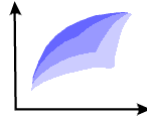


Efficient Frontier



An Online Journal of Practical Asset Allocation

Edited by William J. Bernstein
and Susan F. Sharin

Winter 2004

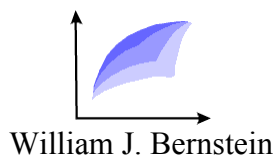
Table of Contents

- [It's the Execution, Stupid](#)
- [Almost Normal](#)
- [A Preview of *The Birth of Plenty*](#)
- [Links of the Month](#)

[**Home**](#)

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Efficient Frontier



It's the Execution, Stupid

Taking one's lumps comes with the authorial territory and, as these things go, I've been lucky. Ninety-five percent of my feedback is positive; in fact, this psychic pay far exceeds my royalties and advances. Further, most of the discontents are pretty obviously the owners of various gored oxen, even if the precise breed is never identified.

But one particular criticism rankles—that my books are "out of date." Why? Because I "ignore" ETFs. In the first place, I don't: *The Intelligent Asset Allocator* was published in 2000, and although I briefly discussed the blossoming field, at the time they were just too new to recommend. In *The Four Pillars of Investing*, which came out a scant eighteen months later, I actually did recommend their purchase to those who were so inclined, and listed them along with the appropriate open-end vehicles. I did state that ETFs were not appropriate for value averaging/dollar cost averaging, for obvious reasons.

Apparently, that was not enough for those who think that open-end funds are old fashioned, if not downright foolhardy, especially in an environment rife with late trading and market timing.

How do I *really* feel about ETFs? I don't buy them. Not for myself, my family and, in particular, not for the clients of our advisory firm. The reason? Because, in most cases, you can do better. To show you why, I've put together a table from the Morningstar database (note that ER is expense ratio and TE, tracking error):

	Index	Vanguard	ETF	Start Date	End Date	ETF ER	Vang. ER	ETF TE (Gross of Fees)	Vang. TE (Gross of Fees)
S&P 500	10.57%	10.47%	10.38%	Feb-93	Oct-03	0.11%	0.18%	-0.08%	0.08%
S&P500V	-8.52%	-8.62%	-8.69%	Jun-00	Apr-03	0.18%	0.23%	0.01%	0.13%
S&P500G	-17.02%	-17.20%	-17.23%	Jun-00	Apr-03	0.18%	0.23%	-0.03%	0.05%
S&P400	-1.61%	-1.54%	-1.78%	Jun-00	Apr-03	0.20%	0.26%	0.03%	0.33%
S&P400V	13.12%		12.82%	Aug-00	Oct-03	0.25%		-0.05%	
S&P400G	-2.91%		-3.29%	Aug-00	Oct-03	0.25%		-0.13%	

S&P600	8.60%		8.42%	May-00	Oct-03	0.20%		0.02%	
S&P600V	3.51%	3.97%	3.18%	Aug-00	Apr-03	0.25%	0.27%	-0.08%	0.73%
S&P600G	-5.37%	-5.25%	-5.67%	Aug-00	Apr-03	0.25%	0.27%	-0.05%	0.39%
Ru1000	-6.71%		-6.84%	Jun-00	Oct-03	0.15%		0.02%	
Ru1000V	0.81%		0.63%	Jun-00	Oct-03	0.20%		0.02%	
Ru1000G	-		-	Jun-00	Oct-03	0.20%		-0.09%	
	15.08%		15.37%						
Ru2000	4.55%	4.48%	4.16%	Jun-00	Oct-03	0.20%	0.27%	-0.19%	0.20%
Ru2000V	14.23%		13.85%	Aug-00	Oct-03	0.25%		-0.13%	
Ru2000G	-8.05%		-8.40%	Aug-00	Oct-03	0.25%		-0.10%	
Ru3000	-5.96%		-6.18%	Jun-00	Oct-03	0.20%		-0.02%	

The first column lists the asset class being tracked, and the next three columns are the returns of the appropriate index, ETF, and Vanguard fund, respectively. All of the ETFs are iShares, except for the SPDR S&P 500 offering, which provides a much longer baseline. The last two columns are the tracking errors versus the index for the ETFs and Vanguard funds respectively, gross of fees (i.e. taking expenses into consideration). Performance net of fees can be determined simply by looking at the third and fourth columns. I cut the analysis off at the end of April 2003 for the S&P 500 value and growth, the S&P 600 value and growth, and the Midcap (S&P 400) category because of Vanguard's switch away from the S&P benchmark system after that.

In all seven cases where a direct head-to-head comparison can be made, the Vanguard funds outperform the iShares. The results are highly statistically significant, with a *t-stat* of 2.78 for net returns and 3.44 for gross returns (*p* values less than 0.016 and 0.007, respectively). Pretty impressive for just seven data points. In some cases, it isn't even close; the Vanguard Small-Cap Value Index Fund beats the relevant ETF by about 80 basis points (bp) both before and after expenses.

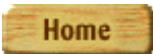
The conclusion here should be obvious even to the most rabid early-adopter (if it hasn't already hit everyone else over the head in light of recent events in the fund industry): *corporate culture counts*. It's not that there's anything wrong with Barclays; their tracking errors are pretty respectable. It's just that they're not Gus Sauter.

Another company, like Vanguard, with a "good culture" is Dimensional Fund Advisors. Their flagship U.S. Microcap Fund has outperformed its index, the obscure CRSP 9-10 decile, by almost 1% per year since inception in 1992, despite a 0.56% expense ratio. (All of that margin came in the first half of the period—in the past decade, they've managed to keep up with the index on a net basis, no small accomplishment in view of the fact that the fund now owns upwards of 10% of the market cap of each of its names.)

The "problem" with DFA's other funds is they don't really take their benchmarks seriously, providing multiple versions for some, none for others, and thumbing their noses at the benchmarks in any case, on the theory that it's best to aim for low turnover and negative transactional expenses, rather than slavishly follow an index, which can be expensive. I agree strongly with them and, in fact, wish that Vanguard would have the moxie to do the same. If DFA has the credibility to put performance above index tracking, certainly so does Vanguard.

But I digress. The arguments in favor of ETFs (that they are theoretically more tax-efficient, that they are less susceptible to timing and late-trading shenanigans, that in a few cases their expense ratios are a tad lower than the corresponding open-end funds) pale in comparison to the performance difference. What good is it that the SPDR expense ratio is 7 bp less than Vanguard's 500 Index Fund when the latter has a 16 bp execution advantage? Just how likely is it that anyone is timing or late trading Vanguard funds? I would not be surprised if somewhere someone had figured out how to get a bit of late or rapid trading past Vanguard, but I'd be shocked if there were any monkey business internal to the company. *Regardless, Vanguard still manages to outperform the corresponding ETF in every case.*

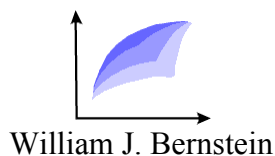
And that's before we get to the cows in the ETF living room: commissions, spreads, and the truly awful performance of the single-country offerings. Call me old fashioned: I'll go with outperformance born of transactional skill every time, even if my fund choices are as out of date as my khakis, eyeglasses, and minivan.



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Efficient Frontier



Almost Normal: Of Fat Tails, Mean Reversion, and Survival



If there is one belief professed by almost all successful investors, it is a faith in mean reversion. This creed can be expressed very simply: what goes up must come down, and vice versa. Or it can be put more formally: prolonged high realized returns must of necessity lower expected returns, and vice versa. And, if one is a showoff: long-period autocorrelations with lag = 1 tend to be negative.

But whether you say tomato or to-mah-to, it all means the same thing—unless you can throw money into stocks when they're in the toilet and avoid buying into bubbles, your best chance at a successful retirement is the demise of a wealthy relative.

Although the evidence for mean reversion is weak, most financial economists believe that it exists. The lack of supportive data likely stems from the statistical nature of mean reversion; since mean reversion is a long-term phenomenon, we cannot collect enough independent observations to prove the case.

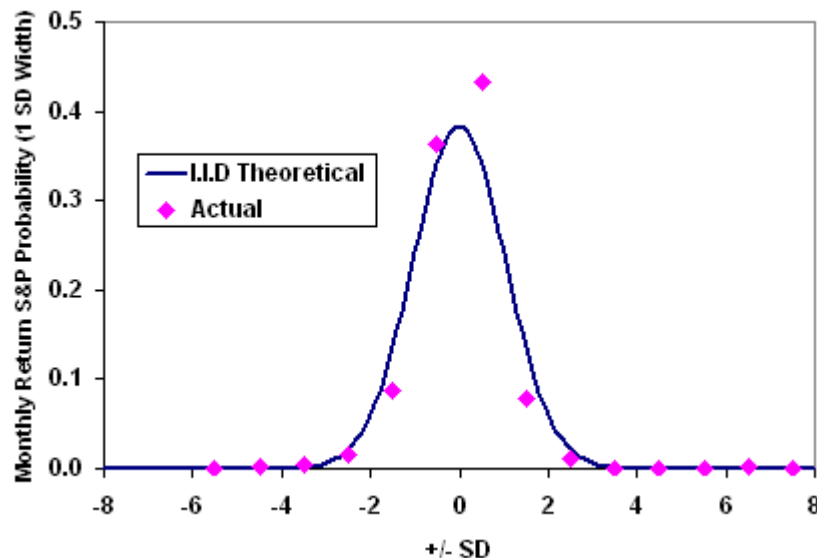
Two recent working papers speak to this issue, and their conclusions are not reassuring. The first, an offering from Philippe Jorion at U.C. Irvine, expands upon previous work with William Goetzmann on twentieth-century equity

returns. Jorion probes the same database with a variety of techniques—variance ratios, loss probability, and value-at-risk—and shows that while mean reversion seemed to occur in the most successful nations, it did not occur in others, and that when the entire sample was examined, there was no evidence for it whatsoever.

Worse, nations that experienced "interruptions" of their capital markets demonstrated mean *aversion*, that is, in unstable nations, one terrible period was likely to be followed by another. The only good news was that a diversified global portfolio demonstrated less risk than that of any single nation.

The second paper, by Xavier Gabaix and his colleagues at MIT, explains why life in the financial markets has a fat tail and why the highly improbable seems to occur so often. Take, for example, the stock-market crash of October 19, 1987, during which the S&P 500 lost 23% in a single day. Since the daily standard deviation (SD) of this index is almost exactly 1%, it was a 23 SD event. How improbable is that? Don't even try to calculate the value—you'll get a migraine from all the zeros.

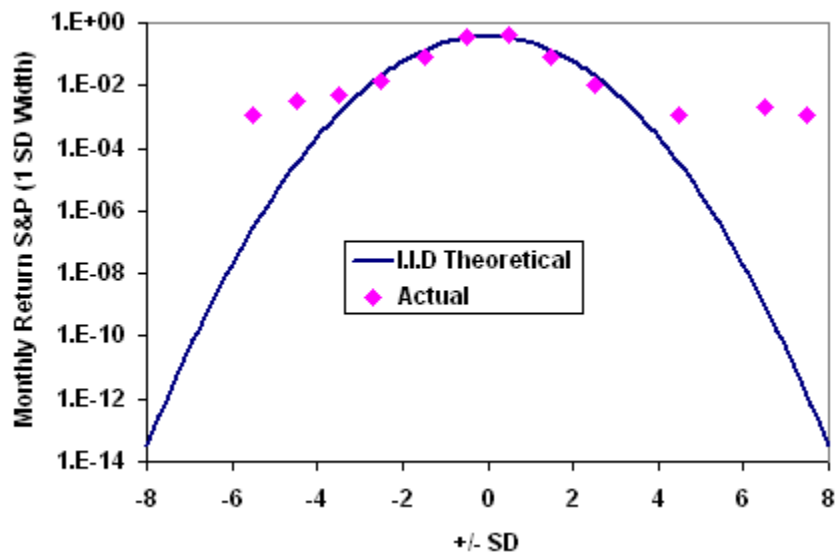
The reason, according to Gabaix et. al., is that security returns are not really normally distributed; they only look that way. To illustrate this phenomenon, I've plotted the frequency of monthly returns of the S&P 500 since 1926. The mean value is 0.974% per month, and the SD of monthly returns is 5.63%. Next, I plotted the actual frequency of returns at 1 SD intervals against a normal distribution (as it's known in the trade, "i.i.d.," independent, identical distribution), as shown below:



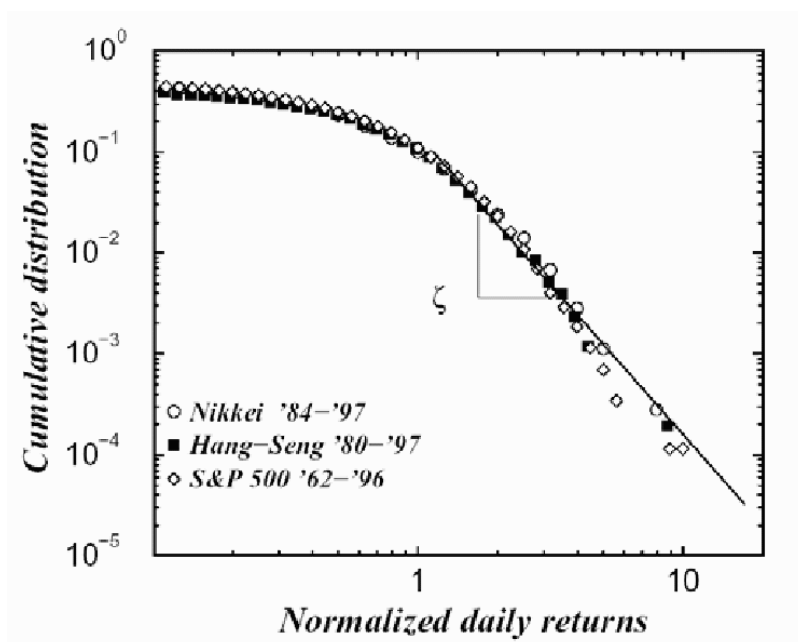
Looks like a pretty good fit doesn't it? Actually, it ain't. It only appears that way because we're plotting frequency on the y-axis using an arithmetic scale. This method doesn't do a very good job of showing what's happening at low probabilities. For example, there was one monthly return in excess of 7 SD above the mean and two between 6 SD and 7 SD—roughly a 0.1% and 0.2%

incidence, respectively, whereas a normal distribution would have predicted an incidence of about 0.0000000001% and 0.0000001%, respectively. Clearly, something is wrong with the normal assumption.

The problem, and the solution, shows up clearly when we plot incidence and probability logarithmically, as shown below:



At the extremes, the probability seems to fall off along a straight line—that is, geometrically when using a semilog plot—not normally, which would yield a much steeper falloff. The authors studied this phenomena using the returns of thousands of securities at intervals as short as fifteen minutes, yielding millions of observations. Their data are breathtaking. With the author's permission, I've reproduced a graph of daily returns for the U.S., Japanese, and Hong Kong Markets:



Note, first, how the distribution of returns is nearly identical across nations. Second, see that in the high probability (low SD) region, there is a "flat spot" of returns, above which they bend over linearly using a double-logarithmic plot. The slope of this plot has a power of almost exactly three—i.e. incidence falls off as the cube of increasing SD. Since there is a "flat region" at low SDs, it's not quite as simple as a -4 SD event being one eighth as probable as a -2 SD event. But the key thing is that using their formulation, events such as the 1987 crash fall into the realm of possibility, even probability. When the authors looked at fifteen-minute returns, they observed events at the ± 70 SD level (that's right, *seventy* standard deviations).

Even more remarkable, the authors present a case for other "power laws" as well. In addition to the "cubic law" of equity returns, there is a cubic law for the incidence of the number of trades, a first power law for the number of investors as a function of size, and a "half-cubic" law relating the number of trades to volume. If you're good at canonical math, the authors will even supply you with an impressive theoretical model that explains their findings.

What ties together the work of Jorion and Gabaix et. al. is the notion that it's a wild world out there and, as the nice folks at Long Term Capital Management found out a few years back, you can't always depend on mean reversion and price convergence to save your bacon.

A medical analogy will suffice. Patients with acute illnesses can wind up in one of three places in the hospital: the routine medical or surgical ward, where uncomplicated cases are managed, the intensive care unit, where the most serious cases are treated and the outcome is not so certain, and the morgue. If you confine your analysis to the ward, you would conclude that human health mean reverts—the sick tend to get well. If you visit the intensive care unit, you might not be so sure. And if you spend most of your time in the morgue, it would be obvious that human health mean *averts*.

The coin depicted at the head of the article, an Athenian stater from around 293 B.C., supplies a metaphor for the same process at a national level. By that date, the decline of that great ancient city-state was well advanced, and in a desperate, unsuccessful bid to hold off the Macedonian hordes at its gates, the Athenians stripped gold from the sacred statue of Athena in the Parthenon and minted it into these coins to pay for the city's defense.

For the past seventy years, financial economists have spent most of their time "on the ward" with the healthiest cases—nations like the U.S. and the U.K. As long as these nations remain stable, their stock markets will appear to mean revert. If there is any good news here (beyond the diversification benefit demonstrated in Jorion's current and previous work), it is that the world's major economies and securities markets should remain healthy for the foreseeable future, and thus continue to bless us with what appears to be mean reversion.

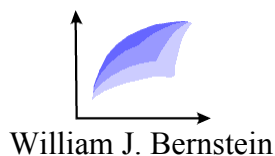
And if they do not, and their markets "mean avert," our portfolios will be the least of our worries.

A rectangular button with a wood-grain texture and the word "Home" in a dark, serif font.

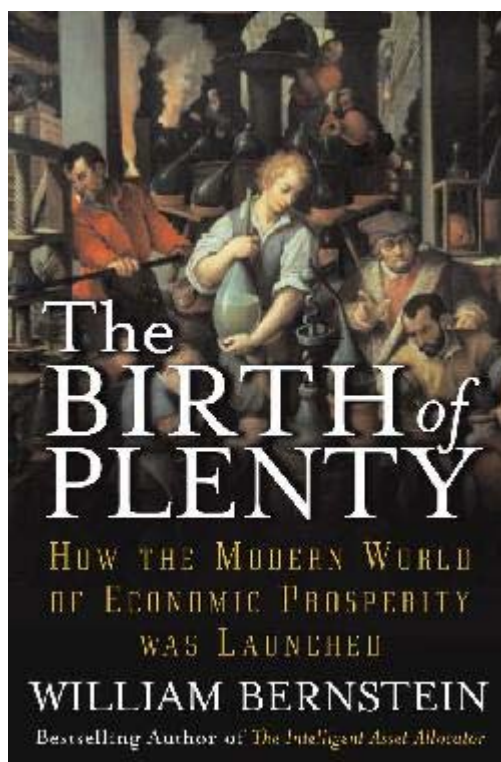
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Efficient Frontier



*The literary wheels are slowly turning at **Efficient Frontier**. Two years of work will culminate on May 1, 2004 with the publication of **The Birth of Plenty**, an inquiry into the origins of modern prosperity. With the kind permisison of McGraw-Hill, I lay out the book's premise here, using excerpts from the Preface and Introduction. ---WB*



For those of you interested in preordering, Amazon.com is currently offering a generous discount on first-edition copies.

The Birth of Plenty

When my wife brought P. J. O'Rourke's *Eat the Rich* home from the library several years ago, I wasn't expecting much in the way of historical insight. Mr. O'Rourke aims to amuse, and his lighthearted romp through the world's economic success and sob stories did not disappoint, most memorably his exposition of credit risk: a junk bond is a loan to your little brother; a high-quality bond is a loan to your little brother by the Gambino family.

Mr. O'Rourke's frothy prose hides painstaking legwork. Scattered under the quips were some well-researched passages, including one that briefly mentioned data assembled by an obscure Scottish economist named Angus Maddison, who found a startling discontinuity in world economic growth around 1820: before that date, growth was essentially nonexistent, and after, sustained and vigorous.

It took me a while to rustle up a copy of Maddison's summary work, *Monitoring the World Economy 1820-1992*. The bound edition looks as dull and as daunting as the densest legal brief, but inside, Maddison's dry data lay out the greatest story ever told: the economic birth of the modern world. The finest written rendition of Japan's Meiji Restoration and post-World War II prosperity does not do justice to the raw numbers presented in Maddison's book: 6% inflation-adjusted growth in Japanese per capita GDP, a doubling of average life span, a near-quadrupling of educational levels, and the rapid disappearance of illiteracy, all in the four decades before World War I.

I became fascinated with this sudden change in the Western world's fortunes. Maddison himself made a half-hearted stab at explanation, briefly mentioning technologic progress, improvements in trade, finance, and human capital, and exploitation of natural resources, as well as referring to more obscure economic concepts such as "growth accounting." None satisfied me. The commonplace belief that technologic change produces economic improvement explains nothing. Almost by definition, economic growth is the child of technological innovation. Were advances in electronics, transport, and the sciences to suddenly cease, economic growth would almost automatically stop.

The question gnawed at me: Why? Why did world economic growth, and the technologic progress underlying it, suddenly explode *when* it did? Why didn't the Florentines invent the steam engines and flying machines that Da Vinci sketched? Why didn't the Romans, with their metallurgical skills, discover electricity and invent the telegraph? Why didn't the Greeks, with their expertise in mathematics, describe the laws of probability, without which modern capital markets cannot function? For that matter, why did the Athenians remain desperately poor for the two centuries between their defeat of the Persians and their envelopment by Alexander, when they possessed the commonly recognized conditions for economic growth: democracy, property rights, free markets, and a free middle class? Most important of all, why did Hobbes's description of life in a state of nature as "solitary, poor, nasty, brutish, and short" disappear from Western Europe less than two centuries after it was set down on paper?

Paul Johnson comes as close as anyone to answering these questions in *The Birth of the Modern*. His description of the revolutions in the sciences, politics, literature, and the arts at the beginning of the nineteenth century is nonpareil, a wonderful prose counterpart to Maddison's work—*Early Modern Developmental History for Poets*, if you will. Johnson, however, remained silent on the ultimate question of why this most important of all historical transitions occurred exactly *when* it did. In a different vein, Jared Diamond's *Guns, Germs, and Steel* asks "Yali's Question"—Why do white men have all the cargo? (Yali is a New Guinea tribesman, and "cargo" is the local term for all technologically advanced inventions—most notably, steel axes, soft drinks, and umbrellas.) Although Diamond's book provides a breathtaking overview of the biological and geographic players in human history, it remained silent on the tribesman's plaintive query.

My task, then, is to uncover the cultural and historical factors that came together during the early nineteenth century and ignited the great economic takeoff of the modern world. Effective nonfiction transcends the mere exposition of facts and narratives, no matter how well told, and provides readers with useful *tools* for understanding the world around them. Any approach to the origins of world prosperity presents two challenges. First, the story—how the world arrived at its present state—is one of the most intrinsically absorbing any author can tackle. If the author cannot command the reader's interest with it, he has no one but himself to blame. The second challenge is to provide the reader with a framework capable of explaining why *any* nation—not just the several covered in this book—is wealthy or poor, democratic or totalitarian, weak or powerful, and perhaps even whether or not its citizens are satisfied with the lives they lead. If the author succeeds, his readers may even be able to catch a glimmer of what the future holds for our planet and its peoples.

This book divides naturally into three parts: why, how, and whither. First, I'll attempt to define economic growth's ultimate sources. Next, I'll describe how these factors played out in various nations. Finally, we'll focus on the remarkable sociological, political, and military consequences of the modern world's explosive economic growth. An understanding of the sources of that growth provides powerful insights into the other great questions of our time:

- In a world that is becoming not only more wealthy but also more complex, fast-paced, and stressful, what is happening to the overall well-being and satisfaction of the average person?
- What is the relationship between wealth and democratic development? What does economic progress, and the resultant growing inequality of wealth among nations, hold in store for the world's political future? What are the prospects for successfully exporting democracy to countries like Iraq and Afghanistan?
- How has the evolution of modern prosperity affected the current balance of power in the world? Is the military

ascendancy of the United States a historical accident, and can it be expected to continue? How effectively can non-Westerners, particularly in the Moslem world, wield political and military power?

The great tragedy of the premodern era was that large bodies of knowledge would be lost for millennia. Before Gutenberg and Bacon, inventors lacked two critical advantages that we take for granted today: robust information storage and a firm foundation of scientific theory. The lack of a scientific method meant that technological advances relied purely on trial and error and were thus few and far between. Further, inventors and manufacturers could record their work in only a few places, if at all. Consequently, inventions were frequently "lost," and the technological and economic condition of the ancients retrogressed almost as often as it advanced.

True, beginning about A.D. 1000, there had been improvement in human well-being, but it was of a sort so slow and unreliable that it was not noticeable during the average person's twenty-five-year life span. Then, not long after 1820, prosperity began flowing in an ever-increasing torrent; with each successive generation, the life of the son became observably more comfortable, informed, and predictable than that of the father.

This book will examine the nature, causes, and consequences of this transformation. The first section will unfold the compelling narrative told by these new data. I will identify the points in both time and space where economic growth sprang alive after millennia of slumber. I will also describe and examine the history of the four factors—property rights, scientific rationalism, capital markets, and improvements in transport and communication—that are the essential ingredients for igniting and sustaining economic growth and human progress.

The second section tells the story of when and how these factors came into play: first in Holland, then in England and its cultural offspring, followed in turn by the rest of Europe, Japan, and, finally, the remainder of East Asia. In each case, I will dissect the takeoff in growth and find that not until all four factors mentioned above are in place can a nation prosper.

Although I try to maintain a global perspective throughout this book, many readers will find its focus overly Eurocentric. Were not the Chinese—the inventors of paper, the printing press, and gunpowder—the great innovative engineers of the premodern world? Were not the early Arab empires oases of learning and culture during a time when Europe was mired in the Dark Ages? Did not mathematicians in India devise a numerical system, incorporating the concept of zero, that was far more advanced than the Greco-Roman letter-based system? To all these questions a resounding yes. Yet not one of these societies was able to turn the modern Western trick of continuously and permanently raising its citizens' standard of living. Further, the four factors responsible for modern wealth—property rights borne on the common law, scientific rationalism, advanced capital markets, and the great advances in transport and communication—were largely European in origin. Although prosperity has become a global phenomenon, there is no escaping the fact that the nursery of

modern wealth lies in the area between Glasgow and Genoa.

Finally, the book's third section will plumb the sociological, political, economic, and military consequences of the great discrepancies in personal and national wealth that have arisen from this birth of plenty, and what the consequences of growth hold in store for the future.

Recent advances in the social sciences provide us with a fascinating window on the complex interaction of societal values, wealth, and politics. First, the bad news. In a world growing more and more prosperous, people are not necessarily becoming happier, particularly in the West. But the good news is that substantial improvements in individual well-being are occurring in developing nations. As nations pass from the third world to the first, their citizens do indeed become more satisfied. Moreover, it is economic development that produces democracy, not the other way around—"too much" democracy may actually be bad for economic growth. The rule of law is the essential bulwark of a robust system of property rights. Property rights, in turn, are essential to prosperity. Finally, prosperity is the essential fertile soil in which democracy flourishes. Thus, optimism about democratic development in a nation whose traditional cultural values are antithetical to the rule of law—such as Iraq or Afghanistan—is likely to prove costly and dangerous.

I will argue that the destinies of nations are determined far more by their economic dynamism than by the vagaries of war, culture, and politics. The current world hegemony underwritten by American military might is no accident. History teaches that the fate of all great world powers is decay and downfall, but this cannot occur to the United States until another nation both surpasses American economic productivity *and* takes an interest in projecting power—something that will not likely come to pass anytime soon.

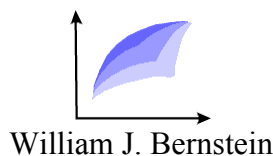
By examining how our world prospered when and where it did, we just may be able to better divine where it is we are going.



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Efficient Frontier



Links of the Month

403bwise.com

This month, we're going to eschew my fondness for financial academic arcana and help out some of my favorite people—teachers. Besides being overworked, overstressed, underpaid, and often disrespected, it is starting to dawn on these folks that for years they have seen the short end of the deal in yet another arena—their retirement plans.

While some teachers benefit from well-run defined benefit plans, even more find themselves in one of the dankest, foulest-smelling cellars of the financial world—the 403(b) plan. School districts love 'em—they require no plan document, no educational effort, and almost no administrative support. Who fills this gap? Usually a motley crew of small-time advisors, broker-dealers, and even moonlighting colleagues peddling the most ghastly assortment of insurance products and B-shares imaginable. (And just who allows this to happen? Think free skybox seats and nights on the town for school administrators and union reps.)

Are you a teacher who has one of these awful plans and worries about a retirement diet of Little Friskies? Are the wonderful folks who teach your kids in this boat? Do you or they even know they have a problem? Log onto 403bwise.com and find out about all the nifty tricks now at your disposal for identifying, fixing, or escaping a bad plan. And if you're a little rusty on the basics of retirement planning and investing, they'll help you out there too. Need a speaker for your retirement group? A model plan? They just may be able to help you out. They'll even make you [laugh](#).

My favorite maneuver: the [90-24 transfer](#) which enables a participant to periodically sweep out his money-market fund (which usually doesn't carry a load, even in the worst of plans) over to Vanguard or TIAA-CREF. If need betake a look at their sister site, 457bwise.com, as well.

Terrance Odean's Streaming Lecture

Terry Odean's marvelous research and lecture style need no elaboration here. You'll first have to go to his [Web site](#), then click on the "Streaming Video. . ." link. You have my money-back guarantee—you will be entertained!

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