

# **What the Luck?**

**The Surprising Role  
of Chance in Our  
Everyday Lives**

**Gary Smith**



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## A Better Crystal Ball

**A** STUDY ASKED HUNDREDS OF MEN AND WOMEN TO ESTIMATE THEIR height and weight. The participants were then measured and weighed and the estimates were compared to the measurements. The study found that tall people tended to underestimate their height, while short persons exaggerated their height. People apparently wanted to be more nearly average. The same was true of weight. Heavy persons tended to understate, while thin persons overstated.

The authors of this study concluded that the estimates “converged towards a pair of desired measures.” They suggested that, “Our observations also have implications for studies of self-appraisal and body image.” Evidently, people didn’t want to stand out, sort of like the Japanese proverb, “The stake that sticks out gets hammered down.” In Australia, it’s called the Tall Poppy Syndrome.

As appealing as that interpretation might be, there is another explanation: regression to the mean. There is an imperfect relationship between our estimates and the actual measurements. Think about it. How much do you weigh at this moment? Your weight fluctuates day to day and even hour to hour and different scales give different measurements. Your estimate of this fluctuating weight is inevitably inaccurate.

To demonstrate the consequences of the imperfect relationship between estimated and measured weight, I made some hypothetical calculations. I assumed that each person’s measured weight fluctuates randomly around an average value, at any point in time, being either average or four pounds above or below average. Similarly, I assumed

that a person's estimate of his or her weight is either average or five pounds above or below average. For example, if a person's weight averages 160 pounds, measured weight is equally likely to be 156, 160, or 164 pounds and estimated weight is equally likely to be 155, 160, or 165 pounds. The measurement errors and estimation errors are completely independent. People are not biased one way or another.

Finally, I assumed that the average values for the group of people being studied are evenly distributed at five-pound intervals between 140 and 200 pounds. This range is a bit narrow and the uniform distribution is unrealistic, but these simplifications help us focus on the implications. The fluctuations of measurements and estimates may also be a bit high, but I want the consequences to show up clearly in the graphs.

**Figure 1**

**People Want to Believe that They are Close to Average**

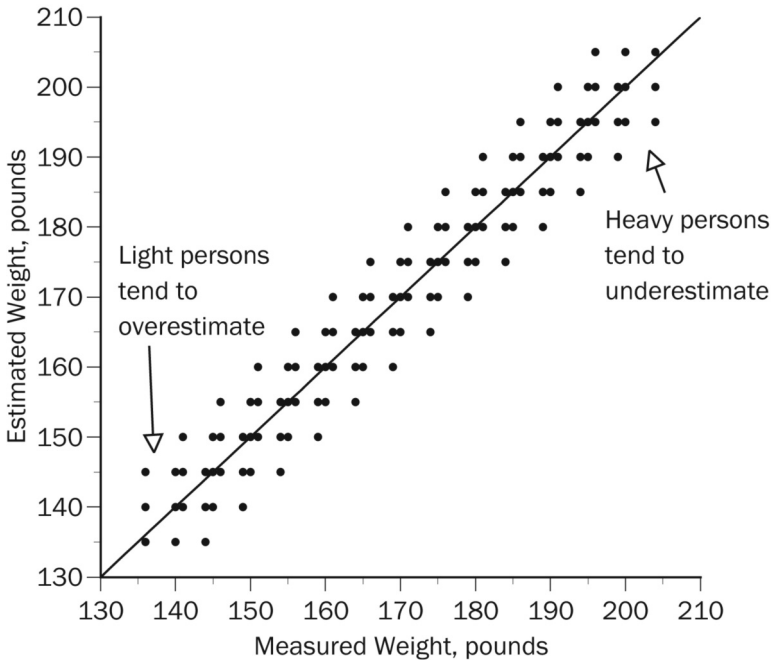


Figure 1 shows the measured and estimated weights for these people. The points above the 45-degree line are people who overestimated their measured weight; the points below the line are those

who underestimated. Even though the measurements and estimates are unbiased, there is a pattern to the data. As in the original study, heavy persons tend to underestimate their measured weight, while light persons overestimate their measured weight. The estimated values are closer to the mean than are the measured values, suggesting that people desire to be closer to average than they really are, even though I assumed that every person's estimate is completely unbiased.

**Figure 2**  
**People Want to Believe that They are Far From Average**

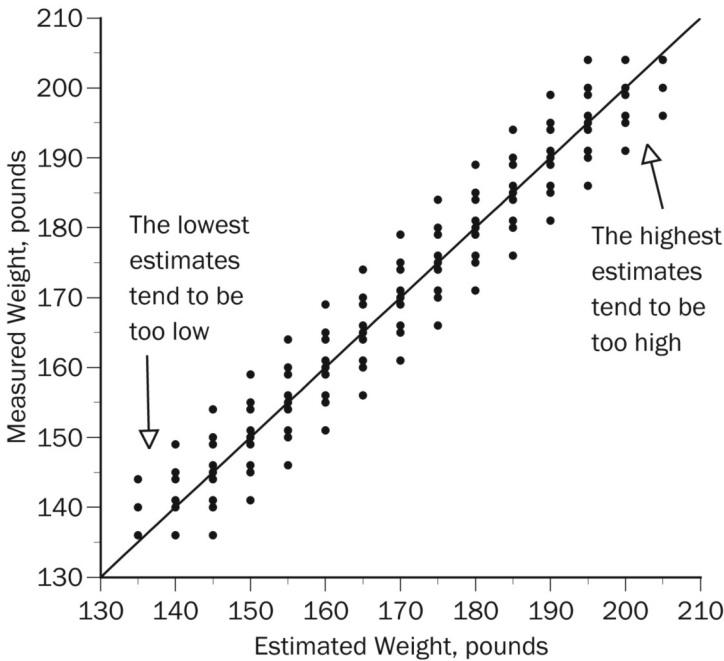


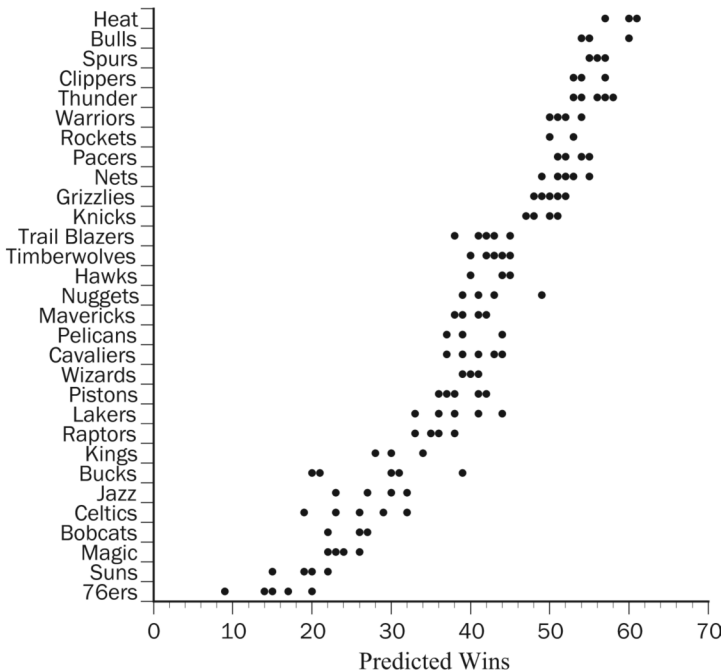
Figure 2 reverses the axes. People above the 45-degree line weigh more than they estimated; people below the line weigh less than estimated. Now, it seems that people overestimate how far they are from average because they don't want to be average! That interpretation is just as wrong as the opposite conclusion, based on Figure 1, that people want to be average. Remember, I assumed that the estimates and measurements are completely unbiased. People may want to be near average, or far from average, but we can't tell from a comparison of estimated and measured values.

This is very similar to our earlier example of the most intelligent women marrying less intelligent men and the most intelligent men marrying less intelligent women. All we are seeing in Figures 1 and 2 is regression to the mean.

### Predicting Winners

Before the 2013-2014 National Basketball Association (NBA) season, five widely respected analysts (ESPN, Bleacher Report, Matt Moore, Royce Young, and Zach Harper) predicted the number of wins by each team during the 82-game regular season. Every analyst predicted the Miami Heat to finish first and the Philadelphia 76ers to finish last. For Miami, the predicted number of wins ranged from 57 to 61 games, with an average of 59.8. For Philadelphia, the predictions ranging from 9 to 20 games, with an average of 15. Figure 3 shows the five predictions for each of the 30 teams.

**Figure 3**  
Five Expert Forecasts of 2013-2014 Regular-Season NBA Wins

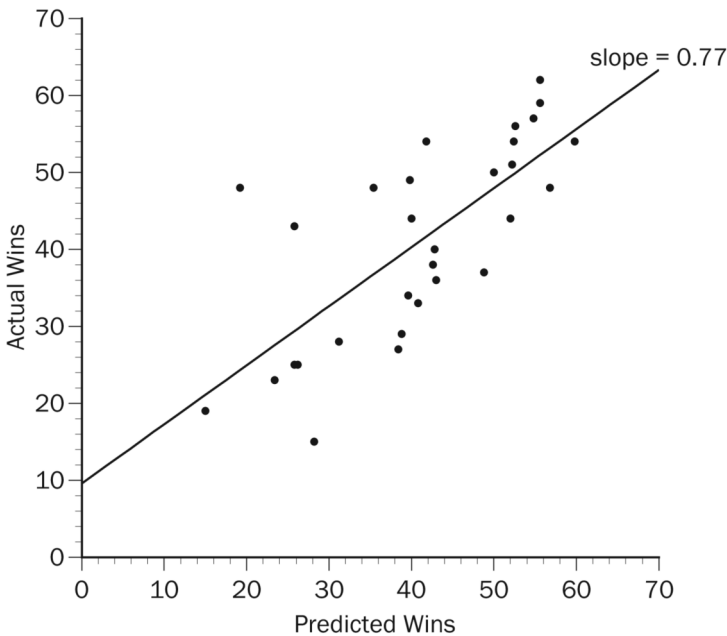


The variation in the expert predictions reflects the uncertainty in game outcomes. The best team doesn't win every game (Miami's predicted 60 wins out of 82 games is 73 percent) so it is not surprising that there is uncertainty about how many games a team will win over the course of a season.

As it turned out, the Heat (predicted to finish first) won 54 games (fifth best in the league) and the 76ers (predicted to finish last) won 19 games (second from the bottom).

Figure 4 shows the imperfect relationship between the actual number of wins and the average prediction of the five analysts. The slope is 0.77, which means that teams predicted to win 10 games more than average tended to win only 7.7 games more than average. The performance of the teams predicted to do the best and worst was closer to the mean than anticipated. The extreme NBA forecasts could have been improved by shrinking them towards the mean.

**Figure 4**  
**Average Prediction and Actual 2013-2014 Regular-Season NBA Wins**



## Interest Rate Predictions

Should I take out a fixed-rate or variable-rate mortgage? Will rising interest rates crush the stock market? A lot of people are paid a lot of money to predict changes in interest rates, but interest rates are almost as hard to predict as stock prices. One thing we can be certain of is that the predictions aren't perfect, which suggests that large predicted changes are more likely to be overestimates than underestimates. If so, the accuracy of predicted interest rate changes can be improved by using Kelley's equation to shrink the predictions.

If we interpret Kelley's equation from a Bayesian perspective, a reasonable prior prediction is no change in interest rates. If the predicted changes were always correct, we would use each prediction as is. If predictions were unrelated to actual changes in interest rates, the forecasts would be useless, and we should ignore the forecasts and predict no change. In between these extremes, the Kelley-equation prediction of the change in interest rates is closer to zero than is the expert prediction.

Reid Dorsey-Palmateer and I applied this reasoning to interest rate forecasts from the Survey of Professional Forecasters. The American Statistical Association (ASA) and the National Bureau of Economic Research (NBER) started the ASA/NBER Economic Outlook Survey in 1968. In 1990, the survey was taken over by the Federal Reserve Bank of Philadelphia and renamed the SPF. Approximately 35 professional forecasters are surveyed each quarter. Quarterly forecasts one-to-four quarters into the future are available for the three-month Treasury bill rate, ten-year Treasury bond rate, and Moody's AAA corporate bond yield.

In each case, we used Kelley's equation to adjust the average predicted change in interest rates, based on the historical correlation between predicted and actual changes. Table 1 shows that the adjusted predictions were generally more accurate than the SPF forecasts, though the differences are most persuasive for long-term bonds.



**Table 1**  
**Predicting Changes in Interest Rates**

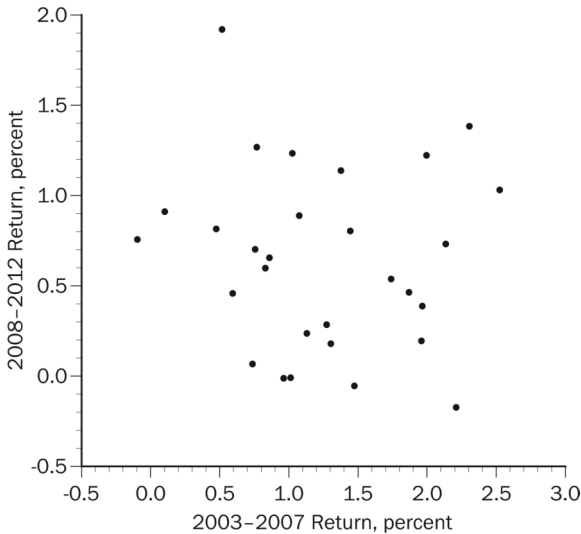
<i>Interest rate (months ahead)</i>	<i>More Accurate</i>	
	<i>SPF</i>	<i>Adjusted</i>
T-bill (+1)	37	51
T-bill (+2)	35	50
T-bill (+3)	37	47
T-bill (+4)	36	46
T-bond (+1)	9	37
T-bond (+2)	14	30
T-bond (+3)	15	27
T-bond (+4)	12	28
AAA (+1)	26	62
AAA (+2)	25	61
AAA (+3)	22	62
AAA (+4)	28	54
Total	296	555

## **The Next Best Thing to Knowing Someone Who is Usually Right**

Many financial advisors and portfolio managers use a sophisticated procedure called mean-variance analysis to choose stock portfolios that offer an attractive combination of relatively high expected returns with relatively low risk. Typically, historical data are used to estimate the characteristics of the stocks in the portfolio, and a computer program is used to choose an optimal portfolio.

However, as the warning labels say, “Past performance is no guarantee of future results.” Figure 5 shows a scatterplot of the average monthly returns on Dow Jones Industrial stocks for the five-year period 2003 through 2007 and for the subsequent five-year period 2008 through 2012. The correlation is slightly negative, but so close to zero as to be meaningless. The 2003-2007 returns are not reliable predictors of the 2008-2012 returns.

**Figure 5**  
**Correlation Between Average Monthly Returns**



This loose correlation between one five-year period and the next suggests that there is regression to the mean and room for Kelley's equation to guide us to better portfolios. Here, if we account for regression to the mean, we make more accurate forecasts of 72 percent of the average monthly returns for 2008 through 2012.

The same principles apply to asset classes, like U.S. stocks and Treasury bonds. The fact that stocks have done better or worse than bonds over the past 10, 20, or 100 years doesn't mean that the same will be true over the next 10, 20, or 100 years.

One way to handle this reality is to tweak the historical data by changing implausible numbers into plausible numbers. This is, in fact, what Dave Swensen has done in his management of the Yale Portfolio. For example, over the past 90 years or so, U.S. stocks have beaten U.S. Treasury bonds by about eight percent a year, but Swensen expects that, going forward, stocks, on average, will beat bonds by only about four percent a year.

Since Swensen took over in 1985, he has increased the return on Yale's endowment, while reducing the risk. A 2005 cover story for the *Yale Alumni Magazine* was titled "Yale's \$8 Billion Man," referring

to the fact that Yale's \$14 billion endowment would have would have been \$8 billion lower if it had earned the same investment returns as the average college and university endowment over the preceding 20 years. In 2013, Yale reported that the value added over the preceding 20 years was \$18 billion.

It is not really possible for you or me to emulate Swensen since he invests in gas fields and forests that we can't afford and in hedge funds and private equity deals that we can't access. He also has an uncanny knack for picking good managers. Swensen turned down one fund manager who later crashed and burned because the only thing Swensen knew for certain about this man's approach was that he was greedy. Talking about Bernie Madoff, who turned out to be running a massive Ponzi scheme, Swensen said, "If you sat down and had a conversation with him about his investment activities and couldn't figure out that he was being evasive, shame on you."

It has been estimated that some 50 to 80 percent of Yale's success in outperforming other colleges and universities has been due to Swensen's knack for finding managers who outperform the average manager in their asset class, with the remainder due to his use of mean-variance analysis to select a superior asset allocation.

Two students and I applied mean-variance analysis to assets that ordinary people can invest in: a U.S. stock fund, a Treasury bond fund, and a money market fund. We considered three approaches: historical returns, expert opinion, and expert opinion adjusted for regression to the mean.

The historical returns were the past returns on Treasury bonds, U. S. stocks, and money market funds. Our expert opinion came from the Livingston survey. In 1946, a Philadelphia newspaper columnist, Joseph Livingston, started a semiannual survey of business economists' forecasts of macroeconomic variables. The Federal Reserve Bank of Philadelphia started a data base of the survey responses in 1978 and took over the survey after Livingston died. The Philadelphia Fed surveys professional economic forecasters from a wide variety of industries, including non-financial businesses, investment and commercial banks, academic institutions, and government agencies. We looked at the expert forecasts of bond and stock returns.

Our regression-to-the-mean portfolio was based on the argument that when predicted returns are unusually high, these predictions are likely to be too high. For example, if the average stock return has historically been 10 percent and the expert prediction is 20 percent, a better prediction might be closer to the historical average of 10 percent. So, our regression-to-the-mean portfolio shrunk the Livingston predictions towards the historical values.

During the years we studied, annual predicted stock returns ranged from -0.3 percent to 8.8 percent, while predicted bond returns ranged from -1.4 percent to 4.3 percent. These forecasters were surely taking current economic conditions into account, not just using historical averages. It is also clear (and unsurprising) that their forecasts are imperfect. What may be surprising is that their predicted bond returns were essentially uncorrelated with actual bond returns, demonstrating how hard it is to predict interest rates. Their stock forecasts were negatively correlated with actual stock returns. Yep. When these professional forecasters were optimistic, the stock market tended to do poorly; when they were pessimistic, the market tended to do well. Although their forecasts might seem worthless, they are not. It may be as profitable to know forecasters who are usually wrong as to know forecasters who are usually right.

It turned out that the regression-to-the-mean portfolio crushed the portfolio based on the historical data and the portfolio based on the Livingston forecasts. Over the thirteen-year period we studied, an initial investment of \$10,000 in a portfolio based on either historical data or the Livingston forecasts grew to \$30,000, while the portfolio chosen by the regression model grew to \$48,000 (60 percent higher).

Not only can we avoid being misled by regression, we can profit from it. We can out-predict professional forecasters by taking into account the regression they overlook.

## PRAISE FOR **WHAT THE LUCK?**

“Smith provides examples from almost every aspect of everyday life, from sports and education to business and health, in an accessible and enjoyable exploration of the role of luck in our lives.”

—*Library Journal*

“Read this book. Then give it to your family and friends. There is no other single idea that will better improve your understanding of the world, and judgment of the future, than regression to the mean.”

—CADE MASSEY, Professor, Wharton School of Business, University of Pennsylvania

“Gary Smith’s *What the Luck?* alerts us to many subtle and unappreciated consequences of one of life’s great truths: it has its ups and downs.”

—GEORGE AKERLOF, Georgetown University, Nobel Laureate in Economics 2001

“*What the Luck?* is a fabulous, funny, and completely accessible explanation of the pervasive misreporting and misunderstanding of what statistics really mean in common discourse. If you are interested in what is really going on in sports, gambling, genetic inheritance, and everything else that is misrepresented statistically, you will love this book. I wouldn’t wait for the TV miniseries, I’d take *What the Luck?* to bed now.”

—BRUCE CHAPMAN, Professor of Economics, Australian National University

“The concept of ‘regression to the mean’ is frequently misunderstood, and Smith’s clear, understandable, and witty writing style helps him guide the reader through confusion about the role of chance and how random variations influence so many choices and perceptions of truth. Through his relatable examples, we can see through fallacies, change the way we see our lives, and learn to rely less on random chance.”

—*WITF Harrisburg* (November Book Club Pick-Of-The-Month)

“This book deeply enriches readers’ understanding of the ubiquitous role of chance in everyday life. The book is so wonderful that I predict the author’s next book will be less wonderful. Why the pessimistic prediction? This book will painlessly—even enjoyably—teach you why.”

—MICHAEL MURRAY, Charles Franklin Phillips Professor, Bates College

“*What the Luck?* is a humorous, entertaining book citing real-life examples, from areas as diverse as gambling, sports, scholastic achievement, medicine and the stock market to explain how randomness and ‘luck’ are far more

prevalent in our daily lives than we may realize. Reading this book also helped remind me that regression is often a more meaningful driver of stock (and bond) performance than the underlying business fundamentals. This is an important lesson for any serious investor.”

—MIKE SCHIMMEL, Portfolio Manager,  
Kayne Anderson Capital Advisors

“A tremendously entertaining and revealing read... quick and engrossing... a must read for those who approach the world with educated insight! Two thumbs up!”

—SIMEON NESTOROV, CFA, Managing Director,  
Berkeley Square Inc.

“*What the Luck?* is a must-read for those in the healthcare profession. We are constantly inundated with research on the latest and greatest therapy and understanding regression toward the mean can help us better interpret and apply this research to the daily care of our patients.”

—ROBERT SALLIS, MD, Director of Sports Medicine, Kaiser Permanente Medical Center, Clinical Professor of Family Medicine at UC Riverside School of Medicine, Past-President of the American College of Sports Medicine (ACSM), Chair of Exercise is Medicine, a joint initiative of ACSM and the American Medical Association

“In clear, entertaining prose and the use of telling, useful, and even charming examples, Smith dissects one of the most fundamental principles of how the world works—and how our intuitions often fail to catch on. Anyone who wants to think more clearly and act more rationally will profit from reading this book.”

—TOM GILOVICH, author of *How We Know What Isn't So* and Professor at Cornell University

“There is an infectious clarity of statistical reasoning in Gary Smith’s work. His friendly, logical, systematic writing entertains and gives a confidence of membership in an inner circle as brilliant as Smith himself.”

—ERIC ENGBERG, Data Scientist and Software Engineer, Wells Fargo

“People often underestimate the impact of luck in their lives. *What the Luck?* is eminently readable and entertaining, filled with colorful examples.”

—SEBASTIAN THOMAS, Director, Head of US Technology Research, Allianz Global Investors

“The beauty of this book is it sheds light on the need for humility when one experiences good fortune, and the importance of hope after misfortune. This nuanced understanding will help readers make better decisions in all realms of their lives.”

—JONATHAN ABELSON, MD, radiation oncologist

“Regression toward the mean is the key to the universe. Of course, learning about this is both a blessing and a curse. Once people have digested this book, they will absolutely see regression everywhere and understand its effect, but they will also be driven crazy, as you undoubtedly are, when they hear all of the unsupported and sometimes absurd explanations people cling to in order to make sense of it.”

—JAY CORDES, Data Scientist

“Humans are prone to search and ‘find’ causal drivers of the events that shape our lives. In reality, we are impacted by chance more often than we think. Professor Smith uses simple reasoning and vivid examples to help us decipher truth from fiction, thereby helping us to make better decisions.”

—BRYAN WHITE, Founder, Sahsen Ventures

“Smith uses a wide variety of real-life examples to illustrate why conventional wisdom often fails to acknowledge that one of the most important ingredients is luck.”

—KARL J. MEYER, Director of Strategy,  
Hewlett Packard Enterprise

“As a lifelong sports fan I’ve always been puzzled by a phenomenon in which a team wins a championship and, after failing to repeat the next season, everyone from fans to management looks for what went wrong and begins trading players and changing strategies, thereby dooming the team to do even worse the season after. Gary Smith has solved this puzzle, and many more in all walks of life, through the concept of regression to the mean, one of the most powerful and least understood factors in how things turn out in life. You will not look at the world the same after reading this illuminating book.”

—MICHAEL SHERMER, publisher of *Skeptic* magazine, columnist for *Scientific American*, and author of *The Moral Arc* and *Why People Believe Weird Things*

“Absorbing Gary Smith’s message will help us avoid common but costly mistakes like putting too much of our wealth in investments that have little probability of out-performing the market, or expecting ourselves (or others) to perform in ways we (or they) can’t, or feeling guilty for what happens that isn’t really our fault. Lots of people everywhere can benefit from the principle he so clearly explains, and many of the concrete examples he uses to illustrate it will strike home.”

—BENJAMIN M. FRIEDMAN, William Joseph Maier Professor of Political Economy, Harvard University, and author, *The Moral Consequences of Economic Growth*

“*What the Luck?* is a tremendously entertaining and revealing read. A quick and engrossing piece of work, it is a must read for those who approach the world with educated insight!”

—SIMEON NESTOROV, CFA, Managing Director,  
Berkeley Square, Inc.

“Vagaries of chance are part of our lives, whether we like it or not. What the Luck? presents serious stuff in an eminently readable and entertaining manner. Using colorful examples, it teaches humility for good fortune and hope after misfortune. A wonderful read!”

—CRISTIAN CALUDE, Professor of Applied Science, University of  
Auckland, and Giuseppe Longo, Centre Cavallès, CNRS et Ecole Normale  
Supérieure, and the Department of Integrative Physiology and Pathobiology,  
Tufts University School of Medicine

“Gary Smith has another winner! His ability to combine entertaining writing with meaningful analysis should put him at the top of every thinking person’s reading list.”

—WOODY STUDENMUND, Laurence de Rycke Professor  
of Economics, Occidental College

“Decision makers everywhere should read it to avoid making the mistakes of their predecessors.”

—ANDREW GELMAN, Professor of Statistics and Political Science,  
Director of the Applied Statistics Center at Columbia University

“Smith uses entertaining and intuitive examples to show how regression to the mean explains patterns in education, business, and medicine.”

—ANITA ARORA, MD, MBA, RWJF Clinical Scholar at Yale University

“Smith provides a fascinating and accessible overview of regression toward the mean in sports and other domains. If you play fantasy sports, you should go get a copy of this book at once (while hoping your competitors have not done likewise).”

—ALAN REIFMAN, author of *Hot Hand: The  
Statistics Behind Sports’ Greatest Streaks*

“If you can combine the insightful lessons of this book with equanimity in decision-making, your foresight may become remarkable—and it won’t be due to luck.”

—MICHAEL SOLOMON, Partner,  
Leonard Green & Partners, Private Equity



“Few statistical concepts are as important to understand today as regression to the mean. Through fascinating tales, *What the Luck?* provides a panoply of examples of this essential phenomenon in sports, business, life, and more. I heartily recommend it.”

—PHIL SIMON, award-winning author of *Message Not Received: Why Business Communication Is Broken and How to Fix It*, lecturer at Arizona State University’s W. P. Carey School of Business

“After reading *What the Luck?*, you will appreciate how to separate the sense from the nonsense when it comes to making decisions about your health, your money, your test scores, or your favorite sports team. Written with accuracy and humor, I highly recommend it.”

—ARTHUR BENJAMIN, Professor of Mathematics, Harvey Mudd College author of *The Magic of Math: Solving for  $x$  and Figuring Out Why*