

# **The Fundamental Index**

**A BETTER WAY TO INVEST**

**Robert D. Arnott**

**Jason C. Hsu**

**John M. West**



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*For George Keane. None of this research would have taken place without his persistent insistence that “there has to be a better way.” And there is.*





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# Foreword

*There is no free lunch.*

—Milton Friedman

In *The Fundamental Index*, Rob Arnott and his colleagues essentially argue that a portfolio whose holdings are proportional to a suitable measure of the efficiency of a firm will outperform one whose holdings are proportional to the market value or capitalization of the firm. In other words, what I will refer to as an *efficiency-weighted portfolio* will outperform a capitalization-weighted portfolio.

The implications of efficiency-weighted index investing will be significant for investors and, thus, are worth the time of a short mathematical review of the logic. Over and above the dividends that corporations pay, and the long-run growth in their stock values, the holding and trading of securities is a zero-sum game. If some investors make more than others, then someone is consuming someone else's lunch. To analyze this argument, let us focus on the zero-sum value-added game that the market participants play, ignoring dividends and long-run growth.

Suppose we have four companies, each with \$1 in reported earnings. Suppose two of these have ample future growth prospects that would justify a price 20 times the current profits, or \$20, and the other two have less impressive prospects and fully deserve \$10—10 times the current earnings. *But, no one can have a clear view of the future prospects of our companies, so the market merely guesses at these fair values.* Suppose the market does a pretty good job, but misjudges those prospects by 20 percent in each of the four cases, with one

growth stock priced 20 percent too high and one 20 percent too low, and likewise for the value stocks. So, we have two stocks with a true value of \$20 each, priced at \$24 and \$16, and two stocks with a true value of \$10, priced at \$12 and \$8.

Suppose prices revert to fair value in the next year. The “cap-weighted” portfolio produces zero return; since the prices are symmetric around value, the errors cancel. If we could construct a fair-value-weighted portfolio, few would disagree that it should be better than capitalization weighting. It is. Half of our portfolio rises 25 percent in value, and half loses 16.7 percent, for an average of 4.2 percent return. Why? Because the fair value portfolio puts equal amounts in over- and undervalued stocks, while capitalization weighting put 60 percent of our money in the overvalued and 40 percent in the undervalued companies.

Since we have no idea what the fair value is for each company, and so there’s no way for us to construct this fair-value-weighted portfolio, why should we care that fair value weighting beats capitalization weighting? What of the other construction methods? The portfolios weighted equally and by company profits (efficiency-weighted), which lead to the same weighting in this example, produce a return of 4.2 percent also, identically the same as the fair-value-weighted portfolio!

How can this be? It’s at odds with classical finance theory, which says that we can’t beat the cap-weighted portfolio. But classical finance theory is largely built on a foundation of efficient markets under doubtful CAPM assumptions, which implies that future prices are randomly distributed around current price. We are subtly changing this assumption. In fact, we are assuming the opposite: that current price is randomly distributed around fair value. As long as capitalization weighting has errors relative to fair value and prices revert toward fair value, capitalization weighting will suffer this drag relative to fair value weighting. And any portfolio that differs from fair value weighting in a fashion that is uncorrelated with the error in the price will match the return of the fair-value-weighted portfolio!

The reason I refer to this procedure as *efficiency weighting* is that, on average, the company that has greater profit per unit of market valuation is more efficient than the one with less profit per unit of market valuation. Perhaps there are extenuating circumstances in some instances. But this washes out on average. As a whole, the companies with greater profit per unit of market valuation are more efficient and are a more profitable investment.



The preceding example would seem not to be an equilibrium, since the cap-weighted investors gain nothing while the efficiency-weighted investors are getting richer. Asymptotically, the former disappear and the latter become the whole market. However, we have not said that the same players continue indefinitely. We may assume that some investors go out of the market and new ones come in.

In short, the answer to the question of how efficiency-weighted investors can continually take money from the cap-weighted investors is expressed in the saying attributed to P. T. Barnum:

There's a sucker born every minute.

—HARRY MARKOWITZ



# Preface

*Victory has a hundred fathers, and no one acknowledges a failure.*  
—1942 G. Ciano *Diary* 9 Sept. (1946) II. 196<sup>1</sup>

It is a rare joy to have an opportunity to explore an idea that offers both powerful practical applications and potentially important theoretical implications. Such is the case for the Fundamental Index<sup>®2</sup> concept—a simple idea which has the potential to “fundamentally” change the way we think about investing and markets. For 30 years, index funds, with next-to-nothing in trading costs and management fees, have proven to be formidable competitors to active managers who have had difficulty overcoming the corrosive effects of higher transaction costs and management fees.

Attractive as the index fund is as an investment concept, the capitalization-weighted implementation of the index fund concept is flawed. Because the size of our investment in any company is directly linked to stock prices, the capitalization-weighted portfolio overweights the overvalued stocks and underweights the undervalued stocks, leading to a performance drag on portfolio returns. The venerable index portfolio can be significantly upgraded by shifting our frame of reference from a market-centric to an economy-centric view of our investable universe, and the benefits to the investor are significant.

In the market-centric approach, we view our investment choices relative to those available in the stock market with companies weighted in accordance with their relative market capitalization. Finance theory supports this idea, subject to a few simplifying assumptions, notably that

all prices are correct, that stock prices identically equal fair value, based on all available information. But these assumptions are not realistic. Most importantly for investors, if prices are wrong, we're going to wind up putting most of our money in overvalued stocks because the scale of our investment is explicitly linked to the stock's price, hence to the error in that price.

In the economy-centric approach, we view our investment choices relative to those available in the economy, with companies weighted in accordance with their relative economic scale. Because there are many measures of a company's economic scale—sales, profits, number of employees, dividends paid, net assets, and so forth—we can use any of these measures, or a combination of them, to gauge company size. If we do this, we still make mistakes—owning some companies that we wish we hadn't and underinvesting in the most stellar successes—but the size of our investment is no longer directly and irrevocably linked to the error in the price. As a result, pricing errors cancel and the performance drag is eliminated.

What causes this performance drag? The answer relates to the fact that structurally the market portfolio—the cap-weighted portfolio of all publicly traded stocks—will put most of our money in “growth companies,” stocks that trade at premium multiples because they are expected to exhibit stronger future growth prospects than the broad market. What's wrong with that? In an efficient market, nothing at all. Their superior future growth will fully justify the premium prices that we pay. But are they superior *stocks*? Are they superior *investments*? In an efficient market, the answer to both questions is “no” because we're prepaying for their superior future growth *exactly enough* to result in the same risk-adjusted return as the value stocks.

This is the Achilles' heel of capitalization weighting: We invest much of our money in high-flying growth companies *because they're at premium multiples*. And if the market falters in its efficiency, pricing some stocks too high and some too low, capitalization weighting *assuredly* suffers a performance drag relative to its opportunity set. The indexing community and the academic community do not worry about this because they take the notion of market efficiency seriously. In academia, market efficiency is accepted with near-religious fervor—even though fair value can never be measured and so the thesis of market efficiency can never be proved!

The theoretical implications are potentially profound. If some stocks are above fair value, they are also above their fair value market capitalization. Because they will crowd out some companies that

better deserve the high market capitalization, and because they will eventually underperform (after all, isn't that the ultimate definition of being overvalued?), this creates the much-studied "size effect." The overvalued stocks will also be above their fair valuation multiples (price-earnings, price-sales, price-book, and price-dividend ratios); as they eventually underperform, this creates the much-studied "value effect." Because most of the overvalued stocks will typically have reached that overvaluation by outperforming other stocks and will ultimately underperform, this creates the much studied long horizon mean-reversion effect.

Academia has developed many advances on the capital asset pricing model, including the arbitrage pricing theory, international CAPM, Fama-French-Carhart, and so forth. Some of these, notably Fama-French-Carhart, do a superb job of helping us to understand how one strategy may differ from another and why some strategies perform better than others. But the efforts to conform these models to an "efficient market" have been clumsy at best, with tortured explanations of "hidden risk factors" that attempt to explain performance differentials. If a strategy outperforms, they argue, it must have more risk, even if we can't see or measure it.

*None of these complications is needed if we merely acknowledge that price and value may differ.* If we allow that prices may equal fair value plus or minus a constantly changing error, the value effect is expected, as is the size effect, as is long horizon mean reversion. Three of the most examined "anomalies" in modern finance very nearly become *preordained* if we accept that price may be wrong!

This brings us almost all the way back to the single-factor Capital Asset Pricing Model (CAPM) of Sharpe, Lintner, Mossin, and Treynor. CAPM plus noise explains every bit as much of what we observe in the real world as the multifactor models, with their hidden risk factors, that have *almost* replaced CAPM. Isn't it more elegant to assume CAPM plus noise rather than to create convoluted explanations that can fit a "round" set of data into a "square" box of efficient markets?

The CAPM and the Efficient Market Hypothesis (EMH) are the reasons the Fundamental Index concept has stimulated such controversy in the academic community, with some of the top professors in finance, including Nobel laureates, squaring off on both sides of this debate.

The debate in the practitioner community is no less intense. Previous to the Fundamental Index idea, asset managers and advisors first made the determination of whether prices were *reasonably*

efficient. Virtually none would subscribe to the notion that the market correctly values every stock at every moment of every day. Depending on where they came out on this market efficiency question, they would then choose whether to establish stock market exposure through active management or traditional index funds.

For those who believed, *indeed knew*, that price and value aren't identical, active management was the preferred choice. The amount of research in our industry would *seem* to suggest that such activities be rewarded. However, finding "good" active managers (and keeping them during the inevitable periods of underperformance) is a daunting task. Thirty years of performance data verify that the cumulative drag of management fees, trading expenses, and agency conflicts are large and that the indexes are tough to beat.

Still, even with its performance advantage, the index fund is no panacea. If prices drift from fair value, even if only from time to time, the traditional index fund, weighting stocks and sectors by their price, will pile ever-increasing amounts into the current favorites of the market. We call such episodes *bubbles*, and human history is littered with them. The tech meltdown at the turn of the century and the recent real estate downturn are just the latest in a long line of bubbles, subsequently bursting at massive expense to investors. Price weighting ensures investors have maximum exposure to a bubble's darlings right before they fall off a cliff.

The Fundamental Index concept preserves the many virtues of index funds while contra-trading against the market's greatest excesses, thereby letting mispricing accrue over time to the investor's benefit. By delinking price from the portfolio weight, the Fundamental Index method bypasses bubbles. As such, it is a powerful alternative for those disappointed by the hollow promise of active management and yet unsatisfied with the excess of traditional index funds.

In testing this very simple idea—moving from capitalization weighting to weighting companies in accordance with their economic scale—we find remarkable results. In U.S. large companies, we find that the idea adds over 200 basis points per year over a 46-year span relative to the cap-weighted market portfolio. In other countries, we find an average of almost 300 basis points added per year over a 24-year span. In small companies and in global applications, this margin of victory rises to the 300 to 400 basis points range, again over 20- to 30-year spans.

As we move into more speculative markets and markets for which fair value is nebulous indeed, the benefits escalate. In the speculative

Nasdaq stocks, the value add leaps to over 600 basis points over the past 33 years. In emerging markets, it soars to 1,000 basis points over an admittedly short 14-year span. Even in the fringes of the bond world, where fair value is less precise than in investment-grade bonds—high-yield and emerging markets bonds—we find 200 to 300 basis points value added. The data are overwhelming. One might well ask how much data a skeptic needs in order to be persuaded.

As many critics love to point out, past success doesn't presage future success. That's obviously true. But, based on this logic, we'd never learn a thing from history nor hire an experienced professional because neither the textbook or the resume offered any clues of the future. Still, a worthy question is: How might the Fundamental Index concept fail in the future? If the market makes no distinction between growth and value stocks, paying the same valuation multiples for all companies, then there is no difference between the Fundamental Index and cap-weighted portfolios; the return difference vanishes. But this would clearly leave much opportunity for the thoughtful investor to pay a penny extra for companies that have superior growth prospects.

There's a middle ground: If the market *underpays* relative to consensus expectations for expected future growth and *overpays* for companies that are struggling, then the performance drag of capitalization weighting will be *reversed* enough to offset the drag created by pricing errors. Such a world is possible, though perhaps implausible.

In this book, we explore the theoretical nuances of the Fundamental Index concept, its historical roots, and its many practical applications. We outline performance characteristics and implementation considerations in U.S. and global equities; small and large companies; niche categories like Real Estate Investment Trust (REITs) and the Nasdaq; and within economic sectors.

I have been blessed to work in the investment arena for over 30 years, with opportunities to explore ideas in global tactical asset allocation, multifactor risk and return models, the linkages between risk and return, and to test some of the core precepts of modern finance—often finding them far removed from reality. Ours is one of a handful of industries that offer so many unique challenges and, in my opinion, prospects to improve our understanding, practice, and, ultimately, our clients' well-being. But in order to do so, we have to be willing to challenge conventional thinking. I have dedicated my career to uncovering these opportunities for change and

improvement, and to sharing my findings with investors through innovative investment products, published research articles, numerous conference presentations, and now a book. Despite all these experiences, this is the first time I have had the privilege of developing an idea that stirred so much controversy and comment, pro and con, from both practitioners and academics, so quickly.

As with so many powerful ideas, this one has many “fathers.” It is built on the foundation of thousands of research papers identifying consistent market inefficiencies, the many theories that form the latticework for modern finance and investing, and the hard work of many, many people.

I’m grateful to my colleagues, most particularly Jason Hsu for carrying out the research that transformed a simple idea into reality. I’m grateful to our advisory panel and others—Keith Ambachtsheer, Peter Bernstein, Brett Hammond, Marty Leibowitz, Burt Malkiel, Harry Markowitz, Marc Rubenstein, and Jack Treynor, to name just a few—for serving as sounding boards as the idea took form.

I’m grateful to our Fundamental Index affiliates—PIMCO, Nomura Asset Management, FTSE (our partner on the FTSE-RAFI index series), IPM, PowerShares, Charles Schwab, Lyxor, XACT Fonder, Assetmark, Cidel Bank & Trust, Claymore, Columbia Management, Parametric, Pro-Financial, and Plexus Group to name a few—for embracing the idea and helping our work to gain traction in the marketplace.

I’m grateful to the people who explored fundamental—and valuation-indifferent—reweighting of the S&P 500 Index, setting a foundation for the acceptance of this idea. Bob Jones of Goldman Sachs Asset Management (GSAM) is the unsung pioneer in this domain, having developed a profits-weighted S&P 500 product in 1990. Sadly, this product never took off for GSAM and was overtaken by the firm’s more conventional enhanced index products.

Subsequent efforts by David Morris and Paul Wood also helped to build the visibility of this line of research. I’m especially grateful to Paul Wood for his efforts—both in his 2003 *Journal of Indexes* article and in his conversations with us—to lay a foundation for the core principles of the Fundamental Index idea.

I appreciate Jeremy Siegel’s efforts to popularize the concept. While he’s suffered some “slings and arrows” for comparing this work with the efforts of Copernicus in the sixteenth century,



his articulation of the “Noisy Market Hypothesis” in the *Wall Street Journal* is one of the most succinct descriptions of the theoretical foundations of the Fundamental Index concept that I’ve yet seen.

George Keane deserves special gratitude in our journey to develop this important idea. George relentlessly campaigned against the pitfalls of both capitalization weighting and the S&P 500 during the late 1990s. His conviction, persistence, and determination spurred us to take up his challenge to seek a better index solution.

I’m grateful to my coauthors, Jason Hsu and John West, for their respective efforts to assure the academic integrity and the easy flow of the book. I also thank Katy Sherrerd for spearheading the editorial process and marshalling the efforts of Jaynee Dudley, Kate Rouze, and Elizabeth Collins in their extensive editorial contributions, Dan Harkins for his compliance oversight, and Brett Myers and Bryce Little for analytical and research assistance. And I’m deeply grateful to a finance community that so values and encourages the exploration of new ideas.

Lastly, I’m especially grateful to my family for their patience with the lost weekends that are inevitable in the process of writing a book.

—ROB ARNOTT



# CHAPTER 1

## Efficient Indexing for an Inefficient Market

*What could be more advantageous in an intellectual contest—  
whether it be chess, bridge, or stock selection than to have opponents  
who have been taught that thinking is a waste of energy?*

—Warren Buffett

1985 Berkshire Hathaway Annual Report  
Chairman's Letter

**F**or 50 years, the finance community has been in the thrall of an idea known as the “efficient market hypothesis,” a view that price identically equals fair value. The efficient market hypothesis is an idea of seductive simplicity, and it forms the foundation for much of modern finance theory and practice. It is a core principle for the multitrillion-dollar world of index fund management. Without the efficient market hypothesis, most of the theorems and proofs of modern finance come unglued.

In this worldview, the price equals the fair value for every asset, in every market, at every moment of every day. Not many academics, and even fewer investors, believe that this view is true. Those who hew to this notion tacitly—and often without realizing it—dismiss the concept of fair value as irrelevant. They define *fair value* as tautologically equal to the price: An asset is worth the price it will

## 2 The Fundamental Index

fetch in the market. But in so defining fair value, they strip the very concept of fair value of any meaning.

Buy low, sell high. This oft-heard aphorism is probably as old as the investment markets in which we operate. With efficient markets, however, the advice makes no sense because prices are always fair; there is no low, there is no high. In such a world, the best strategy is for us to own the market, weighting our holdings in direct proportion to the value of all of the companies we have at our disposal. But, as Warren Buffett has noted, if some investors assume that (or behave as if) markets are efficient when in fact they are not, the shrewd investor can benefit handily.

### **Evidence of Market Efficiency**

Having a clear and informed belief regarding price efficiency is one of the most critical elements to formulating an investment strategy. Consider this: \$500 billion lost in only 30 months. It is a staggering amount of money—more than 50 times the collective annual casino takings from Las Vegas tourists and two-and-a-half times the estimated losses domestic airlines and associated travel industries suffered after September 11, 2001. Shockingly, it's more than 100 times the losses incurred in the collapse of Long-Term Capital Management (the most spectacular hedge fund collapse in history) that many knowledgeable people—including former Federal Reserve Board chairman Alan Greenspan—thought could potentially bring down the entire global economy.

This massive wealth destruction wasn't the result of rogue traders with leveraged balance sheets. It occurred in the stock market—in the 30 months following the collapse of the technology bubble in March 2000. The \$500 billion figure isn't even the total stock market loss over this dreadful stretch. This astronomical loss resulted from one stock: Cisco Systems, the largest stock in the world based on market capitalization at the peak of the tech bubble. This stock was valued at nearly \$600 billion at a time when its sales were less than \$20 billion, its trailing 12-month operating earnings were less than \$3 billion, its cumulative profits since inception were well under \$8 billion, and it had never paid a dividend. Additionally, Cisco's workforce numbered fewer than 30,000 people. Not only did investors collectively assign Cisco a price-earnings ratio (P/E) of nearly 200, they also assigned it a market value of \$20 million per

employee. Of that \$600 billion, \$500 billion was gone 30 months later.

Index fund investors as a group—people who believe in market efficiency and who do not believe in betting on single stocks—lost nearly \$100 billion in Cisco. An average 401(k) participant with \$100,000 invested in a Standard & Poor's (S&P) 500 Index fund lost more than \$45,000 in those 30 bleak months, almost \$4,000 of which was lost on Cisco alone. The damage was even worse for investors riding the growth stock revolution—a \$100,000 investment in the Nasdaq 100 Index was worth less than \$25,000 by the end of the tech bubble carnage. The wreckage experienced by only a few of the S&P 500 Index's largest holdings illustrates how the index investor ended up placing a surprisingly large chunk of money in companies trading at high—sometimes even astronomical—valuation multiples.

There have been countless historical episodes of speculative fever leading to unsustainable prices; inevitably, the fad of the day passes—at considerable cost to investors' psyches and pocketbooks. What is surprising is that *index fund* investors, who embrace diversification and shun the hubris of stock picking, suffered so drastically. Index funds are supposed to be the ultimate diversification choice—the “smart,” risk-reducing vehicle for owning equities. MBA textbooks and the Chartered Financial Analyst (CFA) curriculum endorse index investing as the “optimal” method to eliminate unique stock risk.

Moreover, with dozens of industry groups having substantial representation in a market index, the risk reduction broadens beyond individual stocks to economic sectors. The pundit who first suggested “don't put all your eggs in one basket” would surely approve of index funds. But something went awry in the late 1990s. Cisco and the high-tech sector had become 4 percent and 33 percent of the market index, respectively, when they were less than 0.5 percent and 10 percent of the market a few years prior. Suddenly, the so-called passive indexes became heavily dominated by ultra-high-P/E technology names.

You might ask, “So what? Bear markets happen from time to time.” Whenever they do, the wealth destruction is immense, just as the wealth creation during bull markets can be breathtaking. But bubbles are different. They create ephemeral wealth that dissipates for those left holding the scraps of paper when the music stops.

## 4 The Fundamental Index

One of the lesser-known twists associated with the tech bubble is that in the two years after the bubble burst, during which time Cisco lost \$400 billion of its eventual \$500 billion loss, *most stocks went up!* In the two-year period from March 2000 through March 2002, *the average U.S. listed stock returned more than 20 percent*, whereas the S&P 500 *lost more than 20 percent*.

Clearly, there was a vast disconnect between what the market index returned and what most of its component companies returned. What caused this divergence? The manner in which these market proxies are constructed. Standard market indexes are capitalization-weighted, which means the higher the price a share of stock becomes, the larger its weight becomes in the index. Because share prices are driven by both improved underlying fundamentals and shifting market expectations, the index weights reflect both fundamentals and popularity. In the late 1990s, Cisco and its tech buddies were winning the popularity contest by a landslide; content (fundamental measures of company sales and profits) simply did not carry much weight in this beauty pageant. As a consequence, the S&P 500 reflected a very narrow (if not narrow-minded) opinion and became a concentrated bet on the information superhighway's ability to collect a sufficient toll.

The bull market of the 1990s, for most companies, did not end until April 2002. While the S&P 500 lost 9 percent in 2000, the average stock on the New York Stock Exchange (NYSE) enjoyed a double-digit gain. When the S&P 500 lost another 12 percent in 2001, the average stock enjoyed another, albeit single-digit, gain. This drastic divergence is a stark reminder that the traditional market indexes can be dominated by a handful of extraordinary glamour stocks and therefore may bear little resemblance to the majority of the companies in the stock market. The bear market of 2000 through 2002 was a special period of index decline, one largely driven by a handful of overvalued stocks whose prices corrected sharply when growth fell short of expectations. In fact, many of these growth companies grew handily as their share prices cratered. But those prices had been predicated on even faster growth. It was the shortfall relative to *expectations* that spelled the demise of their share prices. This divergence between index performance and company performance is an alarming indictment of what is wrong with the traditional market indexes.

With cap-weighted index funds, if a company's P/E multiple doubles relative to the rest of the market because of an increasingly