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# TREND FOLLOWING WITH MANAGED FUTURES

## THE SEARCH FOR CRISIS ALPHA

ALEX GREYSERMAN and
KATHRYN M. KAMINSKI

WILEY

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# FOREWORD



It is a rare pleasure and honor for an academic to be asked to write a foreword for a book coauthored by one of his charges, not unlike a parent seeing a child off to college and onto a successful career of her own. However, unlike parenthood, my experience with Katy Kaminski was considerably less challenging because she first showed up at my office more than a decade ago already well-trained in mathematics, statistics, and operations research, and an eager student of finance. Like most MIT students I've had the privilege of advising over the years, Katy did most of the driving; my role was largely to stay out of her way and cheer her on from the stands.

This book—coauthored with Alex Greyserman, a seasoned Wall Street veteran and PhD in statistics—is a fascinating and timely examination of an investment strategy that, for too long, has dwelt in the shadows of the financial industry. Trend following has received a bad rap among mainstream investors and portfolio managers for a number of reasons. Perhaps the most obvious is the natural preference for originality in any creative endeavor, whether it be in the arts or the sciences—why would you want to follow the crowd when you can do something unique?

This instinctive aversion to copycats belies the surprising frequency of copycat strategies found in nature, including herding behavior among most animal species, mimicking abilities such as the color shifting of chameleons, and the high-fidelity nature of DNA replication across eons of time. Among Homo sapiens, trends have also been documented in the spread of technologies such as fire, stone tools, agriculture, and industrialization, not to mention hemlines, low-carb diets, and apps. In the narrow context of financial investments, trends are all too familiar to brokers, financial advisors, and others responsible for marketing new products such as global tactical asset allocation overlays, 130/30 funds, and risk-parity strategies. As certain investment products come into or fall out of favor, trends in asset prices are created by the flow of funds into and out of these products.

But despite the many reasons for trends to exist and persist, there still seems to be an almost religious aversion to trend following investment strategies among certain investors. I believe there are three primary sources for this aversion. The first is the efficient markets hypothesis—if trend following really works, everyone would do it, and then wouldn't it stop working? The second is the fact that early trend following strategies were associated with technical analysis or "charting," which finance academics equate with voodoo and astrology. And the third is the lack of transparency surrounding trend following strategies, which makes it hard for investors to understand how and when they generate value, why they offer unique diversification benefits, and under what conditions they are likely to underperform more traditional investments.



The first point can be addressed by observing that even if prices do fully reflect all available information instantaneously and costless, trends can still exist if an asset carries a positive risk premium. After all, what is a risk premium but a positive expected excess return, which implies an upward-trending price series! Trend following strategies exploit such risk premia, but are one level more sophisticated than traditional buy-and-hold strategies because they acknowledge that risk premia are time-varying and when trends break, stop-loss policies are used to reduce downside risk. But markets are not always and everywhere efficient, as many academics and industry professionals now recognize—investors adapt to changing economic conditions, and trends and reversals are commonplace in adaptive markets.

The second point is an unfortunate aspect of heritage that trend followers can't easily escape, but rather than suffer silently from guilt by association, practitioners can differentiate themselves by articulating a deeper narrative for trend following strategies. And the third point can be addressed by deriving the many investment implications of this deeper narrative such as benchmarking, portfolio construction, style analysis, and performance attribution. This is exactly what Greyserman and Kaminski have done in this exciting volume.

Trend following strategies may never achieve the popularity that passive equity index funds enjoy, but that's probably a good thing—if they did, they might not be as great a source of diversification as they are now. But until then, every serious investor should read this book!

Andrew W. Lo
*Cambridge, Massachusetts*
*March 2014*

# PREFACE



I was born in the former Soviet Union and came to the United States when I was 12 years old. After studying math, statistics, and engineering, I reached a fork in the road 25 years ago. Having worked at a slow-paced engineering job for a year, I remembered taking an elective course in graduate school at Columbia called "Operations Research in Finance" and wondered what the world of finance was all about. In 1989, I went on an interview with Larry Hite in Millburn, New Jersey. Larry was one of the early pioneers of trend following systems. At that time Larry was running the largest CTA in the world, called Mint, with nearly $1 billion under management. The job description was entry level programming and data analysis. During the interview, when I asked Larry what he does, Larry told me that he wins because he "knows what he doesn't know." He also told me that he thinks "not being hindered by higher education" gives him an edge. Having just come from said "higher education" I had no idea what he was talking about. But I knew one fact . . . Larry offered me a salary several thousand dollars a year higher than I was earning in engineering, and on that basis, I decided to take the plunge. Larry Hite has been my mentor since my entry into the finance world. His lack of formal quantitative education is his main asset . . . he asks questions and pushes the envelope from an outside-the-box mind-set better than most quants.

Over the past 25 years I've experienced lots of ups and downs in the CTA industry. A number of times the industry has been declared dead for various reasons, and an equal number of times it has survived and grown. The trials and tribulations of constructing systematic trading strategies is a wild ride. Certain models sometimes work and sometimes don't. The Holy Grail does not exist. Prudent risk management and survival is the name of the game. The markets often seemingly move in a way to make the largest number of people lose the most amount of money. These are necessary forces of adaptation and evolution. As Keynes famously said, "Markets can remain irrational longer than you can remain solvent."

Financial modeling often involves avoiding complexity in favor of simplicity and practical compromise. The "buy side" is dominated not by highly rigorous math or miraculous discoveries, but rather by a mix of analytical and financial understanding, sensible risk management, and a general sense of "humbleness" in the pursuit of an "edge." I have taught in the mathematical finance program at Columbia University for the past 12 years. My main challenge and goal every term has been to take a room full of high-IQ math geniuses, who have rarely been wrong in doing anything, and teach them some humility when facing the realities of the investment world. We cover various materials and math formulas, but at the end of the day, my goal is partially psychological . . . I want the students to understand that they can be wrong, or that the markets can prove them wrong, or that sometimes models can lose money and you simply don't know why, and that rule number one of being successful in the investment world is to lose any emotional attachment to one's superior IQ or sense of infallibility. If, at the end of the term, even a small percentage of the students come out with the understanding and ability to deal with failure as part of the process, I think I have done my job.

First and foremost, I want to thank my family. My parents sacrificed a lot to enable me to pursue the full scope of opportunities in the United States. My wife Elaine drove with me to the aforementioned interview with Larry Hite. As Yogi Berra once said, "When you come to a fork in the road, take it." We took the fork into the world of finance, and she has provided enduring support and encouragement for more than 25 years. My children, Jacquie, Max, Dean, and Reed, provide the daily inspiration to work hard (four college degrees are not cheap).

I want to thank the team at ISAM for encouraging me to pursue this project. Stanley Fink, Larry Hite, Roy Sher, Alex Lowe, Darren Upton, Jack Weiner, and Riva Waller have been supportive colleagues (and part-time editors) for a long time.

Alex Greyserman

When I was eleven, I did my first science project on nerve conduction and temperature. Given that my mother is a savvy financial planner and father is an expert clinical neurologist, it comes as no surprise that my path has led me from mathematics, to electrical engineering, to operations research, and finally into the world of quantitative finance with a twist of behavioral and neurofinance. I grew up in Nashville, Tennessee, but my passion for math and science led me to MIT. I was fascinated by signal processing and systems engineering—who doesn't want to build an MP3 player or write code for satellite phones? After several years enthralled by Fourier transforms, studying engineering physics in French at École Polytechnique, and time modeling subordinated debt contracts for a quantitative modeling team at Société Générale, I was drawn to quantitative finance, pursuing a doctorate in operations research at MIT Sloan. I was overjoyed at the opportunity to work with Andrew Lo, one of finance's top quantitative gurus. He asked me why stop loss rules stop losses and what value simple rules and heuristics have in investments. Everyone used these rules; there must be some reason behind them.

When people say go right, I generally go left. I wanted to study heuristics and simple rules because, given what my father taught me about human cognition, expected utility theory was clearly fantastical nonsense. I spent several incredible years working with Andrew Lo learning everything he could teach me about finance. Andrew taught me to continue to ask questions, to challenge ideas, to never be afraid to try a new angle to attack a difficult problem and to stick to my guns (for example—it's okay that I think utility theory is fantastical nonsense). Over the years, Andrew has been my advisor, my mentor, my friend, and eventually my colleague. I am forever grateful that he set me out on the journey to understand the use of heuristics and rules in investment management. Given that trend following is essentially a set of investment heuristics and simple rules, it is no surprise that I have been thoroughly obsessed with understanding how and why it works for years.



First and foremost, I want to thank my family: my husband, two daughters, parents, and extended American and Swedish families. My husband, Pierre, has continually supported me and encouraged me to take on this insanely big project. My darlings Ellinor and Hailie are the light of my life. I thank my parents for opening up so many doors for me and setting high expectations for success. My brother Matt has been my rock for longer than I can remember. I am forever grateful for my humble superstar mentor, advisor, and friend Andrew Lo. Without your tutelage and support, I would never have achieved so much and learned to think outside of any box. I am thankful for my fellow finance lady friends: Mila Getmansky-Sherman, Jasmina Hasanhodzic, and Maria Strömqvist. My many fellow students and professors at MIT opened new doors and allowed me to see things from new perspectives. I am also grateful for my friends for keeping me closer to the ground: Ann,

Benedicte, Emily, Juliane, Lucile, Lynn, Margret, Maria, Nebibe, Sumita, Susan, Svetlana, and Tanya.

My past colleagues at RPM were a significant part of my journey into managed futures. John Sjödin has been a friend, confidant, and sounding board for my many ideas. I am thankful for my supportive colleagues at the Swedish House of Finance and my friends in the Swedish financial industry. My boss, friend, and colleague Pehr Wissen has been a great source of support on this journey. My passion for teaching has always been greatly supported by my many students from the Stockholm School of Economics (SSE), MIT Sloan School of Management, and the Swedish Royal Institute of Technology (KTH).

Kathryn Kaminski

■ ■ ■

We both have a mutual friend at the CME Group, Randy Warsager. Randy has been a tremendous industry advocate and friend to many. Randy introduced us based on our common research interests. When we met for the first time the challenge was obvious: We had to write an all-inclusive academic textbook on trend following. In addition to our mutual backgrounds in signal processing turned to finance, we both also have an innate desire to bring simplicity to complexity. Our mutual challenge was to turn the world of trend following from a world of geeks and financial folklore into the serious objective discipline that it really is.



First and foremost, we would like to thank the incredible team at ISAM. Lian Yan has been an integral part of this research and played a significant role in the creation of this book. We would also like to thank Noelle Sisco for her keen attention to detail and support. Jack Weiner carefully read and commented on the entire book. We also thank the supporting quantitative analyst team: Chris Bridges and Patrick Luckett.

We thank our industry friends and fellow trend following fans: RPM, Efficient Capital, Abbey Capital, Lighthouse Partners, Hermes, Newedge, and the CME Group. Our mutual relationship with the CME Group, fueled by the enthusiastic efforts of Randy Warsager, led us to meet and create this book. As a fellow believer in research, Newedge has been particularly helpful in supporting this project. We thank James Skeggs for his detailed review of this book. We would like to thank the many bright and insightful colleagues in industry and academia: Ingemar Bergdahl, Svante Bergström, Ranjan Bhaduri, Eric Bundonis, Galen Burghardt, Andreas Clenow, John Connolly, Adam Duncan, Tony Gannon, Joel Handy, Eric Hoh, Per Ivarsson, Ernest Jaffarian, Grant Jaffarian, Greg Jones, Martin Källström, Hossein Kazemi, Larry Kissko, John Labuszewski, Andrew Lo, Mark Melin, Alexander Mende, Sean McGould, Romule Nohasiarisoa, Petter Odhnoff, Kelly Perkins, Blu Putnam, Ed Robertiello, Tarek Rizk, John Sjödin, James Skeggs, Chris Solarz, Mikael Stenbom, and Brian Wells. We are especially grateful for those of you who took a look at our work, provided feedback, or helped give us insights to create this book.

Alex Greyserman, PhD, and Kathryn Kaminski, PhD

# INTRODUCTION



Trend following is one of the classic investment styles. “Find a trend and follow it” is a common adage that has been passed on throughout the centuries. The concept of trend following is simple. When there is a trend, follow it; when things move against you or when the trend isn’t really there, cut your losses. Despite the simplicity of the concept, the strategy has roused substantial criticism among neoclassical economists. For decades, trend following has been shunned as the black sheep of investment styles. In the classroom, in research, and even in the popular press, many have preached the word of efficient markets, touted the value of the equity premium, and asserted the importance of buying and holding for the long term. Figure I.1 presents the performance for trend following and equity markets. Figure I.2 presents the drawdown profile for trend following and equity markets. Over the past two decades, equity markets have experienced rather severe boom and bust cycles. Although trend followers follow trends across markets, the approach is seemingly uncorrelated with this dramatic boom and bust cycle. The drawdown profile for equity markets is akin to a high-speed roller-coaster ride. Although there are many benefits to long-term investing, this simple example demonstrates that the ride may be a bumpy one. In comparison, trend followers have a rather persistent

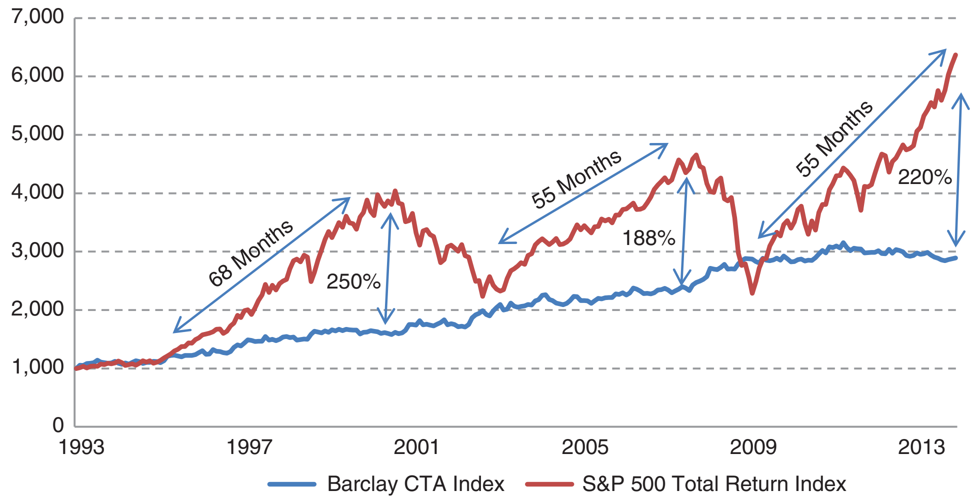


**FIGURE I.1** The cumulative performance for trend following (using the Barclay CTA index) and equity markets (using the S&P 500 Total Return Index). The sample period is 1993 to 2013.
*Data source*: Bloomberg.

drawdown profile. Despite a history of criticism, there is clearly something to following the trend.[1]



The rather stable performance of trend following over a turbulent period for equity markets gives rise to several questions. What would happen if the trend following index had the same volatility? Or even more interesting—what would happen if equity markets and trend following were combined 50/50?

Figure I.3 plots the cumulative performance for equity markets, trend following at the same volatility, and a 50/50 combination of the two. The combination of trend following and equity markets seems to provide the most stable return series over time. Table I.1 lists the performance statistics for equity markets, trend following, and a 50/50 combination of the two. Both equity markets and trend following have similar Sharpe ratios, but an equal combination of the two increases the Sharpe ratio for equity markets by 66 percent. The maximum drawdown for the combined portfolio reduces the maximum drawdown for equity markets from 51 percent to 22 percent. Despite the simplicity of this example, there is clearly something unique and complementary to a trend following approach that deserves further analysis and inspection.

[1] Market efficiency, equity premiums, and buy and hold are all important notions in finance. The point to be made here is that they do not negate the value of trend following. In fact, trend following is a natural complement to these concepts. The goal of this book is to demonstrate and motivate this point.

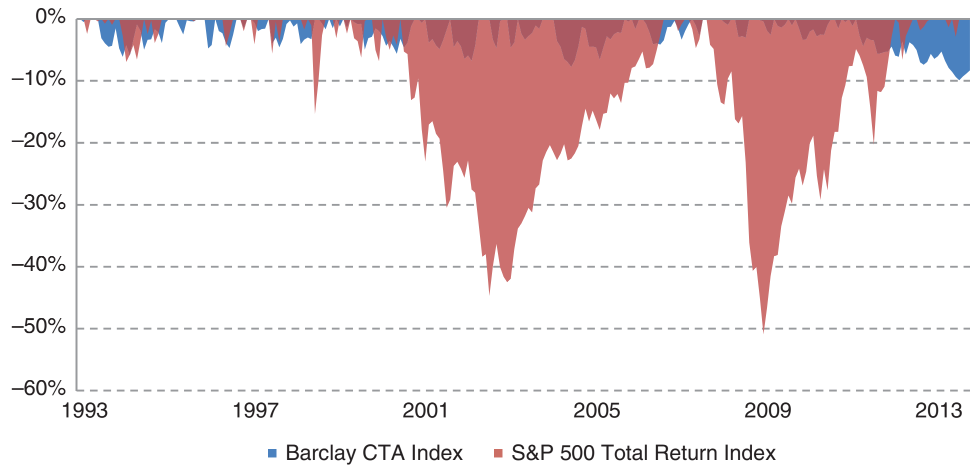


**FIGURE I.2** The drawdown profile for trend following (using the Barclay CTA Index) and equity markets (using the S&P 500 Total Return Index). The sample period is 1993 to 2013.
*Data* source: Bloomberg.

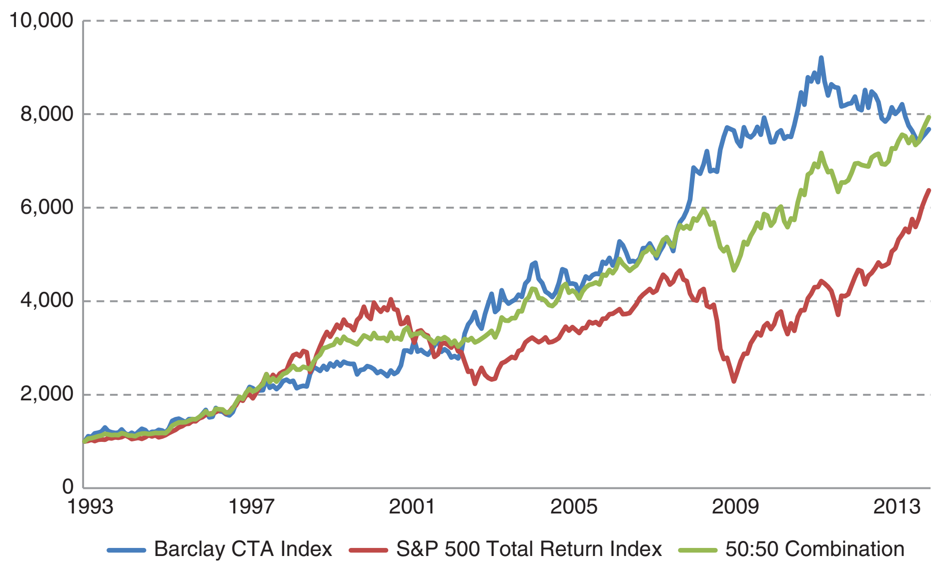


**FIGURE I.3** The cumulative performance for equity markets (S&P 500 Total Return Index), trend following with the same volatility as equity markets (Barclay CTA Index), and 50/50 equities and trend following (S&P 500 Total Return Index, Barclay CTA Index). The sample period is 1993 to 2013.
*Data source*: Bloomberg.

**TABLE I.1** **Performance statistics for equity markets (S&P 500 Total Return Index), trend following at equity volatility (Barclay CTA Index), and a 50/50 combination of equity markets and trend following (S&P 500 Total Return Index, Barclay CTA Index). The sample period is 1993 to 2013.**

| | Barclay CTA Index (at equity volatility) | S&P 500 Total Return Index | 50:50 Combination |
|---|---|---|---|
| Average Return (annual) | 10.19% | 9.22% | 10.37% |
| Standard Deviation (annual) | 14.94% | 14.94% | 10.10% |
| Sharpe Ratio (annual) | 0.68 | 0.62 | 1.03 |
| Max Drawdown | 19.53% | 50.95% | 21.89% |

Modern-day trend following strategies are about systematically finding trends in market prices, riding them, and getting out before they revert. For this type of momentum strategy, there is both an art and a science to execution. The science of modern systematic trend following is facilitated by computational power and trading automation. Subjective (or discretionary) rules of thumb and heuristics have been replaced by structured systems of trading rules creating autonomous trading systems, the notorious "black boxes." A modern systematic trend following system has become more like a finely tuned and engineered machine. These machines adjust their outputs (trading positions) as a function of price movements (inputs). Each system includes internal components (risk management systems) to regulate stressors and shocks.[2] The design of these systems is structurally simple, efficient, and transparent. Simplicity and robustness is essential, as these trading systems manage hundreds to thousands of positions simultaneously.

The art of modern day trend following is in signal processing and trading execution. Trend followers use signals to determine when a trend is beginning or ending. These signals must be quantified, processed, and combined with other signals. Creating a connection between the signal processing and the corresponding trading execution for implementation is a skill that requires eloquence, experience, and a fine attention to detail.[3]

[2] A cellular phone (or any mobile device) provides a good, practical example. Mobile devices have structured methodology for processing external inputs from a user. The functionality of a mobile device is organized by a network of systems coupled together with rules and instructions. These rules and instructions are initiated by external inputs. External inputs are processed, and an action takes place if the proper parameters of that action create a sequence of actions by the device. If there are actions that stress the system, there are internal blocks similar to circuit breakers and controls that deal with external inputs that are not within the bands acceptable for the device.

[3] Returning to the analogy of a mobile phone, the structure and operation system of a mobile device must be functional. The art is in the external user interface and the eloquence in which it processes external inputs.

As with any comprehensive and arduous endeavor, this book begins with *history* by taking a philosophical and historical look at the concept of trend following over the centuries. The remainder of this book has the noble goal of demystifying both the *art* and the *science* of trend following from the perspective of the end user, the institutional investor.

## A Foreword for the Remainder of the Book

The book begins by telling *the tale of trend following* throughout the ages. A multi-centennial view of the strategy from a historical perspective sets the stage for the deeper more detailed analysis of modern systematic trend following in the remainder of the book. The book is divided into six core sections:

I. Historical Perspectives

Using a unique 800-year dataset, trend following is examined from a multi-century perspective.

II. Introduction to Trend Following Basics

The goal of this section is to explain trend following system construction and the mechanics of trading in futures markets. Futures markets, futures trading, and the managed futures industry are reviewed. The basic building blocks of a modern systematic trend following system are discussed.

III. Theoretical Foundations

This section provides theoretical motivation for understanding why trend following works. The Adaptive Markets Hypothesis (AMH) is introduced and applied to derive and clarify the concept of crisis alpha. The concepts of divergent and convergent risk-taking strategies are introduced. This section explains the concept of market divergence and its role in trend following performance. Given that trend following is applied in futures markets, the role of interest rates and the roll yield are also discussed.

IV. Trend Following as an Alternative Asset Class

Trend following is discussed as an alternative asset class. The key properties of trend following returns are discussed, including performance measures, crisis alpha, crisis beta, drawdowns, correlation, and volatility. The concept of hidden and unhidden risks, leverage risk with dynamic leveraging, and macro environments are explained.

V. Benchmarking and Style Analysis

This section discusses return dispersion, benchmarking, and style analysis. The idiosyncratic effects of parameter selection are linked to return dispersion in trend following. A divergent trend following index and three construction style factors are introduced. The divergent trend following index and style factors are used to demonstrate the applications of return based style analysis. Performance attribution, monitoring, appropriate benchmarking, manager selection, and manager allocation are applications of style analysis.

VI. Trend Following in an Investment Portfolio

This section discusses trend following from the investor's perspective and advanced topics based on common themes earlier in the book. Topics include the role of equity markets in crisis alpha, the role of mark-to-market on inter-manager correlation, aspects of size, liquidity, and capacity, as well as the move from pure trend following to multistrategy. Finally dynamic allocation, or the question of when to invest in trend following, is discussed.

# Trend Following with Managed Futures