings).

This approach means that Hellmuth can still win big without ever having to lose too much. Staking also keeps him from feeling too desperate when he is down because the most he can

[8]Gary Smith, Michael Levere, and Robert Kurtzman, "Poker Player Behavior after Big Wins and Big Losses," *Management Science* 55 (September 2009): 1547–55.
[9]David Eil and Jaimie W. Lien, "Staying Ahead and Getting Even: Risk Attitudes of Experienced Poker Players," *Games and Economic Behavior* 87 (September 2014): 50–69.

lose is a small fraction of his net worth. When asked about how limiting his exposure keeps him from taking on too much risk, Hellmuth says, "I never have a horrible day—I am already aggravated and pissed off because I hate losing." Although his emotional state may suffer, his financial losses are limited. He exemplifies an extreme version of the rest of us.

Most of us do not know anyone who will subsidize our bets. But we can learn a lesson from Hellmuth. We might balance a stock portfolio with bonds or take stock options instead of a bigger salary at work. The principle is the same: When you have less at stake to lose, you stay more rational.

## 2. Eliminate Extreme Downside Risk

Hellmuth's autobiography describes, in painstaking detail, every hand in every major poker game he has been in. What sticks out to a less enthusiastic poker fan are the side deals he makes with the other players. At a crucial part of the game, he and another player often take a break, remove their microphones, and step outside. There, they agree to split the prize money and still offer the winner some extra upside, just as he and Annie Duke did at the 2004 Tournament of Champions.

Having a guaranteed payday (win or lose), in addition to being staked, helps Hellmuth stay focused; he does not panic or play too aggressively because he is not facing a big loss.

In everyday life, we can follow Hellmuth's example by buying insurance. Hellmuth is essentially buying insurance against losing when he makes a side deal, because he will receive a payment even if he loses and a bigger payment if he wins. We can buy insurance in case our house burns down, we are robbed, or we get in a car accident. And just like Hellmuth's strategy, doing so offers us peace of mind because the potential loss is smaller.

## 3. Remind Yourself, "This Is Just One Hand Out of Many"

Hellmuth practices what behavioral economists call broad framing: He never feels pressured to play a hand or fold, even if he is down, because he reminds himself it is just one hand out of many. He does not weigh the odds of the single hand he is playing; he considers how it factors into the entire game or tournament.

Because the games Hellmuth plays often last for more than eight hours, he might be tempted to lose perspective when he is down and take big risks on a single hand to earn his way back. But he then reminds himself to view each hand as part of a larger game.

Think of broad framing as playing the long game. For example, you should avoid looking at your stock portfolio too often. If you are investing for the long term, a bad day in the markets—or even a few bad months—is only a blip. It is not an indicator that you should sell your stocks. Framing an individual risky decision as part of a larger gamble will help you think clearly and avoid overreacting to temporary loss.

Hellmuth shows we are not doomed to our biases and left to rely on flawed simple heuristics. Evidence exists that loss aversion is not universal. People who, like Hellmuth, take risk regularly in their areas of expertise do not show harmful biases—they take risks in a consistent and rational way. Hellmuth does not seem like a person in control of himself, but because he is so experienced with risk-taking in poker, he has tricks to overcome his biases. He hedges and insures himself against the downside, which keeps him from worrying too much about loss

and frames his risks more accurately. Hellmuth's story shows how we can use these same tools to be more in control of our emotions and avoid taking too much risk when we are down.

## RISK MANAGEMENT AND RISK-TAKING WISDOM FROM BIG WAVE SURFERS

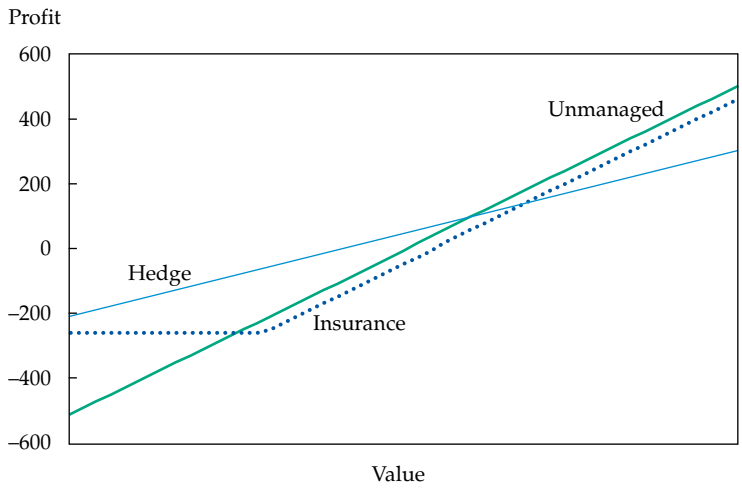
Once we have defined risk, measured it, and understood it, we can find the best strategy to manage it. Risk management means reducing downside risk. We have two ways to do this: (1) hedging, or reducing upside in exchange for less downside; and (2) insurance, where you pay someone to reduce downside risk but you keep the upside. **Figure 3** illustrates the payoffs for different asset price realizations using different investment strategies. The green line plots profits (on the *y*-axis) for different asset price realizations (*x*-axis) for a hypothetical unmanaged portfolio. It has the possibility of a large loss. The hedged (solid blue) line is less steep because it is partially invested in risk-free, lower-yielding assets. The chance for loss is less, but so is the chance for very high profits. The dotted line is insurance; the downside risk is limited, but the slope and potential for upside (less the cost of insurance) are the same as for the unmanaged portfolio.

But as we all know, these strategies bring many complications. Striking the right balance with hedging is difficult—we do not want to give up too much upside, so it is tempting to hedge too little. Insurance creates moral hazard, in which we take more risk than we should. This is a problem not only in financial markets but also in any circumstance where people manage risk.

Greg Long says he is a control freak. "Control freak" is not how you would usually describe someone who seems so cool—Long is a champion big wave surfer, raised on the beaches of Southern California—or who, when you finally track him down, tells you he was camping on the beach in Mexico for a few weeks, far away from a phone signal.

Big wave surfers are a different breed from regular surfers. Rather than surfing smaller waves at well-attended competitions on highly trafficked

**FIGURE 3. INVESTMENT PROFIT BY INVESTMENT STRATEGY**



beaches, big wave surfers seek out swells that are 20 to 80 feet high—the height of buildings—often in remote locations such as Tahiti, South Africa, and Ireland. Long is renowned in the surfing community, not only for being one of the best big wave riders of his generation but also for his fanatical approach to managing risk.

In the popular imagination, big wave surfers are daredevils, thrill seekers who casually chase the biggest wave they can find. This description does not fit Long or any of the big wave surfers I met.

"I was never an adrenaline junkie," Long explained to me. "Maybe when I was younger, but it was mostly [about a particular] wave, a huge force of energy, and the challenge of figuring out where I had to be to ride it, and learning each time how I could do it better next time."

Oceans and weather are like financial markets: chaotic but offering the illusion of control. You can plan and manage risk, but things can always go wrong. This happened to Long on 21 December 2012, 100 miles off the coast of Southern California. Typical of Long, he had left little to chance. He knew the conditions and had the latest safety gear. As on any of his expeditions, Long traveled with a large group, including a dedicated rescue team. For this trip, that meant six men on jet skis. For surfers to be accompanied by an entourage of photographers is not unusual, and Long's were all trained water professionals in their own right, also on jet skis and able to perform a rescue if necessary.

Long wiped out on the second wave of a five-wave set and was dragged deep underwater. He activated the inflatable vest he was wearing by pulling a tab. The vest failed to inflate and bring him to the surface; Long was stranded underwater as massive waves barreled above him.

Long remained calm. He had trained for this type of emergency and can hold his breath for five and a half minutes. Long had to make a decision: Swim to the surface for air and rescue, or wait for the third wave in the set to pass. Waiting out the next wave would be more prudent; swimming to the surface would burn precious energy and oxygen. If he tried to surface as the wave was breaking, the force of the wave would prevent him from reaching air. But Long was running out of oxygen and anxious to get to the top. He decided to go for it. The next wave was already upon him as he approached the surface and, a mere 2 feet from air, Long was pushed back down 30 feet. The force of the third wave shook the remaining breath from his lungs, and he went into a state of shock. His body convulsed, and he fought every instinct to start breathing and inhale water.

With zero oxygen, Long used his last burst of energy to grab on to the leash around his ankle that tethered him to his board. He climbed his leash up to his board, which at that point was submerged 10 feet below the surface.

Cramping, numbness, and full-body convulsions returned. Long could not get a solid grasp on his board and lost consciousness as the fourth wave passed above him. Thankfully, he was still attached to his board, which had floated to the surface. Another surfer working rescue that day spotted Long's board, dove in, and saved him. Long was placed on a sled attached to a rescue jet ski and taken to the expedition's boat moored nearby.

Long regained consciousness once he got to the boat. Still in shock, he coughed up foamy blood and was given oxygen before being airlifted to a hospital, where he made a quick physical recovery. Within days, he was back in the lineup, surfing Mavericks in northern California.

You might not think a big wave surfer and people who work in finance have much in common.

But they both face the same problem: how to balance risk and reward.

I went searching for answers at a risk conference for big wave surfers. It was a little strange at first to see the surfers out of their natural habitat in a neon-lit hotel conference room with only one small window. In many ways, the Big Wave Risk Assessment Group (BWRAG) safety summit on the North Shore of Oahu, Hawaii, was different from other risk conferences. Everyone was tan and in excellent physical shape—even participants well into their 60s. Most wore shorts, T-shirts, and flip-flops. The day included workshops on holding your breath, led by deep-sea divers. Former US Army Special Forces officers instructed us on how to tie a tourniquet and perform an emergency tracheotomy with a pen. At one point, someone used the word "gnarly" as a technical term.

But in other ways, the BWRAG safety summit was just like a pension risk conference: Most of the attendees were men; a majority of the time was spent looking at PowerPoint slides of numbers and figures; and participants engaged in impassioned debates about who bears responsibility for risk when it can harm others.

The goal of the conference is to apply risk science to big wave surfing. Rather than going into the ocean and just hoping for the best, surfers are schooled in the "art" of risk: how to form calculated, informed assessments of risk and then manage it. The risk mitigation tools appear to differ from those used in financial markets, but they serve a similar purpose. Surfers monitor wave conditions, identify hazards (e.g., sharks, crowds, rocks, deep water, cold), and make probability estimates on the odds things will go wrong.

Using this process, surfers can make informed decisions regarding the trade-off between the thrill of riding a big wave and the risks involved in doing so. Take a common hedging strategy—giving up some upside in exchange for reducing downside risks. Surfers hedge by picking the right wave to surf. They do not just surf the biggest wave they can find; they balance risk and reward. For example, waves tend to travel in groups, known as sets. If the waves in front of you are part of a five-wave set, a hedging strategy is taking the fourth wave, even if the first or second one is bigger. That way, after you finish, or wipe out, you are not pounded or held underwater by the next big waves in the set.

Long says he usually takes later waves in a set. That day in 2012 was an exception. He had been out in the water for more than four hours and had already let lots of great waves pass, only to find the later waves in the set too small or unsurfable. The second wave he took just happened to be part of the first large five-wave set that day. Anyone who invests in markets can relate to his decisions: You may sit on the sidelines of a very risky asset as it goes up and up before you finally buy it in the market, only to have it then crash. Long is known to be cautious, but even he was tempted to take extra risk that day and paid the price.

Brian Keaulana is one of the founders of BWRAG. He introduced jet skis to big wave surfing; these invaluable tools are used to rescue surfers who wipe out. Jet skis can cut through rough waters so an injured surfer can be brought to shore quickly to receive medical attention. They are effectively insurance, providing protection if things go wrong while still offering the unlimited upside of surfing big waves. A jet ski saved Greg Long's life.

Keaulana is in his mid-50s, a lifelong Hawaiian big wave surfer, former lifeguard, and now noted stuntman. He played himself in an episode of *Baywatch*. Keaulana speaks proudly of

the Hawaiian values of knowing and respecting the water. He was profoundly influenced by his father, Richard "Buffalo" Keaulana, a big wave surfing legend and patriarch of a surfing dynasty.

In the late 1980s, Brian Keaulana was a contestant in one of the largest big wave surfing competitions, the Eddie (named after legendary Hawaiian surfer Eddie Aikau), on Waimea Bay. He wiped out in rough water. As Keaulana swam, he thought about a surfer who had recently wiped out and drowned while Keaulana was the lifeguard on duty. He had been unable to reach the surfer in time because of the turbulent ocean. Now Keaulana found himself in similar conditions, and as he rode out the rough surf, his friend Squiddy came by on a stand-up jet ski and asked if he was okay. Squiddy could not rescue him on a stand-up jet ski, but a "light went on" for Keaulana. He realized jet skis would allow him to reach surfers in much rougher conditions, and he could save more people.

On his way home from the Eddie, Keaulana hunted down all the literature he could find on jet skis. Yamaha had recently released the WaveRunner, a sit-down jet ski that could make rescues in treacherous water possible. Keaulana took out a loan, bought one, and started experimenting. After some trial and error, he attached a boogie board to the back as an early rescue sled and started using jet skis in rescues.

Soon after Keaulana introduced jet skis to the surfing world, big wave surfers such as the legendary Laird Hamilton started using them to take the sport to new heights. Surfers constantly crave big waves, but the size of waves they could ride used to be limited because paddling fast enough to catch very large ones was too difficult. Hamilton and his friends started using jet skis to launch themselves onto big waves no human could reach by paddling. Called tow-in surfing, this technique allows surfers to ride 70- and 80-foot waves.

Keaulana has done some tow-in surfing himself and does not seem bothered by the way that jet skis have changed the sport. But he worries that people are using them as a crutch to surf waves beyond their skill level: "It gets abused. Maybe people should be out there in 10-foot water, not 20. They are counting on jet skis to save them and are out there for the wrong reasons—to get noticed, for practice. They count on skis and lifeguards to rescue them. One guy [in large surf] says to me, 'Keep an eye on me, I am not that good.'"

Jet skis in big wave surfing serve the same purpose that options (another form of insurance) do in financial markets. Both act as a way to insure oneself against downside risk and still leave unlimited upside. Both can also be used to assume even bigger risks or even to take on more leverage to amplify returns or surf 80-foot waves. And these big risks pose costs to others. Excessive risk-taking in finance transfers risk to individuals or institutions who are unprepared to bear the risk and who then sometimes require a government bailout. When surfers need to be rescued, resources are diverted from helping others in need, the lives of rescuers are put at risk, and extra expense could be involved if the coast guard must be called in to assist.

Safety innovations enable people, whether novices or experts, to take on more risk than they can handle. What went on in the financial industry during an event such as the 2008 global financial crisis has often been held up as a failure of complex risk models. But what goes wrong is often much simpler. Risk models cannot account for everything that could possibly happen, and they are not meant to. A 25-to-1

leverage ratio is the equivalent of surfing an 80-foot wave. You can do all your research, bring in jet skis, and wear an inflatable vest, but oceans and financial markets are not always predictable. There is no way to make an 80-foot wave safe, and there is no way to a make a 25-to-1 leverage ratio risk free.

The situation was not always so complicated in the finance world. In the 1950s and 1960s, investors in financial markets were more typically the few people who could afford to lose money, and the millions of complicated derivatives later used to hedge risk did not exist. In Buffalo Keaulana's youth, there were only a few dozen big wave surfers, and they did not even have leashes to tether them to their longboards (this important safety innovation was introduced in the 1970s). Before surf leashes and jet skis, when surfers wiped out and lost their boards, they might have to swim more than a dozen miles to find a safe place to go ashore. In that era, big wave surfers were all exceptional swimmers and knowledgeable about the ocean. Today, almost all surfers have a leash on their board. Leashes make surfing more accessible to weaker swimmers. From the moment they were introduced, leashes were controversial and divisive in the surfing community because their use meant less-skilled surfers would be in the water. Each new innovation—jet skis and, more recently, inflatable vests—makes the sport safer, but it also encourages people to take more risk.

I asked Brian Keaulana about what he calls the "double-edged sword of safety." I questioned whether surfing would be better without all the technology, if we could go back to a simpler time when only surfers such as Buffalo with excellent training and superhuman swimming skills were in the water. Keaulana thought long and hard about it, but decided no, the technology has been worth the trade-offs.

"It also helped us understand our mind and our physical limits," Keaulana added. "Because we could never test our limits without the use of technology. No one surfed North Shore before. Mostly military people came here, they died, then [we got] better boards, [and more people thought] oh, we can surf this. Then the jet ski came, and we went to the outer reefs. It raised the level of what our minds and bodies can do out in the environment with proper use of technology, but it takes the right people with the right equipment."

He also added that the technology increased the scope of big wave surfing, offering more opportunities for surfers, including sponsorships and increased fame and exposure.

In both surfing and finance, better insurance means more opportunity and growth. Financial innovation promises to offer cheaper and less risky ways to finance new technology.[10] As technology evolves, so do the financial innovations that finance it. New innovations in finance that made managing risk possible can explain everything from the rise of Ancient Rome to the growth of modern cities. The evolution of finance since the 1970s has powered more risk-taking, which has meant more wealth flowing to poor countries, increased development, and less global poverty. In richer countries, financial innovation has made possible many of the advances we enjoy today. A more global, integrated economy requires financial tools that did not exist in the 1950s and 1960s. But globalization and spreading risk around also mean more systemic risk, as we saw in 2008 and 2020. The key to better risk-taking lies in better education on how to use the tools properly and on understanding their limits.

[10]William N. Goetzmann, *Money Changes Everything: How Finance Made Civilization Possible* (Princeton, NJ: Princeton University Press, 2017).

## CONCLUDING THOUGHTS

Sometimes risks do not work out, and big shocks come along that no one could have predicted, but this is the price we pay for a growing economy and more prosperity. The trick is finding ways to limit the collateral damage from risks gone wrong. No technology can eliminate risk. And, worse, we are often hit by shocks we never could have seen coming, such as the novel coronavirus. More globalization means more growth because we can diversify where we buy goods. Most of the time, that means less risk, cheaper goods, and more growth. But it also introduces tail risk when a virus appears, economies shut down, and supply chains are disrupted.

Risk reflects what we can measure with data and past experience. What we can measure, we can manage. We can hedge risk that we can define and with which we are familiar. We can insure against risks that have occurred before.

Uncertainty involves the risks we never could have imagined, that we thought were improbable, and that are immeasurable. Every time we take a risk, we not only expose ourselves to downside we cannot avoid but also are more vulnerable to uncertainty. This dynamic is true whether you are a CFO who decides to take on more debt and then experiences an unforeseen shock that shuts down business for several months, or whether you are a surfer facing a tsunami.

But this weakness does not mean risk management is flawed or impotent. Risk measurement and management help us understand typical challenges and enable us to think through what could happen. Risk management is by definition always incomplete, but even something that works 90% or even 10% of the time is helpful. And even when we are faced with uncertainty, risk management can adapt and be reoptimized to lessen the new, previously unimaginable downside risks.

We can expect many critiques of risk management in the coming months. We will see 401(k) portfolios rise and fall. Businesses will fail and need support because they did not have enough capital. Pressure will be put on the financial sector. Models that predicted damage from the virus will fall short because they had to rely on incomplete data. There has never been a better time to communicate the value of risk management, despite its imperfections. It is the best flawed tool we have to make the world less risky, whether you are a finance professional, a movie mogul, a professional gambler, a surfer, or a public health provider.

Risk models are in many ways a parable, an abstraction to assist us in understanding a complex, ever-changing world so we can make decisions. Parables are also often simplified and incomplete, but they too help us learn and make decisions. This is why storytelling and risk modeling are complements. As we manage risk and uncertainty in a world that feels complex and unpredictable, investigating risk in some unusual places helps us not only to understand the value of our models and their limitations but also to communicate their value.

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