

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

For 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

optimistic outlook on future growth, its market capitalization doubles *and its weight in the index doubles*. Is this because the stock is now twice as attractive after its P/E multiple has doubled? Of course not. The larger weight is merely a consequence of the doubling of valuation multiples, plain and simple. Similarly, if the P/E halves because of aggressive overselling, its weight in the index declines by half. By its very construction, the cap-weighted index puts more weight in stocks, which have become more expensive and reduces the weight of stocks that have become cheaper. Additionally, if a stock is trading at twice the market P/E, its share of the index weight will be twice as large as an average company with the same earnings. By construction, cap-weighted indexes put more of the investor's money in "growth" (or high-P/E stocks) and less money in "value" (or low-P/E stocks).

If the market prices growth and value stocks correctly—that is, if the market gets the relative prices exactly right—then growth and value stocks will offer the same *risk-adjusted* returns. In other words, a correctly functioning market will prepay for prospective future growth as if that expected growth were a *fait accompli*. But if the expected risk-adjusted returns for the growth companies and the value companies are the same, *why would we want to invest more of our money in growth and less in value?*

In the first two years after the tech bubble burst, the traditional indexes—and the index funds tracking them—were down, while the average stock was up, precisely *because* the indexes had loaded up on the pricey, high-flying growth companies. Many of the companies getting higher allocations were trading at multiples of earnings—or, for those with no earnings, multiples of sales—which were without precedent. At the peak of the bubble in March 2000, almost 30 percent of the Russell 2000 Index,¹ the popular small-cap market index, consisted of companies that had no earnings. Most of these companies had never had earnings in their entire history.

Broader and larger-cap indexes also had hefty doses of negative earners during this period. Why did these indexes have so much invested in companies at unprecedented valuation multiples? *Because* these companies were at unprecedented valuation multiples! Those multiples factored into the very market capitalization that determined the weights in the indexes. The stocks had not become more attractive. In fact, common sense suggests that these stocks had probably become less attractive. Index investors owned twice as much simply because the stock had doubled in price!

6 The Fundamental Index

If a select few stocks rapidly soar in price, they will compose an increasing portion of the index. The resulting portfolio may then have less diversification than the broad economy, a peculiar scenario for a portfolio designed to reflect broad investment in that economy! It is almost akin to placing many of our eggs in the basket hanging from the highest—and windiest—branch of the investment tree.

The Case for Indexing

A multitrillion-dollar industry is now based on investing in or benchmarking to cap-weighted indexes.² As of year-end 2006, nearly \$5 trillion in stock and bond assets were tied to cap-weighted indexes worldwide. Assets invested in index funds replicating the S&P 500 alone neared \$1.3 trillion (*Pensions & Investments*, 2007). The Vanguard Group offers four S&P 500 mutual funds, with a combined \$200 billion in assets, for various account minimums. The world's largest exchange-traded fund, S&P Depositary Receipts (SPDRs, or Spiders), managed by State Street Global Advisors, has another \$50 billion.

For many investors who believe that the market is fairly efficient and that it is hard to identify mispricing in the market, investing passively through an index fund seems the natural way to access the equity markets. Certainly, this lesson is the one dispensed, without much question or inspection, in virtually all finance classrooms across the United States. Some of the industry's greatest leaders, including Jack Bogle, Burton Malkiel, Bill Sharpe, and Charley Ellis, endorse this path.

Even the father of security analysis (the antithesis of passive investing), Benjamin Graham, conceded late in his life that the index fund offered the best promise for the majority of investors. Graham (1976) uttered these words more than 30 years ago:

I am no longer an advocate of elaborate techniques of security analysis in order to find superior value opportunities. This was a rewarding activity, say, 40 years ago, when our textbook *Graham and Dodd* was first published; but the situation has changed a great deal since then. In the old days any well-trained security analyst could do a good professional job of selecting undervalued issues through detailed studies; but in the light of the

enormous amount of research now being carried on, I doubt whether in most cases such extensive efforts will generate sufficiently superior selections to justify their cost.

Right about that time, a group of pioneers took things a step further by transforming this market proxy into an investment. In 1973, Dean LeBaron, while continuing to manage active strategies based on a contrarian, value-based approach, created the first indexed portfolios for institutional investors at Batterymarch. Bill Fouse set up not one but two of the largest managers of indexed assets in the world at Wells Fargo Bank (in the division that is now the cornerstone of Barclays Global Investors' worldwide investment operations) and then at Mellon Capital Management. Jack Bogle created the first index fund for individuals at the Vanguard Group in 1976. And after publishing pioneering research on long-term equity returns with Roger Ibbotson in 1976, Rex Sinquefeld set up Dimensional Fund Advisors, now the largest manager of small-company indexed assets in the world.

These early advocates of the cap-weighted index fund touted the idea as the ultimate investment vehicle that cannot be *reliably* beaten *after costs* by most active managers, a view that they still espouse. *We agree.* History has vindicated them, and common sense supports their argument to this day. Their advocacy of indexing tends to rely on two very different arguments. The first is the efficient market hypothesis. *If prices perfectly match each company's fair value at all times*, the cap-weighted index reigns supreme. Bill Sharpe, in his Nobel Prize-winning development of the capital asset pricing model (often described by its acronym CAPM, or "Cap-M"), proved the supremacy of the cap-weighted index to be true, subject to an array of assumptions, including a world without pricing errors.

A second argument, far more powerful to those who don't accept the efficient market hypothesis, is that the majority of active managers, with vast resources at their disposal, *must* underperform cap-weighted indexes net of costs. Why? Because they collectively own essentially that same portfolio. If we take the cap-weighted market portfolio and take out the cap-weighted index funds, we're left with the self-same portfolio for the collective ownership by the active managers. If well-informed, highly skilled, and well-resourced investment professionals cannot outperform the standard indexes with any consistency and reliability, then index investing must be very efficient!

Evidence of Market Inefficiency

Intuitively, we know that perfect market efficiency isn't quite right. Almost no investment manager or adviser believes that price and fair value are identical at all times for all assets. Even most finance professors would say that price is only an approximation of fair value—though they would go on to say that it's a pretty good approximation and that the errors will largely cancel. Let's assume that price is the market's best *guess* at a company's intrinsic value. It's probably a pretty good guess most of the time, but it could be too high or too low. In fact, because the intrinsic value of a stock is the net present value, not of next quarter, not of next year, but of *decades of future cash flows*, the intrinsic value could actually be far removed from the price.

A few examples will demonstrate evidence of stock mispricing. In 1720, the South Sea Company—a narrowly limited monopoly for trade with South America and almost no profits—was being traded in London. What they lacked in financials, the company's directors more than made up for in the art of promotion. To “prove” the overwhelming promise of their monopoly, the company announced its intention to fund the entire sovereign debt of England. Politicians and insiders were influenced to pass the bill by the offering of stock options, which allowed the holder to “buy” the stock with no money and then “sell” it back to the company after the price had risen. With many of the country's elite among the ranks of stockholders and promises of South American gold, the stock price jumped to more than £1,000 per share. As word eventually leaked of directors selling their shares, the stock's meteoric rise reversed. The prospects of any future profits evaporated, along with the wealth of the investors in the “South Sea Bubble.” Sir Isaac Newton, recognizing the company's price-linked dividend as a Ponzi scheme, shunned the idea of investing—until two weeks before the bubble burst. He then finally threw his lot in with the mob—and he lost most of his immense fortune. In the previous century, at the height of the “tulipmania” in Holland, one poor soul spent 3,000 florins (about 20 years' income for the average wage earner in Holland at the time) for a single *Semper Augustus* tulip bulb, only to see a sailor, thinking it was an onion, eating it.

If you think investors are different now, consider the late 1990s and the “Axis of Wealth Destruction” in the U.S. market—Cisco,

AOL, and Lucent Technologies—three of the top 10 stocks in the world by market capitalization at that time.³ The rise of the Internet and the massive information technology (IT) expenditure aimed at fixing the Y2K problems of the legacy computing platforms proved to be a boon for technology infrastructure companies such as networking giant Cisco. From 1997 to 2000, Cisco's P/E rose from 30 to nearly 200 as investors' expectations rose even faster than Cisco's fast-growing operating results. At the height of the recent tech bubble, 3Com spun off its Palm division (maker of the Palm Pilot, a product that has since seen an array of competitors devour its market) for a price that was so high that Palm was briefly worth more than General Motors, whose quarterly dividend was many times Palm's annual sales! Meanwhile, 3Com remained Palm's largest shareholder and was trading at a price roughly half the value of its holdings in Palm stock. 3Com's remaining businesses were valued by the market at a very large negative value.

The same dynamic occurred in Canada, where another networking heavyweight, Nortel, saw its price skyrocket despite the company's posting net losses in 1998 and 1999, by which time this single company constituted 28 percent of the total value of the Canadian stock market. When Nortel sales tumbled, its share price fell by more than 99 percent—in the same 30 months that bludgeoned Cisco's stock.

The phenomenon took place even more dramatically in certain overseas markets, with telecommunications and cell phone giants Nokia and Ericsson both garnering P/E multiples nearing triple digits by early 2000. In fact, when Nortel, Ericsson, and Nokia became roughly one-third, one-half, and two-thirds of their respective national stock markets by value, the companies themselves composed a mere 1 percent to 4 percent of their nations' economies as measured by company sales as a percentage of gross domestic product (GDP). These exorbitant prices were based on future cash flows that were expected to grow annually at 25 percent to 50 percent for many years. Despite solid growth in two of the three companies (unlike the others, Nortel's business operations cratered), these high expectations weren't met. As Figure 1.1 shows, in the following 30 months, each of these stocks fell by 80 percent to 99 percent, leading to massive destruction in portfolio value for their investors, including the cap-weighted indexers.

10 **The Fundamental Index**

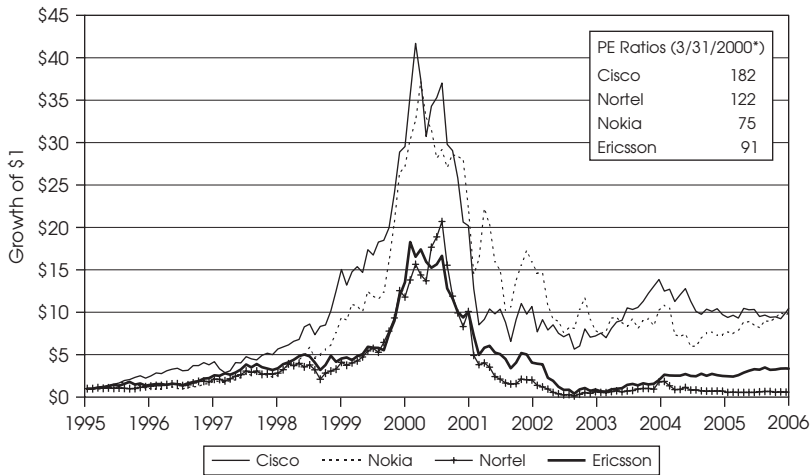


Figure 1.1 The Rise and Fall of Tech Stocks: 1995 through 2006

*Data from Bloomberg.

Source: Research Affiliates, LLC.

Another instructive example is the earlier biotechnology bubble. In 1991, major advancements in DNA research prompted a then-record 35 initial public offerings (IPOs) in the field. Meanwhile, the stock of established player Amgen surged 265 percent. Although biotech was still a relatively small industry on an economic scale, this massive mispricing significantly affected the cap-weighted indexes.

Examples of severely mispriced stocks are not limited to investors bidding up the latest technology or next big thing. Mispricing can occur in even the most low-tech and everyday industries, such as breakfast. The simple doughnut—a ball of dough deep fried, covered in a sugar glaze, and served with a cup of coffee—spawned a recent mini-bubble. After its April 2000 IPO, Krispy Kreme Doughnuts, a company founded in 1937 that serves a product invented in the 1800s, soared to a market capitalization of nearly \$3 billion and a P/E of more than 150—pretty good for a company with \$300 million in total sales and a profit margin of slightly less than 5 percent. Four years later, the stock had shed almost 90 percent of its value.

Conclusion

As Fischer Black, one of the most highly regarded theoreticians in the investment field, used to say on his move from the Massachusetts Institute of Technology to Goldman Sachs, “The markets seem far less efficient from the banks of the Hudson River than from the banks of the Charles River.” We agree. The efficient market hypothesis has flunked most empirical tests to date, sometimes with remarkable statistical significance. Even if one accepts the tautological notion that price equals *current* fair value, no one makes the case that price will be precisely correct relative to the unknowable future cash flows.

Imagine an investor with a perfect crystal ball who is able to see every future cash distribution that will flow from an investment. These future cash distributions can be used to compute an after-the-fact intrinsic value for a stock. Bill Sharpe whimsically refers to this as the “clairvoyant value,” a label that is both accurate and fun. Relative to a stock’s “clairvoyant value,” prices will usually be wrong, frequently by a large margin. The fact that these errors can be large does not justify linking the size of our investment to this error, merely because the error is unobservable until many years hence. In future chapters, we explore whether this particular “pricing error” allows for some reasonably powerful and reasonably reliable ways to outpace the cap-weighted indexes.

