

COMING INTO VIEW

How AI and Other
Megatrends Will
Shape Your
Investments

JOSEPH H. DAVIS, PhD
VANGUARD GLOBAL CHIEF ECONOMIST

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WILL SHAPE YOUR INVESTMENTS**

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WILEY

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To my wife Elizabeth

CONTENTS

PREFACE: SKAGWAY, JACK BOGLE, AND MEGATRENDS	vii
CHAPTER 1 CHALLENGING MY OWN ASSUMPTIONS	1
CHAPTER 2 AI AND TWO SIMPLE TRUTHS	19
CHAPTER 3 THE FALLACY OF GLOBALIZATION'S RETREAT	49
CHAPTER 4 NOT DESTINY, JUST DEMOGRAPHICS	71
CHAPTER 5 GOVERNMENT DEBT AND DEFICITS: ONE MATTERS MORE	85
CHAPTER 6 MEGATRENDS AROUND THE WORLD	101
CHAPTER 7 THE TUG-OF-WAR: AI vs. FISCAL DEFICITS	115

CONTENTS

CHAPTER 8	
PREPARING FOR THE TUG-OF-WAR: PRINCIPLES vs. DOGMA	137
CHAPTER 9	
A VICTOR'S PORTFOLIO, ACT I: DIVIDE AND CONQUER	151
CHAPTER 10	
A VICTOR'S PORTFOLIO, ACT II: CHOOSE WISELY	173
CHAPTER 11	
CONCLUSION	183
APPENDIX	
FRAMEWORK DETAILS FOR THE INTERESTED READER	187
ACKNOWLEDGMENTS	199
INDEX	203

PREFACE

SKAGWAY, JACK BOGLE, AND MEGATRENDS

COMING INTO VIEW

At 3:30 p.m. on August 16, 1920, a de Havilland DH-4 cleared the Coastal Mountain Range and descended toward Skagway, Alaska—a port town established during the Klondike Gold Rush. The *Daily Alaskan* chronicled the bi-plane's arrival: "There was surely some excitement in Skagway yesterday when the shout went up that the aeroplanes were coming. The first one arrived at three thirty in the afternoon and was seen by almost everyone in town and it was certainly a beautiful sight."

In a black-and-white photograph preserved by the National Park Service,¹ men and women stand frozen in a field beyond Skagway's wood-framed buildings, their heads turned skyward (see Figure P.1). *What did these pioneers think as two tons of wood and steel clattered across the sky in this remote corner of North America?* Many had likely read about the Wright Brothers and "flying machines," but to see one with their own eyes must have been a revelation.

As a child, I would stare at this photograph, mesmerized by the airplane. I could almost feel the rush of wind from the airplane's wings as it passed over my head. But now that I'm older, I no longer stare at the airplane. Today, my eyes gravitate toward the people in the crowd. They were ordinary men and women, living in a gold-rush town clinging to relevance.

That day, in the shadow of the jagged mountain peaks, the future came roaring into view. Were they filled with excitement or fear? I imagine they asked the same questions that we ask when we glimpse the future. How will our lives and fortunes change? Will our children's future be better or worse?

Figure P.1 Skagway residents witness the first airplane passing over their remote port town, 1920.

Source: National Park Service, Klondike Gold Rush National Historical Park, Candy Waugaman's Collection, KLGO Library TA-8-8917.



A CENTURY OF TRANSFORMATION

History answered these questions for the residents of Skagway. The de Havilland DH-4 epitomized innovations that transformed the U.S. economy. Over the next century, some of these Alaskans might have experienced once unimaginable possibilities—a trip from the farthest reaches of western North America to New York City in hours rather than weeks; washing machines, dishwashers, and ovens and cooktops that eliminated much of the drudgery from household chores. And by 1969, some of those same descendants of Skagway's pioneers watched astronaut Neil Armstrong walk on the moon, a moment perhaps as unimaginable to them as that first airplane was to their grandparents.

Material progress in the United States has multiplied since then. In 1920, the median family income was less than \$25,000 in today's dollars. A newborn male could expect to live to age 54, a newborn female to 55.² A century later, the median family income is \$74,580.³ Male life expectancy is 74, 80 for a female.⁴ And unimaginable possibilities have multiplied, from autonomous vehicles on the road in San Francisco to NASA's plan to send astronauts to Mars in the next decade.

GAZING UPWARD AGAIN

As we gaze toward a future that feels both exhilarating and uncertain, do we see our generation's de Havilland DH-4 coming into view to transform our own work and lives? Artificial intelligence (AI) is a candidate.⁵ Will AI disappoint, or will it be the invention that propels our economy and society into a new era? If it is to be the latter, should we be excited about the

remarkable feats that AI might soon perform? Or fearful that this rapidly developing technology will automate and eliminate our jobs?

Even if AI delivers extraordinary breakthroughs, there is still the real possibility that technology will not rescue us from the headwinds the economy faces. It will have to contend with slowing population growth, rising geopolitical and trade tensions, and building national debt. These forces—a complex mix of headwinds and tailwinds—will reshape the economy, our jobs, and the financial markets in the years ahead. As investors, how should we best navigate this uncertain future? Should we prepare for the best, or brace for the worst?

Most days I feel like those Skagway pioneers, gazing up at the sky and wondering how the future will affect us all, our livelihoods, and our financial future. But unlike those Alaskan pioneers, we have tools that they didn't—data, models, and the benefit of hindsight from technologies of the past—to guide us in understanding what the future may hold.

MOVING BEYOND OPINIONS

Opinions about our future economic prospects, even informed ones, are not enough to navigate an uncertain future. Just as a patient expects a doctor to discuss the odds of success of a medical treatment when an illness is diagnosed, investors should expect the same range of outcomes when planning for their financial future. An effective strategy must be grounded in a range of outcomes, not conjecture on only one path, and it must account for the interplay of powerful forces like technology, demographics, globalization, and debt that shape economies and markets.

This book introduces a data-driven framework designed to do exactly that. The framework—detailed in the Appendix—provides probabilities of the most likely scenarios that will shape our economic and financial future,

primarily focusing through the year 2035. By connecting the forces of technology, demographics, globalization, and fiscal debt—what I call *megatrends*—with the building blocks of economic growth, inflation, and investment returns, this framework is intended to go beyond speculation.⁶ Acknowledging the uncertainty of our future, my aim is to offer actionable insights for anyone seeking to build a resilient investment portfolio in the years ahead.

FROM SKAGWAY TO LUNCH WITH JACK BOGLE

My focus on these megatrends is the result of a conversation with Vanguard founder Jack Bogle. In 2004, I met Jack for lunch in the “Galley,” the cafeteria in Vanguard’s nautical lexicon. I was new to Vanguard, hired to generate insights on the economic outlook for our investment teams and clients. I braced for a debate about the Federal Reserve Board’s recent rate hikes or whether next quarter’s GDP would exceed expectations.

We discussed none of this. Jack was quick to remind me why I had secured a Vanguard key card and cubicle. “What I need from economists, and what our clients need,” he said, “is a framework to determine the long-run earnings and dividend growth for stocks and interest rates for bonds.” Jack was talking about the building blocks of returns and the forces (i.e., megatrends) that shape their outcomes. Jack had long advocated for a simple yet elegant formula for predicting long-run (which Jack often defined as 10 years) stock and bond returns:

$$\text{Expected stock returns} = \text{Initial dividend yield} + \text{Future earnings growth} + \text{Change in P/E ratio}^7$$

Decades earlier, Jack had noted in his classic 1993 investment book, *Bogle on Mutual Funds*, that using the three components of stock valuation shown here “has led to remarkably helpful predictions of long-range returns” (p. 247). Still, Jack understood that forces like technology and debt shaped these variables in ways that his formula couldn’t capture.

As we finished lunch, placing our plates on the conveyor belt to the dishwasher, I told Jack that I would begin working on extending the framework he wanted, a more dynamic approach that would account for the push and pull of megatrends. “Keep me posted,” he said. I’ve been working on it ever since.

PROBABILITIES AND HUMILITY

This book is the culmination of 20 years of economics, investment, and asset allocation research. It integrates insights from three different economic disciplines (business cycles, endogenous growth, and asset pricing) and real-world experience into a unified framework, the **Megatrends Model**. This framework has benefited from discussions with policymakers, Federal Reserve researchers, business leaders, leading universities, and some of our 50 million clients. It is my hope that the end result will help all investors—financial advisors, investment consultants, self-directed investors, and endowments—build portfolios consistent with their objectives.

This book integrates megatrends with the financial markets to present a range of possible future outcomes, rather than a view of simply one future. This approach to forecasting is an asset, not a liability. Indeed, in his best-selling 2012 book *The Signal and the Noise: Why So Many Predictions*

Fail—But Some Don’t, Nate Silver rejects such singular “point forecasts” in favor of forecasts that present several scenarios, with odds (or “probabilities”) assigned to each. Probabilities are often displayed in sports or in games of poker and chess in trying to handicap outcomes, thus proxying for real-world uncertainty as events unfold.⁸ Annie Duke, a champion poker player and best-selling author of *Thinking in Bets* (2018), shares a similar perspective. By estimating the potential performance of stocks and bonds in one scenario versus another, an investor can make better decisions based on the expected values of those different outcomes. By linking megatrends with investment recommendations, this book is intended to bridge books that focus exclusively on economics with those focused exclusively on personal finance.

CHALLENGING ASSUMPTIONS

The main thesis of this book is simple yet profound. It’s that the consensus view on the future U.S. economy—a view of “status quo” in growth, inflation, and financial returns that I have sometimes shared—is unlikely to persist. Yes, it is possible, but the future will more likely bring an inflection point. This conclusion is based on accounting for the push and pull of competing megatrends that many standard frameworks can miss. The nature of our work, our standards of living, and our portfolio returns are unlikely to resemble those of the recent past.

This diagnosis is less radical than it sounds. Why? Because the “status quo” view expects a narrow range of outcomes quite uncommon in history. The “status quo” view is close to the type of “point forecast” that Nate Silver warns about. It can be a rational view, but this book is about sharing why it rests on some very strong assumptions.

THE IMPLICATIONS FOR INVESTORS

Whether you manage your own investor portfolio, direct corporate strategy, or manage the wealth of clients, this book has two broad *investment* implications. Both are actionable and practical.

- **First, we should not plan our investments for the status quo:** Megatrends move like tectonic plates that alter the economic geography. The consensus view is a *risky* one in its underappreciation of the likelihood of non-consensus outcomes through 2035.
- **Second, we should plan for two future paths, not one:** Two other scenarios, as I'll share, are more probable than the "status quo." As investors, we will need to evaluate portfolios that are prepared for both. The reality is that these two scenarios are not just possibilities, but *probabilities* that can be incorporated into our investment plans to better control risk and improve long-term outcomes. These scenarios could also prove useful to policymakers.

STAYING THE COURSE

Since founding The Vanguard Group in 1975, Jack Bogle championed long-term investing with a simple yet powerful principle: "Stay the course." This philosophy emphasizes maintaining a well-diversified, low-cost portfolio consistent with one's risk tolerance and financial goals.

As someone who has spent over 20 years at Vanguard, I firmly believe in the power of "staying the course" when navigating economic and financial uncertainty. As the Chair of Vanguard's Strategic Asset Allocation Committee and head of its Investment Strategy Group, I take seriously the

responsibility of helping set strategic asset allocations for multi-asset portfolios relied upon by millions of investors. Whether you are saving for your retirement, your children's education, or for the next generation, this book is written with you in mind.

PREPARATION OVER PREDICTION

Jack Bogle recognized that portfolio risks shift as megatrends shift. And while we cannot control or strongly predict market returns, we *can* control market risk by assigning probabilities to different outcomes. That was ultimately the reason behind my lunch with Jack that day. He had respectfully challenged me to use economics to help investors better plan by forming more reasonable expectations of portfolio risks.

In my view, “staying the course” is less about predicting the future and more about preparing for multiple scenarios. Sound risk management means evaluating how one's portfolio may perform given the probabilities of different outcomes. Jack's advice was timeless. This book's aim is to use new data and models to better quantify the risks from shifting megatrends to best follow this advice.

WHY THIS MATTERS

This book evaluates the future performance of several strategic model portfolios under different megatrend scenarios. I'll start with classic ones such as the 60/40 portfolio (60% stocks and 40% bonds). I'll also draw in perspective from other investment legends, including Burt Malkiel's *A Random Walk Down Wall Street* and Benjamin Graham's 1949 classic *The Intelligent Investor*.⁹

PREFACE

This book will allow you to evaluate your portfolio's performance in light of competing megatrends. I will provide explicit portfolio allocations that could mitigate certain risks. I will share why intuitive strategies—like investing heavily in technology stocks during technological change and avoiding bonds during a period of rising deficits—can backfire. If this book delivers on its promise, readers should feel more informed, more confident, and more prepared to take action with respect to their investments and their future.

I have never forgotten my lunch with Jack Bogle some 20 years ago, the chance to trade thoughts on economics with this investment pioneer as he ate a peanut butter and jelly sandwich and drank a diet iced tea. Jack passed away in 2019 at the age of 89. But his philosophy and wisdom continue to help millions of investors, including me and my Vanguard colleagues.

My hope is that this book would make Jack proud.

Joseph Davis, Ph.D.

The Vanguard Group

Valley Forge, PA

January 2025

P.S. As author, I have designated that any profits from the sale of this book should be donated to Vanguard Strong Start for Kids, my employer's charitable initiative dedicated to helping children growing up in poverty.

NOTES

1. Gurcke, K. (2012). “The First Aeroplane in Skagway.” www.nps.gov. National Park Service. May 8, 2012. <https://www.nps.gov/articles/klgo-first-airplane-in-skagway.htm>.
2. University of California Berkeley. 2019. “Life Expectancy in the USA, 1900-98.” [Berkeley.edu. https://u.demog.berkeley.edu/~andrew/1918/figure2.html](https://u.demog.berkeley.edu/~andrew/1918/figure2.html).
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4. U.S. Social Security Administration. 2016. “Actuarial Life Table.” [ssa.gov. 2016. https://www.ssa.gov/oact/STATS/table4c6.html](https://www.ssa.gov/oact/STATS/table4c6.html).
5. A definitional note: I use the term *artificial intelligence*, coined by Stanford University professor John McCarthy in 1955, as a catchall to describe emerging technologies that allow computers and computer-controlled devices to perceive the environment, learn from experience, solve new problems, and communicate—capabilities associated with intelligent beings. Generative AI, the engine behind chatbots and algorithms that can produce human-like writing and computer code, is one example. Machine learning techniques such as reinforcement and deep learning, which can almost instantaneously produce optimal solutions to complex multi-variable problems, is another. New AI-related technologies will continue to emerge.
6. These megatrends are what economists refer to as drivers of *supply*. They involve the ebb and flow in the supply of new workers or retirees (*demographics and aging*), the supply of new products and ideas (*technology*), the exchange of goods and ideas across borders (*globalization*), and the supply of government debt (*fiscal deficits*). Other factors I include in the Megatrends Model include measures of climate change and geopolitical risk. And make no mistake—these forces are not just relevant for long-term plans; they matter for the here and now, as I will share in Chapter 1.
7. See, for instance, Bogle, J. C. and Nolan, M. W., Jr. (2015). Occam’s Razor Redux: Establishing Reasonable Expectations for Financial Market Returns. *Journal of Portfolio Management*, 42(1), 119–134. Jack referred to the first two components in that formula as stock’s fundamental *investment returns*. The latter change in valuations represented the *speculative return* that tended to regress to the mean over time. My co-authors and I expanded upon Jack’s framework in a 2018 *Journal of Portfolio Management* paper to include other critical factors, including changes in inflation and real (inflation-adjusted) interest rates.

For details, please see Davis, J., Aliaga-Diaz, R., Ahluwalia, H., and Tolani, R. (2018). Improving U.S. Stock Return Forecasts: A “Fair Value” CAPE Approach. *Journal of Portfolio Management*, 44(3), 43–55. The empirical framework for this book (and summarized in this book’s appendix) expands upon these previous frameworks along several important dimensions.

8. The importance of probabilistic thinking and humility in forecasting is also underscored in Tetlock, P. E. and Gardner, D. M. (2015). *Superforecasting: The Art and Science of Prediction*. Crown Publishing Group. Thanks to my Vanguard colleague Andy Reed for pointing out that acknowledging uncertainty is also a fundamental component of wisdom, according to the prevailing theoretical model in developmental psychology. See, for instance, Baltes, P. B. and Smith, J. (2008). “The Fascination of Wisdom: Its Nature, Ontogeny, and Function,” *Perspectives on Psychological Science*, 3, 1 which can be found at <https://doi.org/10.1111/j.1745-6916.2008.0006>.
9. Burt Malkiel’s classic investment book, originally published in 1973, is now in its twelfth edition. See Malkiel, B. (2019). *A Random Walk Down Wall Street: The Time-Tested Strategy for Successful Investing*. W.W. Norton & Company.

CHAPTER ONE

CHALLENGING MY OWN ASSUMPTIONS

THE NOBEL PRIZE AND STATUS QUO BIAS

On October 9, 2017, The Royal Swedish Academy of Sciences awarded Richard H. Thaler the Sveriges Riksbank Prize in Economic Sciences, otherwise known as the Nobel Prize in Economics.¹ Professor Thaler, a pioneer in behavioral economics at the University of Chicago, has helped transform our understanding of human decision-making. Decades of his work have challenged the traditional notion among economists that humans and financial markets are inherently rational.

In an interview by the University of Chicago's *Big Brains* podcast,² Thaler recalls the early 4 a.m. call from Sweden notifying him of his Nobel Prize. "I look at [my] cell phone and it says, 'Sweden.'" He paused and then

chuckled and added, “They tell you the good news. And take great lengths to convince you that this is not a prank.” Thaler then goes on to note the call ended with the request: “Drink some coffee because there’s a press conference in 45 minutes.”

Professor Thaler’s work has had a profound influence on me, both as an economist and as an investor. His work on “saving for a pension” and “nudges”—small interventions that help people make better decisions—has added billions of dollars to Americans’ retirement savings. Millions of workers now save more for their retirement thanks to auto-enrollment and default features in 401(k) plans, a direct application of Thaler’s research.³

Another compelling body of his work, some co-authored with fellow Nobel Laureate Daniel Kahneman, helped to further develop and popularize the concept of *status quo bias*. Status quo bias is the tendency for human beings to stick with a current belief or decision, even when new information reveals more likely alternatives. Thaler and his peers have shown that this bias affects decisions as varied as choosing insurance policies and NFL draft picks. In economics, it occurs when forecasters stick with outdated assumptions, reluctant to admit that they might be wrong. My Mom would call that being stubborn. Whatever the label, it blinds us to shifting patterns.

COMFORT IN CONSENSUS, AND THALER’S NUDGE

Status quo bias looms large in forecasting. When asked about U.S. economic prospects over the next decade, I’ve often echoed the prevailing consensus shared by my industry peers: GDP growth and inflation will hover near 2%. This widespread view assumes a return to the “new normal” world that existed before COVID-19, with low but stable growth, low inflation, and low interest rates.