

## INTRODUCTION

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By ratiocination, I mean computation.

—Thomas Hobbes, 1588–1679

If I had to bet on the best long-term predictor of good judgment among [a group of political and economic forecasters], it would be their commitment—their soul-searching Socratic commitment—to thinking about how they think.

—Philip Tetlock, *Expert Political Judgment*, 2005

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The premise of this book is that the practice of fundamental research can help decision makers adapt to a world of “Black Swans,” the seemingly improbable but highly consequential surprises that turn our familiar ways of thinking upside down. Most commonly associated with the work of Benjamin Graham and David Dodd, fundamental research is the study of causal variables underlying the performance of companies, industries, or economies, with the goal of predicting future developments. The research strategies in this book build upon that heritage, but they have been updated for the growing importance of computer technology, and they have a special focus on volatility. To be sure, fundamental research (with or without computers) will not provide a sure-fire way to success. We are all destined to be surprised far more often than we would like. Nonetheless, this book shows how fundamental research can help us forecast *some* Black Swans, recognize the possibility of others *just a little bit earlier*, and when surprise is unavoidable, *react more quickly* and (one hopes) mitigate the losses (possibly catastrophic) that result from misjudgments during periods of extreme volatility.

This book is based on my experience as a Wall Street analyst, but it is aimed at a much broader audience. As a senior analyst at a major investment bank, I covered the so-called “specialty finance” sector consisting of firms like Countrywide, Fannie Mae, CIT Group, Sallie Mae, MasterCard, Discover, American Express, and Provident Financial. A decade’s worth of experience with this controversial group culminated in a ground-zero view of the mortgage, housing, and capital markets crisis that erupted in 2007. My experiences are directly relevant to investment professionals, such as analysts, traders, portfolio managers, risk managers, and chief investment officers, and possibly to retail investors. But the Black Swan phenomenon also takes wing in businesses and professions outside the securities industry. This book should be useful to senior executives, corporate strategists, regulators, and policymakers throughout the business world and in the intelligence community, the social sciences, journalism, and research in other fields—to anyone who must analyze, react, and strategize in the face of sudden change.

The capital markets crash of 2008 has taught more people to appreciate the idea of the Black Swan. Popularized by Nassim Nicholas Taleb, the Black Swan refers to a highly improbable event that seemingly could not have been anticipated by extrapolating from past data. Taleb references Europeans’ surprise on discovering the Australian black swan (*cygnus atratus*): they had believed that all swans by definition were white (*cygnus cygnus*) because these were the only kind they had ever seen. In the markets, Black Swan events are marked by sudden shifts in the level of volatility affecting stocks, sectors, and sometimes the entire economy, producing price shocks of multiple standard deviations, at least as measured by the sense of risk prevailing before the storm. Of course, students of the markets have long recognized that the volatility of financial returns has a slippery quality. Benoit Mandelbrot, the founder of fractal science, observed that financial markets had fatter tails than implied by the normal (or bell-shaped) distribution. Taleb warned that people tend to underestimate risk, especially when armed with statistical models built on normal curves. His criticism of financial risk management and, more broadly, his warnings to beware the Black Swan proved timely.<sup>1</sup> Mistakes during the crash of 2008 suggest that some decision makers missed his message or did not know how to implement it. That is where this book comes in: it offers a pragmatic approach to research, analysis, and decision making for an environment punctuated by episodes of extreme volatility.

The idea of the Black Swan should not be reserved for infrequent global shocks; rather, Black Swans occur at different scales all the time. Many now associate the concept with the recent downturn, widely regarded as the most severe since World War II, the kind of shock we all hope is infrequent. But there are plenty of smaller, more mundane swans, whipsawing individual stocks and sectors, even when the rest of the market is calm. (There are numerous examples in the chapters that follow). These surprises have several sources, including the inherently difficult-to-forecast complexities of the fundamental world, the collective behavior of people in markets, and the feedback effects between fundamentals and markets.

In formulating the strategies in this book, I have tried to place the principles of fundamental research on a more scientific foundation. Some of the old rules, like value investing, do not necessarily work when Black Swans are operating. Yes, there is much good sense in the value discipline. But the logic has failed in certain areas, such as in the insistence on valuation rules of thumb (like price-to-book ratios), uncritical assumptions about the mood swings of “Mr. Market,” or even “magic formulas” that are supposed to produce superior results—an approach that Graham himself dismissed.

To take fundamental research to the next level, I have tried to update the field’s commonsense principles for recent advances in finance theory, quantitative investing, and artificial intelligence, borrowing insights from Fischer Black, David Shaw, Marvin Minsky, Judea Pearl, and Herbert Simon, among others. To be clear, I am not an academic or a “quant.” But as a practicing analyst, I was always interested in using advanced computer modeling to improve my forecasts (as some of the stories that follow will show). I have seen how powerful analytics can produce a competitive edge. I have also seen analytics go dangerously wrong. When surprise strikes, it is no use blaming models. We live in an information-intensive environment, so decision makers must seek out the right balance between human intuition and computer analysis.<sup>2</sup> Basing fundamental research on the same scientific principles as fully quantitative disciplines strikes me as important, because with the ongoing growth in computational power, the two approaches may eventually converge.<sup>3</sup>

This book does not include any complicated math, but the reader will encounter probability trees, the basic tool for thinking probabilistically and an aid to making explicit our subjective estimates when peering into the future. Chapters 2 and 7 show how to use probability trees to map out multiple

scenarios for a set of critical causal variables. Chapters 3, 4, 5, and 6 use probability trees to illustrate how we should react to new information, as well as intuitive mistakes people sometimes make. Chapter 8 covers Monte Carlo analysis, the ultimate in computer-powered probabilistic reasoning.

The book is organized into three parts. The first focuses on *uncertainty*: what are its sources, and how can one make accurate predictions in a volatile world? The three chapters in this section cover the process of generating and testing hypotheses, thinking in scenarios, and finding the right level of confidence to make decisions.

The second part is about *information*. It shows how to zero in on critical issues, react accurately to new data, and obtain useful information from parties with strategic interests, such as corporate managers.

The final part of the book covers *analysis*. It showcases high-powered analytic techniques that can help resolve complex fundamental questions—and that can also be misused. The book ends with a discussion of judgment, a critical component of any decision, and the main defense against certain kinds of Black Swans.

Here is a more detailed road map:

## Part I—Uncertainty

**Chapter 1: Forecasting in Extreme Environments.** The first chapter starts with some of the main sources of excessive volatility: complex fundamentals, imitation among traders, and the interaction between markets and fundamentals, which can produce positive feedback effects. While forecasting in extreme environments is a daunting exercise, the basic approach involves generating and testing hypotheses, the basics of the scientific method. Most investors understand the importance of hypotheses. But maximizing accuracy requires two steps that real-world decision makers sometimes miss (especially outside of controlled laboratory conditions): calibrating models with the market and identifying catalysts to test hypotheses. The discipline of calibration and catalysts can prevent costly mistakes, as we will see in a story about Fannie Mae in late 2007, when signs of trouble were emerging but before the company's ultimate fate was sealed.

**Chapter 2: Thinking in Probabilities.** This chapter introduces the probability tree as a basic but versatile tool that helps in confronting uncertainty.

This tool can translate judgments about critical issues into stock-picking decisions, calibrate subjective assessments of risk with market volatility, and identify asymmetric outcomes. The case study turns back the clock to 2001, when a subprime credit card issuer called Providian offered me an early taste of extreme volatility.

**Chapter 3: The Balance Between Overconfidence and Underconfidence, and the Special Risk of Complex Modeling.** If extreme volatility is how the markets register surprise, then we may surmise (with hindsight) that investors were too confident. Indeed, it has become commonplace for psychologists and behavioral economists to assert that people are overconfident. Chapter 3 discusses the nature and limitations of human confidence as an emotional signal for decision making, including the risk that abundant information and sophisticated modeling may produce a special kind of false confidence. However, the behavioral critique takes us only so far, because without confidence no one would make decisions. Too little confidence can also be a problem; to make accurate decisions, one must search for the right balance. Further, in competitive businesses, where resources are limited, decision makers need to find that balance as quickly and efficiently as possible. In this chapter I recount successful recommendations based on limited information with unsuccessful calls based on advanced analytics. The chapter also reveals how flaws in modeling subprime credit risk contributed to the mortgage and housing crisis of 2007.

## Part II—Information

**Chapter 4: Fighting Information Overload with Strategy.** One reason people are surprised by episodes of extreme volatility is that the world contains more information than any person, team, or organization can process. Information overload is a fundamental reality of the modern world. True, ever more powerful computers assist us in organizing and analyzing information. Unfortunately, any computational device, human or silicon, is subject to physical and mathematical limitations, so computers cannot solve the problem of information overload. This chapter highlights the difference between acquiring information under an active strategy and reacting passively. The active strategy focuses on critical issues and combines intuitive reactions to new information with conscious decisions about how to allocate limited resources. A case study contrasts the information strategy of a hedge fund that anticipated

the subprime mortgage crisis of 2007 with the strategy of a mutual fund that did not.

**Chapter 5: Making Decisions in Real Time: How to React to New Information Without Falling Victim to Cognitive Dissonance.** If we had more time to react, then perhaps extreme volatility might be manageable. But a fast-changing world puts a special kind of stress on the human cognitive system. Terms such as *cognitive dissonance*, *change blindness*, and the *boiling frog syndrome* refer to the trouble people sometimes have changing their minds until the evidence is overwhelming—at which point it may be too late. Case studies from my research include examples of successfully reacting to new information, as well as mistakes.

**Chapter 6: Mitigating Information Asymmetry.** Access to management teams is high on many investors' wish lists, because rarely does anyone have more information about a business than the people running it. However, trying to acquire proprietary information from management teams (or other expert sources) can be difficult—and even counterproductive. The challenge lies in the *information asymmetry* between managers and investors. This chapter describes how to monitor a company's message for signs of internal contradiction, echoing the concept of cognitive dissonance discussed in Chapter 5. The chapter also explains how the right questions can elicit useful information.

## Part III—Analysis and Judgment

**Chapter 7: Mapping from Simple Ideas to Complex Analysis.** With hindsight, Black Swans may seem simple. Beforehand, it is not clear whether one factor will dominate, and if so, which one. Analysts use models to manipulate multiple variables across various scenarios. But modeling introduces its own source of complexity. The goal in “mapping out” a problem is to link the model's output to a handful of critical issues in a way that maximizes accuracy and minimizes complexity. This chapter will illustrate the practice of mapping with stories about MasterCard and American Express, two high-profile competitors in the global payments sector whose stocks produced surprising outcomes.

**Chapter 8: The Power and Pitfalls of Monte Carlo Modeling.** Monte Carlo modeling is a high-powered analytic technique used extensively in science, engineering, and financial “*quant*” applications. Monte Carlo models solve problems by generating thousands or millions of random scenarios,

serving up probabilistic estimates for problems too complicated to work through by hand, sometimes with eerily accurate results: I will recount how my research team used Monte Carlo modeling to estimate litigation risk at American Express and value Fannie Mae's stock at a time when the company was not publishing current financial statements. However, every model has its limits. Monte Carlo models produce dangerously unreliable results if the analyst does not understand the correlation between variables, which requires a sound grasp of underlying causal relationships. This chapter will explain how incorrectly analyzing correlation contributed to the 1998 failure of Long-Term Capital Management and, just a few years later, to the collapse of a new market in "*correlation trading*," which involved hundreds of billions of dollars worth of collateralized debt obligations.

**Chapter 9: Judgment.** Whether intuitive, conscious, or computer powered, analysis of any sort faces physical, mathematical, and human limitations. For this reason, successful decision making requires a final step, which we call judgment. More than just weighing the pros and cons, judgment involves thinking about—and when necessary changing—the process by which we analyze information and arrive at decisions. You see judgment at work when a decision maker weighs the output of a sophisticated computer model against intuitive insights. You also see it when executives evaluate their corporate strategy in light of changing competitive conditions.

Judgment is a critical defense against the Black Swans that arise when too many people follow the same style of analysis and decision making without recognizing that their collective behavior can bring about a break with past trends. This chapter illustrates the perils that can arise when this kind of recognition is lacking, including profiles of the "Quant Quake" of 2007, a risk management backfire that cost credit card issuer MBNA its independence, and the inherent flaw in the Basel II regulatory capital regime that unleashed a global banking crisis.

Because collective behavior is hard to quantify, judgment is more art than science. Further, the unpredictability of collective behavior is one of the main causes of market swings—and thus a reason that we will likely never banish the Black Swan. Rather than hoping we could, the more constructive attitude, in my view, is to learn to live with the phenomenon of extreme volatility. This means making realistic predictions and staying quick on your feet, ready to react accurately to surprises. To help decision makers with these tasks is the purpose of fundamental research, and this book.

