

WILEY FINANCE

Quantitative Value

A PRACTITIONER'S GUIDE TO AUTOMATING
INTELLIGENT INVESTMENT AND ELIMINATING
BEHAVIORAL ERRORS

+ website

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Table of Contents

[Cover](#)

[Preface](#)

[PART ONE: The Foundation of Quantitative Value](#)

[CHAPTER 1: The Paradox of Dumb Money](#)

[VALUE STRATEGIES BEAT THE MARKET](#)

[HOW QUANTITATIVE INVESTING PROTECTS
AGAINST BEHAVIORAL ERRORS](#)

[THE POWER OF QUANTITATIVE VALUE
INVESTING](#)

[NOTES](#)

[CHAPTER 2: A Blueprint to a Better Quantitative
Value Strategy](#)

[GREENBLATT'S MAGIC FORMULA](#)

[IT'S ALL ACADEMIC: IMPROVING QUALITY AND
PRICE](#)

[STRATEGY IMPLEMENTATION: INVESTORS
BEHAVING BADLY](#)

[NOTES](#)

[PART TWO: Margin of Safety—How to Avoid a
Permanent Loss of Capital](#)

[CHAPTER 3: Hornswoggled! Eliminating Earnings
Manipulators and Outright Frauds](#)

[ACCRUALS AND THE ART OF EARNINGS
MANIPULATION](#)

[PREDICTING PROBLEMS](#)

[NOTES](#)

CHAPTER 4: Measuring the Risk of Financial Distress: How to Avoid the Sick Men of the Stock Market

A BRIEF HISTORY OF BANKRUPTCY PREDICTION

IMPROVING BANKRUPTCY PREDICTION

HOW WE CALCULATE THE RISK OF FINANCIAL DISTRESS

SCRUBBING THE UNIVERSE

NOTES

PART THREE: Quality—How to Find a Wonderful Business

CHAPTER 5: Franchises—The Archetype of High Quality

THE CHAIRMAN'S SECRET RECIPE

HOW TO FIND A FRANCHISE

NOTES

CHAPTER 6: Financial Strength: Foundations Built on Rock

THE PIOTROSKI FUNDAMENTAL SCORE (F_SCORE)

OUR FINANCIAL STRENGTH SCORE (FS_SCORE)

COMPARING THE PERFORMANCE OF PIOTROSKI'S F_SCORE AND OUR FS_SCORE

CASE STUDY: LUBRIZOL CORPORATION

NOTES

PART FOUR: The Secret to Finding Bargain Prices

CHAPTER 7: Price Ratios: A Horse Race

THE HORSES IN THE RACE

RULES OF THE RACE

THE RACE CALL

A PRICE RATIO FOR ALL SEASONS

THE OFFICIAL WINNER

NOTES

CHAPTER 8: Alternative Price Measures—Normalized Earning Power and Composite Ratios

NORMALIZED EARNING POWER

COMPOUND PRICE RATIOS: IS THE WHOLE GREATER THAN THE SUM OF ITS PARTS?

NOTES

PART FIVE: Corroborative Signals

CHAPTER 9: Blue Horseshoe Loves Anacott Steel: Follow the Signals from the Smart Money

STOCK BUYBACKS, ISSUANCE, AND ANNOUNCEMENTS

INSIDER TRADERS BEAT THE MARKET

ACTIVISM AND CLONING

SHORT MONEY IS SMART MONEY

NOTES

PART SIX: Building and Testing the Model

CHAPTER 10: Bangladeshi Butter Production Predicts the S&P 500 Close

SUSTAINABLE ALPHA: A FRAMEWORK FOR ASSESSING PAST RESULTS

WHAT'S THE BIG IDEA?

RIGOROUSLY TEST THE BIG IDEA

THE PARAMETERS OF THE UNIVERSE

NOTES

CHAPTER 11: Problems with the Magic Formula

GLAMOUR IS ALWAYS A BAD BET

[IMPROVING THE STRUCTURE OF A
QUANTITATIVE VALUE STRATEGY](#)
[OUR FINAL QUANTITATIVE VALUE CHECKLIST](#)
[NOTES](#)

[CHAPTER 12: Quantitative Value Beats the Market](#)
[RISK AND RETURN](#)
[ROBUSTNESS](#)
[A PEEK INSIDE THE BLACK BOX](#)
[MAN VERSUS MACHINE](#)
[BEATING THE MARKET WITH QUANTITATIVE
VALUE](#)
[NOTES](#)

[Appendix: Analysis Legend](#)

[About the Authors](#)

[About the Companion Website](#)

[Index](#)

[End User License Agreement](#)

List of Tables

CHAPTER 1: The Paradox of Dumb Money

[TABLE 1.1 Long-Term Performance of Common Price
Ratios \(1964 to 2011\).](#)

[TABLE 1.2 Performance of Graham's Simple
Quantitative Value Strategy \(1976 to 2011\).](#)

CHAPTER 2: A Blueprint to a Better Quantitative Value
Strategy

[TABLE 2.1 Performance Statistics for the Magic
Formula Strategy \(1964 to 2011\).](#)

[TABLE 2.2 Glamour, Middle, and Value Decile Performance Statistics: Magic Formula Strategy \(1964 to 2011\)](#)

[TABLE 2.3 Performance Statistics for Common Quality Measures \(1964 to 2011\)](#)

[TABLE 2.4 Summary Annual Performance Statistics: Quality and Price \(1964 to 2011\)](#)

[TABLE 2.5 Top and Bottom Decile Performance Statistics: Magic Formula and Quality and Price Strategy \(1964 to 2011\)](#)

CHAPTER 3: Hornswoggled! Eliminating Earnings Manipulators and Outright Frauds

[TABLE 3.1 Bernie's and Warren's Simplified Financial Statements](#)

[TABLE 3.2 Enron Select Financials \(1990 through 2000\)](#)

[TABLE 3.3 Enron's PROBM Results \(1994 to 2000\)](#)

CHAPTER 4: Measuring the Risk of Financial Distress: How to Avoid the Sick Men of the Stock Market

[TABLE 4.1 WorldCom Distress Model Warning Signals](#)

[TABLE 4.2 Improvements to Our Stock Universe through the Elimination of Frauds, Manipulators, and Distressed Firms \(1964 to 2011\)](#)

CHAPTER 5: Franchises—The Archetype of High Quality

[TABLE 5.1 CFOA Performance \(as of December 31, 2011\)](#)

[TABLE 5.2 Comparison of Moody's and Fake Co.'s ROA](#)

[TABLE 5.3 Franchise Stocks' 8yr_ROA, 8yr_ROC Performance](#)

[TABLE 5.4 Apple Inc. Margin Growth Analysis](#)

[TABLE 5.5 Procter & Gamble Profit Margin Analysis](#)

[TABLE 5.6 Example of Margin Stability Calculation](#)

CHAPTER 6: Financial Strength: Foundations Built on Rock

[TABLE 6.1 Performance Statistics: F_SCORE and FS_SCORE \(1974 to 2011\)](#)

[TABLE 6.2 Lubrizol Corporation's FS_SCORE Calculation](#)

CHAPTER 7: Price Ratios: A Horse Race

[TABLE 7.1 Compound Annual Growth Rates for All Price Measures \(1964 to 2011\)](#)

[TABLE 7.2 Factor-Adjusted Performance for All Price Measures \(CAPM Alpha\)](#)

[TABLE 7.3 Risk Measures for the Value Decile of All Price Ratios](#)

[TABLE 7.4 Risk Measures for the Glamour Decile of All Price Measures](#)

[TABLE 7.5 Price Ratio Performance During Economic Expansions](#)

[TABLE 7.6 Price Ratio Performance during Economic Contractions](#)

CHAPTER 8: Alternative Price Measures—Normalized Earning Power and Composite Ratios

[TABLE 8.1 Results of Differing Long-Term Average Price Ratios \(1972 to 2011\)](#)

[TABLE 8.2 Performance Statistics for the All-Inclusive Composite Ratios \(1972 to 2011\)](#)

[TABLE 8.3 Top and Low Decile Performance Statistics: All-Inclusive Composite Ratios \(1972 to 2011\)](#)

[TABLE 8.4 Performance Statistics for the Best Composite Ratios \(1972 to 2011\)](#)

[TABLE 8.5 Value and Glamour Decile Performance Statistics: Best Composite Ratios \(1972 to 2011\)](#)

[TABLE 8.6 Composite Ratio Horserace \(1972 to 2011\)](#)

CHAPTER 9: Blue Horseshoe Loves Anacott Steel:
Follow the Signals from the Smart Money

[TABLE 9.1 One-Year Abnormal Returns and Profitability Changes Following Activism](#)

CHAPTER 10: Bangladeshi Butter Production Predicts
the S&P 500 Close

[TABLE 10.1 Delisting Effects on Book-to-Market Deciles](#)

[TABLE 10.2 Performance of a Passive, Equal-Weight Portfolio Compared to the S&P 500 TR and the Ten-Year Treasury TR \(1964 to 2011\)](#)

CHAPTER 11: Problems with the Magic Formula

[TABLE 11.1 Comparing the Performance of the Magic Formula and Its Constituent Parts, the EBIT Enterprise Multiple and ROC \(1974 to 2011\)](#)

[TABLE 11.2 Performance Statistics for Common Quality Measures \(1974 to 2011\)](#)

[TABLE 11.3 Comparing the Performance of Magic Quality and Its Constituent Parts, the EBIT Enterprise Multiple and GPA \(1974 to 2011\)](#)

[TABLE 11.4 Comparing the Performance of the Magic Quality on Steroids and Its Constituent Parts, the EBIT Enterprise Multiple and Our Full Quality Suite \(1974 to 2011\).](#)

[TABLE 11.5 Comparing the Performance of the EBIT Enterprise Multiple Glamour Decile High Quality and Low Quality Using Our Full Quality Suite \(1974 to 2011\).](#)

[TABLE 11.6 Performance Statistics Comparing “Cleaned” Stocks and Universe \(1974 to 2011\).](#)

CHAPTER 12: Quantitative Value Beats the Market

[TABLE 12.1. Analysis Legend](#)

[TABLE 12.2 Performance Statistics for Quantitative Value \(1974 to 2011\).](#)

[TABLE 12.3 Recovery Required to Break Even Following Worst Drawdown \(1974 to 2011\).](#)

[TABLE 12.4 Market Cycle Definitions \(1974 to 2011\).](#)

[TABLE 12.5 Asset Pricing Coefficient Estimates for Quantitative Value \(1974 to 2011\).](#)

[TABLE 12.6 Selected Quantitative Value Portfolio Holdings](#)

[TABLE 12.7 Performance Statistics for Quantitative Value \(1991 to 2011\).](#)

List of Illustrations

CHAPTER 1: The Paradox of Dumb Money

[FIGURE 1.1 Cumulative Returns to Common Price Ratios](#)

[FIGURE 1.2 Graham Simple Value Strategy Performance Chart \(1976 to 2011\)](#)

[FIGURE 1.3 Graham Strategy Portfolio Holdings over Time \(1976 to 2011\)](#)

[FIGURE 1.4\(a\) One-Year Rolling Period Performance Statistics: Graham Strategy \(1976 to 2011\)](#)

[FIGURE 1.4\(b\) Five-Year Rolling Period Performance Statistics: Graham Strategy \(1976 to 2011\)](#)

[FIGURE 1.4\(c\) Ten-Year Rolling Period Performance Statistics: Graham Strategy \(1976 to 2011\)](#)

CHAPTER 2: A Blueprint to a Better Quantitative Value Strategy

[FIGURE 2.1 Greenblatt's Magic Formula Strategy Performance Chart \(1964 to 2011\)](#)

[FIGURE 2.2\(a\) One-Year Rolling Period Performance Statistics: Magic Formula Strategy \(1964 to 2011\)](#)

[FIGURE 2.2\(b\) Ten-Year Rolling Period Performance Statistics: Magic Formula Strategy \(1964 to 2011\)](#)

[FIGURE 2.3 Decile Performance Chart: Magic Formula Strategy \(1964 to 2011\)](#)

[FIGURE 2.4 Quality Measures Cumulative Performance Chart \(1964 to 2011\)](#)

[FIGURE 2.5 Magic Formula and Quality and Price Strategies Comparative Performance Chart \(1964 to 2011\)](#)

[FIGURE 2.6\(a\) One-Year Rolling Period Performance Statistics: Magic Formula and Quality and Price Strategy \(1964 to 2011\)](#)

[FIGURE 2.6\(b\) Ten-Year Rolling Period Performance Statistics: Magic Formula and Quality and Price](#)

[Strategy_\(1964 to 2011\).](#)

[FIGURE 2.7 Decile Performance Chart: Magic Formula and Quality and Price Strategy_\(1964 to 2011\).](#)

CHAPTER 3: Hornswoggled! Eliminating Earnings Manipulators and Outright Frauds

[FIGURE 3.1 Performance of Hirshleifer et al.'s SNOA Long/Short Strategy](#)

[FIGURE 3.2 Annual Performance of Sloan's STA Long/Short Strategy](#)

[FIGURE 3.3 Annual Performance of Hirshleifer's SNOA Long/Short Strategy_\(1964 to 2011\) replication](#)

[FIGURE 3.4 Value of \\$100 Invested in Enron](#)

CHAPTER 4: Measuring the Risk of Financial Distress: How to Avoid the Sick Men of the Stock Market

[FIGURE 4.1 Campbell et al. Model's Prediction Capability](#)

[FIGURE 4.2 Histogram Comparing Distribution of One-Year Returns for the Universe and the "Cleaned" Universe \(1974 to 2011\).](#)

CHAPTER 6: Financial Strength: Foundations Built on Rock

[FIGURE 6.1 Cumulative Returns to the F_SCORE and the FS_SCORE](#)

[FIGURE 6.2 Invested Growth of \\$100 in Lubrizol and the S&P 500](#)

CHAPTER 7: Price Ratios: A Horse Race

[FIGURE 7.1 Enterprise Multiple \(EBIT Variation\) by a Length](#)

CHAPTER 8: Alternative Price Measures—Normalized Earning Power and Composite Ratios

[FIGURE 8.1 Comprehensive Composite Ratio Performance Chart \(1972 to 2011\)](#)

[FIGURE 8.2\(a\) Five-year Rolling Period Performance Statistics: All-Inclusive Composite Ratios \(1972 to 2011\)](#)

[FIGURE 8.2\(b\) Ten-year Rolling Period Performance Statistics: All-Inclusive Composite Ratio \(1972 to 2011\)](#)

[FIGURE 8.3 Best Composite Ratio Performance Chart \(1972 to 2011\)](#)

[FIGURE 8.4\(a\) Five-Year Rolling Period Performance Statistics: Best Price Ratios \(1972 to 2011\)](#)

[FIGURE 8.4\(b\) Ten-Year Rolling Period Performance Statistics: Best Price Ratios \(1972 to 2011\)](#)

CHAPTER 9: Blue Horseshoe Loves Anacott Steel: Follow the Signals from the Smart Money

[FIGURE 9.1 Teledyne Performance Chart \(1972 to 1987\)](#)

[FIGURE 9.2 Stock Repurchase Abnormal Returns \(1980-1990\)](#)

[FIGURE 9.3 Predicting Repurchase Completion with Past Repurchase Completion](#)

[FIGURE 9.4 Abnormal Returns to Opportunistic and Routine Insider Trades](#)

[FIGURE 9.5 Abnormal Returns around 13D Filings](#)

[FIGURE 9.6 Monthly Alphas for Short Interest Strategy](#)

CHAPTER 10: Bangladeshi Butter Production Predicts the S&P 500 Close

[FIGURE 10.1 Sustainable Alpha](#)

[FIGURE 10.2 Impact on the Price-to-Earnings Ratio Strategy of Look-Ahead Bias Introduced by the Restatement of Financial Results \(1987 to 2001\)](#)

[FIGURE 10.3 Performance of Passive Equal-Weight Index Compared To S&P 500 TR \(1964 to 2011\)](#)

[FIGURE 10.4 Real Returns on Global Stock Markets from 1921 to 1996](#)

[FIGURE 10.5 Analysts Are Reliably Overoptimistic](#)

CHAPTER 11: Problems with the Magic Formula

[FIGURE 11.1 Histogram Showing EBIT Enterprise Multiples Paid by Magic Formula and Value Decile of EBIT Enterprise Multiple \(1974 to 2011\)](#)

[FIGURE 11.2\(a\) Histogram Showing EBIT Enterprise Multiple Value Decile Compared to the Universe \(1974 to 2011\)](#)

[FIGURE 11.2\(b\) Histogram Showing EBIT Enterprise Multiple Value Decile Compared to Glamour Decile \(1974 to 2011\)](#)

[FIGURE 11.3 Invested Growth of EBIT Enterprise Value Separated into High-Quality and Low-Quality Portfolios \(1974 to 2011\)](#)

CHAPTER 12: Quantitative Value Beats the Market

[FIGURE 12.1 Cumulative Value for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.2 Annual Performance for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.3 Market Cycle Performance for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.4 Short-Term Event Stress Tests for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.5 Down Month Analysis for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.6 Worst-Case Scenario Analysis for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.7 Risk/Reward for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.8\(a\) Five-Year Rolling CAGR for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.8\(b\) Ten-Year Rolling CAGR for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.9\(a\) Five-Year Rolling Max Drawdown for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.9\(b\) Ten-Year Rolling Max Drawdown for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.10\(a\) Five-Year Rolling Alpha for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.10\(b\) Ten-Year Rolling Alpha for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.11 Decile Performance for Quantitative Value \(1974 to 2011\)](#)

[FIGURE 12.12 Quality Splits via Quantitative Value and Magic Formula Quality \(1974 to 2011\)](#)

[FIGURE 12.13 Cumulative Value for Quantitative Value \(1991 to 2011\)](#)

[FIGURE 12.14 Annual Performance for Quantitative Value \(1991 to 2011\)](#)

[FIGURE 12.15 Market Cycle Performance for Quantitative Value \(1991 to 2011\).](#)

[FIGURE 12.16 Drawdown Analysis for Quantitative Value \(1991 to 2011\).](#)

[FIGURE 12.17 Risk/Reward Chart for Quantitative Value \(1974 to 2011\).](#)

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Quantitative Value

A Practitioner's Guide to Automating Intelligent Investment and Eliminating Behavioral Errors + Website

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For Nickole, without whom none of this is possible, and with whom anything is possible.

—Toby

To all my girls: Katie, Alice, and Glenda. Semper Fidelis.

—Wes

Preface

This book is first and foremost about value investment—treating stock as part ownership of a business valued through analysis of fundamental financial statement data. Benjamin Graham established the principles of value investing more than 75 years ago. Today, they are widely employed in the investment industry and generally accepted in academia. Its success as an investment philosophy is largely due to the investment performance of Graham's most famous student, Warren Buffett, whose shareholder letters have inspired multitudes to follow in his footsteps. Despite the widespread adoption of the philosophy, the exponential growth in computing power, and the ubiquity of financial data, the value phenomenon persists. It seems to defy logic. Why does the efficient market leave a free lunch on the table? The best answer is that the value phenomenon persists for the same reason it existed when Graham first conceived it: human beings behave irrationally. While investment tools have advanced, humans remain all too human, subject to the same cognitive biases that have plagued us since time immemorial. We may not be able to conquer these intrinsic behavioral weaknesses, but we can adapt our investment process to minimize them. The means to do so is the second aspect of this book: quantitative investment.

While the term *quantitative* likely conjures images of complex equations churned by powerful computers, it's best understood as the antidote to behavioral error. Our apparatus for reasoning under conditions of uncertainty is faulty, so much so that we are often entirely unaware of how imperfect it is because it blinds us to our failure. We are confidently incompetent. We need some means to

protect us from our cognitive biases, and the quantitative method is that means. It serves both to protect us from our own behavioral errors and to exploit the behavioral errors of others. The model does need not be complex to achieve this end. In fact, the weight of evidence indicates that even simple statistical models outperform the best experts. It speaks to the diabolical nature of our faulty cognitive apparatus that those simple statistical models continue to outperform the best experts *even when those same experts are given access to the models' output*. This is as true for a value investor as it is for any other expert in any other field of endeavor.

This book is aimed at value investors. It's a humbling and maddening experience to compare active investment results with an analogous passive strategy. How can it be that so much effort appears to be wasted? (We use the word *wasted* euphemistically. A more honest expression might be "value destroying.") The likely reason is that active managers unconsciously—but systematically—introduce cognitive biases into the portfolio, and these biases lead to underperformance. It's not, however, our destiny to do so. There are several quantitative measures that lead to better performance, and these metrics will be familiar to any value investor: enhancing the margin of safety, identifying the highest-quality franchises, and finding the cheapest stocks. We canvass the research in each, test it in our own system, and then combine the best ideas in each category into a comprehensive quantitative value strategy. It's not passive indexing. It's active value investing performed systematically.

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Legendary Australian ad man John “Singo” Singleton once said, “Anyone who reckons luck doesn't have anything to do with success has never been successful, and never will be,

unless they're bloody lucky." It's a worldview to which Mr. Carlisle subscribes, and so, first and foremost, he'd like to thank his own personal Goddess Fortuna, Nickole Carlisle. Nickole helped to make the manuscript as compelling to the lay reader as we hope it is to the quant. Mr. Carlisle would also like to thank Michael and Heather Craft, Steve Baxter, Pete Latham, Chris Hughes, and Roger and Wendy Carlisle for the support; Troy Harry for the opportunity; Dougs, for teaching him that you don't play Ping-Pong if you can't take a punch; Em, who taught him that if you can keep your head when all about you are losing theirs, you have not fully grasped the gravity of situation; and Pete Love and Ross Johnson for the thoughtful discussion. Finally, he would like to thank the loyal readers of greenbackd.com, who inspired him to push beyond the boundaries of the online world.

Finally, we are deeply appreciative of the entire team at Wiley Finance, most especially Bill Falloon and Meg Freeborn, who provided guidance and advice all along the way.

PART ONE

The Foundation of Quantitative Value

This book is organized into six main parts. Part One sets out the rationale for quantitative value investment and introduces our checklist. In it we examine several simple quantitative value strategies to illustrate some key elements of the investment process. In Part Two we discuss how to avoid stocks at high risk of sustaining a permanent loss of capital—those suffering from financial statement manipulation, fraud, and financial distress. Part Three contains an examination of the indicia of high-quality stocks—an economic franchise and superior financial strength. We go bargain hunting in Part Four, looking for the price ratios that best identify undervalued stocks and lead to the best risk-adjusted investment performance. We look at several unusual implementations of price ratios, including long-term average price ratios and price ratios in combination. Part Five sets out a variety of signals sent by other market participants. There we look at the impact of buybacks, insider purchases, short selling, and buying and selling from institutional investment managers like activists and other fund managers. Finally, in Part Six we build and test our quantitative value model. We study the best way to combine the research we've considered into a cohesive strategy, and then back-test the resulting quantitative value model.

CHAPTER 1

The Paradox of Dumb Money

“As they say in poker, ‘If you've been in the game 30 minutes and you don't know who the patsy is, you're the patsy.’”

—Warren Buffett (1987)

In the summer of 1968, Ed Thorp, a young math professor at the University of California, Irvine (UCI), and author of *Beat the Market: A Scientific Stock Market System* (1967), accepted an invitation to spend the afternoon playing bridge with Warren Buffett, the not-yet-famous “value” investor. Ralph Waldo Gerard hosted the game. Gerard was an early investor in Buffett's first venture, Buffett Partners, and the dean of the Graduate School at UCI, where Thorp taught. Buffett was liquidating the partnership, and Gerard needed a new manager for his share of the proceeds. Gerard wanted Buffett's opinion on the young professor and the unusual “quantitative” investment strategy for which he was quietly earning a reputation among the members of the UCI community.

Gerard had invested with Buffett at the recommendation of a relative of Gerard's who had taught Buffett at Columbia University: the great value investment philosopher, Benjamin Graham. Graham had first published the value investor's bible, *Security Analysis*, along with David Dodd, in 1934.¹ He was considered the “Dean of Wall Street,” and regarded Buffett as his star pupil. Graham's assessment would prove to be prescient.

By the time Thorp met Buffett in 1968, Buffett had established an exceptional investment record. He had started Buffett Partners 12 years earlier, in 1956, at the

tender age of 26, with initial capital of just \$100,100. (Buffett joked that the \$100 was his contribution.) By 1968, Buffett Partners controlled \$100 million in capital, and Buffett's share of that was \$25 million.² For the 12 years between 1956 and 1968, Buffett had compounded the partnership's capital at 30 percent per year before his fees, which were 25 percent of the gain over 6 percent per year. Investors like Gerard had compounded at an average of 24 percent a year. Before taxes, each original dollar invested in Buffett's partnership had grown to more than \$13. Each of Buffett's own dollars, growing at the greater prefee annual rate of 30 percent became before taxes over \$23. By 1968, however, Buffett was having difficulty finding sufficiently undervalued securities for the partnership, and so had decided to wind it up. This had led Gerard to find a new manager, and Gerard hoped Thorp was the man. He wanted to know if Thorp's unusual quantitative strategy worked, and so, at Gerard's behest, Thorp found himself sitting down for a game of bridge with Buffett.

Buffett is a near world-class bridge player. Sharon Osberg, international bridge player and regular professional partner to Buffett, says, "He can play with anyone. It's because of his logic, his ability to solve problems and his concentration."³ Says Buffett, "I spend 12 hours a week—a little over 10 percent of my waking hours—playing the game. Now I am trying to figure out how to get by on less sleep in order to fit in a few more hands."⁴ Buffett presented a daunting opponent. Thorp observed of Buffett's bridge playing⁵:

Bridge players know that bridge is what mathematicians call a game of imperfect information. The bidding, which precedes the play of the cards, conveys information about the four concealed hands held by the two pairs of players that are opposing each other. Once play begins, players use information from the bidding and from the cards as they are played to deduce who holds the remaining as yet unseen cards. The stock market also is a game of imperfect information and even resembles bridge in that they both have their deceptions and swindles. Like bridge, you do better in the market if you get more information, sooner, and put it to better use. It's no surprise then that Buffett, arguably the greatest investor in history, is a bridge addict.

Thorp was no stranger to the card table either. Before he figured out how to beat the market, Thorp wrote *Beat the Dealer*, the definitive book on blackjack card counting. William Poundstone recounts the story of Thorp's foray into card counting in his book, *Fortune's Formula*.⁶ In 1958, Thorp had read an article by mathematician Roger Baldwin, who had used U.S. Army “computers”—which actually meant “adding machines” or the people who operated them—to calculate the odds of various blackjack strategies in an effort to find an optimal strategy. Over three years, he and three associates found that by using an unusual strategy they could reduce the house edge in blackjack to 0.62 percent. Amazingly, prior to their paper, nobody, including the casinos, knew the real advantage held by the house. There were simply too many permutations in a card deck of 52 to calculate the casino's edge. “Good” players of blackjack, other writers had claimed, could get the house's edge down to 2 or 3 percent. Baldwin's strategy, by reducing the house edge to 0.62 percent, was a huge leap forward. The only problem, as far as Thorp could see, was

that Baldwin's strategy still lost money. He was convinced he could do better.

Thorp's key insight was that at the time blackjack was played using only one deck and it was not shuffled between hands. In the parlance of the statistician, this meant that blackjack hands were not “independent” of each other. Information gleaned in earlier hands could be applied in subsequent hands. For example, in blackjack, aces are good for the player. If the dealer deals a hand with three aces, the player knows that only one ace remains in the deck. This information would lead the player to view the deck as being less favorable, and the player could adjust his or her betting accordingly. Thorp used MIT's mainframe computer to examine the implications of his observation and found something completely counterintuitive—the “five” cards had the most impact on the outcome of the hands remaining in the deck. Fives are bad for the player and good for the house. Thorp realized that by simply keeping track of the five cards, the player could determine the favorability or otherwise of the cards remaining in the deck. Thorp found that his improved strategy gave the player an edge of 0.13 percent. That small edge, Thorp reasoned, given enough hands, could add up to a lot of money. He published his new strategy first in a paper and then subsequently as *Beat the Dealer* in 1962, which went on to become a classic in gambling literature. The book detailed how Thorp had used his card-counting strategy for a period of several years, making \$25,000 in the process. The casinos didn't like players counting cards to gain an edge. They immediately started taking “counter-measures,” including adding more decks, randomly shuffling the cards, using “mechanics” (dealers who cheated by manipulating the cards in the deck), threatening Thorp with physical harm, and then simply barring him from the casinos. By 1964, Thorp no longer found blackjack fun or profitable. He

had found a new obsession, the stock market, and he was already hunting for an edge.

Thorp started working on the key element of what would become his quantitative investment strategy when he moved to UCI in 1964.⁷ There he met Sheen Kassouf, another professor at UCI, who had been working on the same problem: how to value a warrant, an unusual security that converted into stock on a certain event. They started meeting together once a week in an effort to solve the warrant valuation conundrum. Thorp found the answer in an unlikely place. In a collection of essays called *The Random Character of Stock Market Prices* (1964), Thorp read the English translation of a French dissertation written in 1900 by a student at the University of Paris, Louis Bachelier. Bachelier's dissertation unlocked the secret to valuing warrants: the so-called “random walk” theory. As the name suggests, the “random walk” holds that the movements made by security prices are random. While it might seem paradoxical, the random nature of the moves makes it possible to *probabilistically* determine the future price of the security.

The implications of the random walk theory are profound, and they weren't lost on Thorp. He saw that he could apply the theory to handicap the value of the warrant. Where the warrant's price differed from Thorp's probabilistic valuation, Thorp recognized that an opportunity existed for him to trade the warrant and the underlying stock and to profit from the differential. While any given warrant might expire worthless, given a large enough portfolio of warrants Thorp was likely to make money. These two insights—a probabilistic approach to valuation and the construction of portfolios large enough to capture the probabilities—formed the bulwark of Thorp's “scientific stock market system,” one of the most consistently