The Marriage of Information Technology and Investing: For Richer or Poorer?

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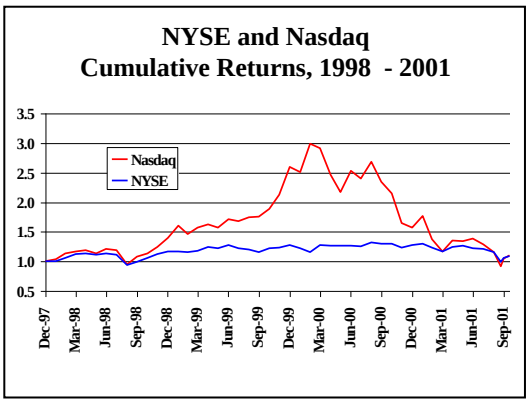
The marriage of information technology and investing has changed our nation's—and the world's—financial system, and its wedding vows reverberate all through the mutual fund industry. Given the tumultuous geopolitical, economic, and market era in which we are now living, and with the unprecedented terrorist attack on the heart of the U.S. financial system, an economy in recession, and the most severe bear market in more than a quarter-century, adding the phrase "for richer or poorer" to my theme could hardly be more timely. We are in a New Era in which America is being challenged on her own shores, even as the New Era of information technology shapes nearly everything we do.

Just as we were taught in our college economics classes, however, competition remains the iron rule of capitalism. The Internet, for all of its mind-boggling complexity, speed, accessibility, and entrepreneurial innovation, has proven to be just what we should have expected: Not only a superb medium for human communication, but the greatest medium for unfettered price competition ever designed by the mind of man—a priceless asset to consumers, but an enormous challenge to the profitability of producers. We live in a New Era in our economy, but the winners and losers are still being sorted out.

But, as we now know, we are *not* in a New Era in the stock market. After rising from $3.7 trillion at the end of 1994 to $16.2 trillion in March of 2000, the total value of U.S. stocks declined to $10.6 trillion as the stock market tumbled 40% to its late September lows, before recovering some of the lost ground. But the dichotomy between the returns of the information technology stocks of what became known as the New Economy (always capitalized!), and the traditional basic industry stocks of the Old Economy was stark.

From the start of 1998 through the first quarter of 2000, the NASDAQ Index, home of the New Economy, rose by 200%. During the same period the New York Stock Exchange Index, largely Old Economy issues, rose just 26%. (The difference between the two indexes is not inconsequential: A NYSE listing requires a company to have at least three years of operating earnings; the NASDAQ requires no earnings history.) And then the bubble burst. In fits and starts, the NASDAQ Index plunged. At its low following the terrorist attack, it was down 72% from its earlier peak. The NYSE Index, by contrast, was off just 2% during the same period. From 1998 to date, the net return: NASDAQ +9%, NYSE +8%.



In the aftermath of this boom and bust cycle—just one more such cycle in the annals of American finance—this conference presents a wonderful opportunity for this veteran participant in the rapidly-changing world of investing to meet with this group of information technology professionals from all across the nation. I want to discuss the role of technology in changing the financial marketplace, its impact on the mutual fund industry, and how Vanguard has responded. I'll conclude with some investment advice that I believe will help you become richer rather than poorer as you pursue your personal goal of long-term wealth accumulation.

Does Technology Help us to Better Serve Fund Investors?

As I observe the changing world of information technology, with all its glamour, excitement, gadgetry, and drudgery, and the truly staggering allocation of the resources of financial intermediaries that are now devoted to it, I'd like to step back and ask the only question that really needs to be asked: *Does the marriage of information technology and investing help*

mutual fund firms to better serve our clients? The answer is multi-faceted, for as we adjust to the information age technology is playing many roles in the financial business.

Here are the seven questions that I'll consider with you:

(1) Does technology enhance the returns of mutual fund investors?
(2) Does technology help us to create better investment products?
(3) Does technology afford our investors better information?
(4) Does technology help us to provide better communications?
(5) Does technology help us to provide better services?
(6) Does technology offer our clients better financial advice?
(7) Does technology give us a better cost structure?

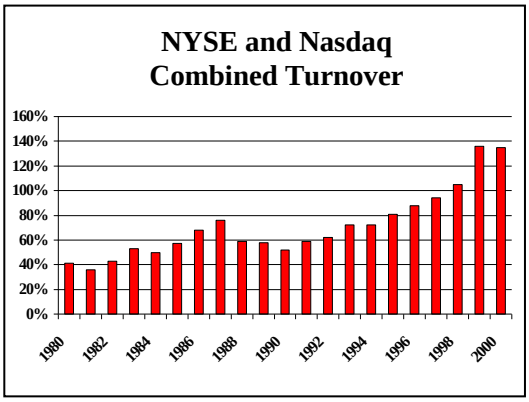
As I focus on these issues, I am reminded of the timeless message of Vanguard's long-time Chief Technology Officer, Robert A. DiStefano, whose inspired leadership, mastery of the IT field, and compassionate human values brought us into the Information Age with flying colors. His death last summer, at far too early an age, only magnifies that message: "*How* we do technology is far less challenging than deciding *what* we do. We must be clear on our objectives and our strategies, and allocate our resources accordingly. *We must set intelligent priorities and have clear business objectives for each project we undertake, and serving our clients must be at the heart of all we do*."

The Economist of London said pretty much the same thing: "Durable client relationships are only partly about clever technology, however imaginatively used. Mainly they require relentless attention to detail: good products, prompt service, well-trained staff with the power to do a little extra when they judge it right to do so. No wonder firms that send you away with a smile on your face are so rare." So now let's see the extent to which mutual fund firms are using technology to send clients away with a smile, with better performance, better products, better information, better communications, better services, better advice, and a better cost structure.

(1) Better Investment Performance?

Technology has changed the financial markets, and for the better. Markets are cheaper, faster, more transparent, and more automated. They are truly global in nature, executing at the

speed of light giant transactions in complex financial instruments that would have been inconceivable in an earlier age, and operating at volume levels undreamed of in an earlier era. For example, shares of U.S. stocks (NASDAQ and NYSE combined) turned over at 135% last year, three and one-half *times* the 40% rate of two decades earlier. Importantly, without electronic systems and the dispersal of market activity and back-up communications networks that they facilitated, the rapid reopening of our financial markets after the September 11 terrorist attacks would have been impossible.



What is more, money managers today have seemingly infinite information at their fingertips. Corporations observe the rules of full disclosure, and a vast community of investment professionals analyze each firm's financial statements in intimate detail. Soaring transaction volumes, liquidity and information availability—spread among market participants almost simultaneously—have made the markets even more efficient, arguably making it more difficult for skilled managers to ply their trade. Money managers can—and do—compare their portfolio holdings with those of their peers, and their weightings with those of the stock market indexes which the marketplace uses to evaluate them, and fiduciaries can—and do—regularly evaluate their managers on the same basis. And whether we like it or not, *benchmark* risk—how the manager performs relative to the chosen standard—has replaced, well, *real* risk—how much the client can lose—as the relevant concept.

In these more liquid, volatile markets, electronic technology has sharply reduced the costs of each transaction. Despite these lower *unit* trading costs, however, *total* trading costs have actually risen because transaction volume has soared by an even larger magnitude. The stodgy investment committees of an earlier age have been replaced by mercurial portfolio managers, and

a star system not unlike Hollywood's has emerged, with the brightest stars attracting the largest cash flows from investors.

Doubtless some managers have used this New Era of infinite information to their advantage. After all, the new Compaq 700 has 5000 *times*(!) the power of a 1985 IBM PC. But it is in the nature of markets that for each winner there must be a loser. Beating the market is a zero-sum game. The *average* fund manager can't win. When asked if the average manager could win, Columbia University's legendary Benjamin Graham, mentor to the even more legendary Warren Buffett, said: "No. That would mean that the stock market experts as a whole could beat themselves—a logical contradiction." Which quickly leads to the second truth: While all investors as a group share the market's gross return, their net return is reduced, dollar for dollar, by the costs of financial intermediaries. *After costs*, beating the market is a *loser's game*.

Yet in the New Era, the relative returns earned by mutual fund investors have not merely stayed the same; they have gotten worse. Why? Because the costs paid by mutual fund investors have risen. Result: the share of market return earned by fund investors has declined even further. How much have costs risen? In the Old Industry, the average equity fund carried an expense ratio of about 0.75% of assets per year; in the New Industry, the average is more than 1.6%—an increase of more than 100%. Including the costs of soaring portfolio turnover—up from about 20% to nearly 100% annually—and sales charges, fund all-in annual costs now could well reach as much as 3.3% per year. But even at 2½% of assets per year, fully 25% of an assumed 10% stock market return would go to the intermediaries rather than the investors.

The industry's shortfall to the stock market during the past three decades appears, not surprisingly, to be a directly comparable—and largely causal—2.9%, double the 1.5% shortfall that I calculated by hand in 1975 from old industry by manuals during the pre-information age. Those rising costs are the principal reason that fund performance in the Information Age is not far better. It is far worse.

And, yes, costs do matter. Just compare an assumed market return of 10% with a mutual fund return of 7½%—10% gross stock market return minus even 2½% expenses—for a tax-deferred retirement plan in which $5,000 per year is invested over 40 years: Final value of the actively-managed mutual fund investment, $1.1 million. Final value of the passive stock market investment, $2.2 million. *Two to one*. While investment technology, as Ben Graham knew

intuitively, could not possibly enhance fund returns relative to the market, it is high time that fund costs be reduced. That vast $1.1 million chasm in the amount of capital accumulated—occasioned primarily by investment costs—reminds us that we need to use technology to help us get there.

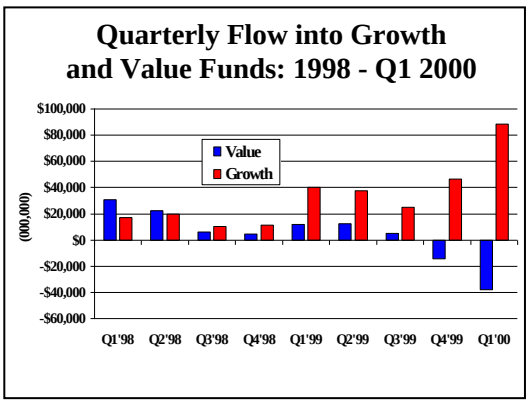
(2) Better Investment Products?

Thanks in part to technology, the fund industry certainly has a lot more products—8,341 funds today, compared to 564 funds in 1980. The incredible power of the computer has not only enabled the development of innovative and complex financial market instruments, but the creation of new kinds of mutual funds—"new products," as the industry refers to them. Technology enables us to backtest with remarkable facility the results of any kind of fund; a fund that invests on the basis of a stock's price momentum, for example, or a fund that invests in companies sending positive signals to Wall Street by beating the earnings estimates with which it has conditioned the marketplace. Alas, however, backtesting proves to have little predictive power.

Technology has also facilitated the development of so-called quantitative funds, relentlessly using modern portfolio theory to search the market for winning stocks through computer models that calculate risk factors, size factors, industry factors, financial structure factors and the like. The result: A diversified portfolio that, *if all works well*, will consistently outpace the market. Alas, the slips 'twixt cup and lip seem as eternal ever, and there's no evidence that any of these new types of funds have provided better returns than their traditionally managed kinfolk.

But for very different reasons, the New Era of technology has given fund owners not only worse returns, but *much* worse returns. The boom in technology stocks during the late 1990s resulted in the creation of 678(!) risky new funds—Internet funds, telecom funds, technology funds, and technology-oriented growth funds—largely designed to attract fund investors eager to participate in the great NASDAQ boom. The industry's resultant hyping and promotion of these "New Economy" funds rapidly increased the industry's risk profile, which reached its most dangerous exposure in mid-March 2000, at the very moment that the bubble, having reached its point of maximum inflation, was about to pop.

Together these aggressive funds gathered the staggering total of $237 billion of additional investor assets during the year and one-quarter immediately preceding the market peak, withdrawing $23 billion from their value funds during the same period, precisely the reverse of what they should have done. At the market high, $2.1 trillion of assets of fund shareholders was invested in the New Economy aggressive growth funds, nearly *twice* as much as the $1.1 trillion of investor assets in value-oriented Old Economy funds. Since then, the former group has dropped by an average of 40%, while the latter group is off just 4%.



No, it wasn't the fault of technology that the superficial investment appeal of technology stocks lured millions of investors into these new funds. Rather, the mutual fund industry bears the responsibility for doing the luring—creating the aggressive new funds, promoting them to the skies, and then watching them self-destruct. The idea of making what will sell rather than selling what we make, always lingering in the industry's background, lurched to the fore during the great bull market, and the investing public paid the price.

Happily, there was at least one area in which technology helped to improve the lot of some investors. Given the inevitable mathematics of the stock market that I described at the outset, the industry began to develop passive, low-cost mutual funds that assured a market-like performance, and thus virtually guaranteed superiority over peer funds. The *index fund* could merely buy all of the stocks in the market and hold them forever, paying no advisory fees, engaging in no costly portfolio trading, holding administrative and marketing costs to rock-bottom levels, and charging no sales loads. While its concept is simple—buying American industry and holding it forever—however, its implementation is not. The data-crunching power of technology is required to keep an index fund portfolio rigidly in line with its target index, to

promptly adjust for any changes in the index, to value its portfolio accurately and promptly, to coordinate daily cash flows with portfolio activity, and to create the market-like baskets of stocks that have proved so useful in managing its portfolio.

Overall, then, technology has *not* resulted in the creation of better products. Through no fault of its own, it has facilitated the creation of worse products—especially the New Economy funds that represented one of the great crazes in mutual fund history, making fund investors poorer by scores of billions of dollars. But on the plus side, technology has helped the index funds to track the market even more efficiently, enriching investors simply by assuring them of their fair share of financial market returns.

(3) Better Information for Investors?

Hardly surprisingly, it is in the area of investor information that the Information Age has shone its brightest. Through fund evaluation services such as Morningstar, Value Line, Strategic Insight, and the like, open networks provide data about mutual fund portfolios and performance so vast as to be beyond the ability of the human mind to absorb. Never again will mutual fund investors lack the ability to make fully-informed investment decisions. From that standpoint, mutual fund investors are among the greatest beneficiaries of the information revolution.

Fund information is surely rife, and accessible at a moment's notice. Consider *Morningstar Mutual Funds*, which provides "everything you ever wanted to know about your fund, but were afraid to ask," and on a single page at that: Historical asset values and dividends; total returns on a quarterly basis, absolute and relative to market indexes and peers; fund expense ratios and sales charges; tax efficiency; risk analysis; the 25 largest stock holdings; the average price-earnings ratio, earnings growth rate, and market capitalization; industry weightings; and, if you're into Modern Portfolio Theory, alphas, betas, and R-squareds. And there's still room left on the page for a two-paragraph editorial comment! All topped-off by the fund's rating: one-star, worst; five-star, best.

I fear, however, that fund investors pay little attention to this plethora of information on fund risks, costs, and portfolio construction. Rather, they select funds that have had hot past performance and five-star ratings. But since past performance has rarely proven prologue to the future, "stars" *cannot*—and *do* not—give investors the power to select future winners. A

portfolio of Morningstar five-star funds, for example, has provided far lower returns than the stock market itself, all the while carrying significantly higher risk. So while technology has enriched investors by giving them better information, but investors have impoverished their potential returns by using the information to make worse decisions. They are acting as shoppers rather than long-term shareholders, and we in the industry haven't fulfilled our responsibility to educate investors as to what information matters and what doesn't. The Book of Proverbs had it right: "Get wisdom, get insight."

In addition to public networks that provide information on fund returns, risks, costs, and portfolios, nearly all of the major fund families have built proprietary networks that provide their shareholders with timely, accurate, and complete information about their investment accounts. If you go to Vanguard's website, for example, and check the value of your fund accounts—all of your family accounts are at a single site, and one click will get you there after you identify yourself—and you'll see the value of your account at the close of the previous day, any changes you've made in your holdings, and your balance among stock funds, bond funds, and money market funds. You can check your purchase dates and your tax basis. You can also quickly learn about pending distributions of realized capital gains, as well as each fund's unrealized gains or losses.

It wasn't too many years ago when there were *no* consolidated fund statements (each fund was treated like an individual stock), and when information came by mail, usually a month or more after the quarter ended. Thanks to technology, we've come a long way in a short time, and fund investors now receive better information, better organized, and available in what amounts to real time. But, like the wealth of publicly-available fund information, this wealth of proprietary account information has only a tenuous relationship to improving the returns of investors.

To whatever avail, it's easy to see how important, timely, and comprehensive information is to investors who are moving money from one fund to another, to investors who are paranoid about performance, and to investors with short-term horizons. But to what avail is this plethora of comprehensive, up-to-the-minute information to true long-term investors—the kind of investors whom Vanguard has sought—who are putting their money to work in middle-of-the-road funds (even index funds!), who are allocating their assets intelligently between bond funds and stock funds, and who are carefully planning to accumulate wealth for a retirement plan that

they expect to call on, say, 30 years hence? Wouldn't they be as well served—or better served—by buying right, holding tight, and checking on their account once a year or so? That kind of discipline will pay off in the long run.

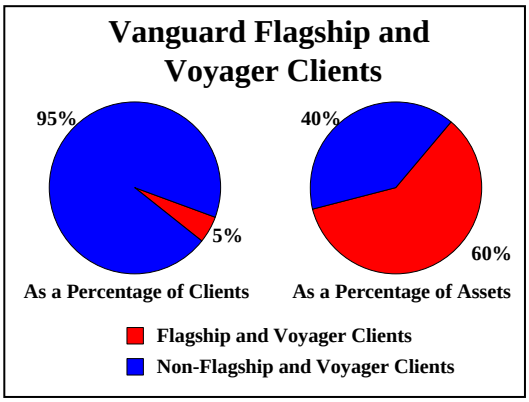
Knowledge may be power, but the fact that fund investors are receiving better information than ever before has been largely offset by their using that information for the wrong purposes. The bandwidth of the human mind, I fear, has been overwhelmed by the staggering bandwidth of information now presented to us—even thrust on us. *What should make fund investing better may well be making it worse*. The trick is to convey the vast array of information available to fund investors in a sensible but focused way, so as to provide perspective—not merely on a one-way *information* highway, but through a two-way *communication* network.

(4) Better Communications with Owners?

To better communicate with our Vanguard shareholders, in recent years we have begun to use technology to enhance the services we provide. Today, fully one-third of our individual assets are held by shareholders registered on our website. And nearly 50% of our client service interactions take place over the web. Our goal is to give our clients the closest thing to personal service that is possible without actual face-to-face, person-to-person interaction, which, truth told is, as a practical matter, impossible. After all, the median holding of a mutual shareholder is less than $5,000 and an account of that size would generate about only $80 in annual revenues for the average fund manager, and, given our low costs, a minuscule $12.50 for Vanguard. Clearly, those revenues couldn't possibly justify a substantial commitment to personal service for the typical investor.

But we do make an effort to provide special services designed to expand and deepen our relationships with our investors, and technology has played a major role in accessing our account database. As in all businesses, a relatively small number of relatively large clients are responsible for a high portion of our business, and our most desirable clients are those with the largest investment balances and the longest and strongest relationships with us. While our objective is old-fashioned—using enhanced services to retain clients, all the while keeping costs under control—the technology used in this pursuit is new. Electronic wizardry has allowed us both to mine our shareholder database for those clients and then to more effectively manage those relationships.

The special services we provide to our client households with $250,000 to $1,000,000 or more invested at Vanguard include a designated and experienced phone representative (or team) who provides continuity, account familiarity, and (in the words of *The Economist* article that I cited earlier) an ability to do "a little extra when they judge it right to do so." While the 400,000 households that qualify represent only about 5% of our investor population, they hold nearly $200 billion of our shares—fully 60% of our $320 billion of shares held by individuals. (We categorize the remaining $230 billion as *institutional*, fund shares largely owned through retirement and thrift plans.) These *Flagship* and *Voyager* investors are among our most loyal and satisfied owners.



We push technology as far as we can to personalize these services. We hold e-meetings, and send e-mail which discusses changing markets and changing investment expectations. We have begun a program of *collaborative browsing*, in which both client and Vanguard representative have the same data before them on the computer screen. They can readily discuss the status of the accounts, consider the implications of changing fund holdings, and provide some reassurance, when appropriate, about staying the course.

Technology has also enabled us to create more favorable prices for our largest and most durable clients. Nearly a decade ago, we created an *Admiral* series of funds with a $50,000 minimum holding requirement and lower fees reflecting our economies of scale. On 2000, we began to expand this service to all of our funds, creating, in effect, two classes of shares: the low-cost class for regular investors and a *very* low-cost class for substantial investors with long holding periods. The Admiral class already totals more than $50 billion.

Our goal is both to retain the loyalty of our clients through appropriate pricing, and to bring personalized interactions as close to personal meetings as possible. The shareholders truly care about the personal touch, a point driven home to me last summer when a group of nearly 50 shareholders who knew each other only through the Internet—the Morningstar *Vanguard Diehards* website, where they call themselves "Bogleheads"—came at their own expense to visit us at our Valley Forge headquarters. In a wonderful interaction of Internet technology and human values, the message was clear: Even in this world of electronic communications, human contact remains the *desideratum*. Information technology will be for the better only as it provides better communication—communication that educates as well as informs, that reminds us of our obligation to serve the needs of honest-to-God, down-to-earth human beings, who have entrusted their hard-earned assets to our care, each with their own hopes, fears, and investment goals.

(5) Better Services for Shareholders?

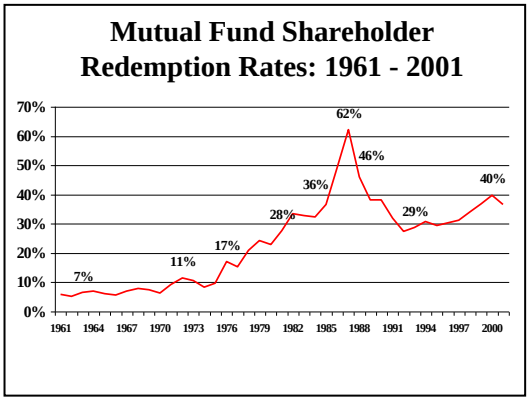
There can be no question but that technology has brought to mutual fund shareholders a level of service that is not only better, but better almost beyond imagination. What began with the revolution in telecommunications more than a decade ago—imagine the financial service industry without the 800 number!—now encompasses the round-the-clock ability to buy and sell stocks by the minute—and buy and sell funds by the daily close of business—electronically, simply by pressing a computer button and watching the trade, the clearing, and the settlement take place almost automatically, right before your eyes.

What is more, without technology there is no way we could effectively administer shareholder accounts holding a variety of funds; IRA accounts with small monthly deposits; 401-K corporate savings plans with almost infinite fund choice (even self-directed brokerage accounts) and loan provisions; variable annuities; and withdrawal plans that automatically meet the minimum distribution requirements of the Internal Revenue Service—and do all of that almost flawlessly, if not yet at a Six Sigma level. At the same time, we have given investors almost unlimited choice of funds, plans, and programs, and the ability to change their portfolios at a moment's notice.

But all of these miracles of technology are not only for better; they are also for worse. There is no iron law that says that higher investor returns will result from a wider range of investment choice, nor from greater frequency in changing funds, nor from rapid swings in asset

allocation. To the contrary, the limited evidence we have suggests that quite the reverse is true. As investors, we have met the enemy, and he is us. It is not that technology hasn't wrought miracles in creating new tools; it has done exactly that. But the fund industry has offered these tools to investors without providing the education required to assure the productive use, not the counterproductive abuse, of the system.

And so redemptions of fund shares have soared. So have exchanges within fund families from one fund to another. Together they now run to nearly 40% of fund assets compared to 7% in 1961. Put another way, the holding period of the average fund investor has dropped from 14 years during the 1960s and 1970s to about 2½ years currently. Investors in mutual funds—as well as fund managers and direct investors in common stocks—seem enthralled by the new gadgetry and are ready, willing, and able to use it. But the result is that shareholders are increasingly using mutual funds for short-term *speculation*, sharply vitiating the value of the best medium even designed for long-term *investing*. I believe that trading mutual funds shares and trying to time the market are, finally, loser's games. The marvelous new services that technology has enabled our investors to use are all too often being used counterproductively, and they will be poorer, not richer, as a result.

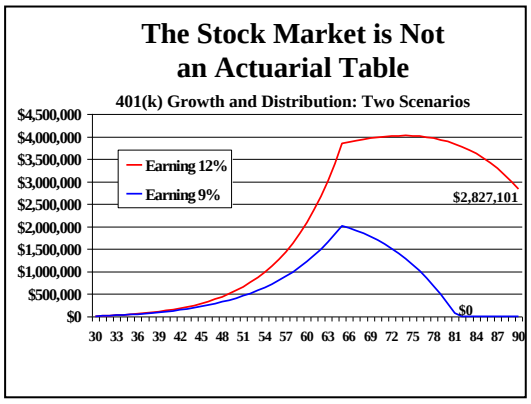


(6) Better Financial Advice?

Amidst all the information and commentary that is available on Internet websites, I find myself particularly concerned by the application of technology in financial planning advice. Yes, the advice is voluminous and comprehensive, giving us the apparent ability to better plan our financial futures. We can do so with decimal-point precision, and we can manipulate the data to

our hearts' content, raising and lowering our expected retirement plan contributions, our allocations to stocks and bonds, and our assumptions about tax rates and inflation rates, retirement age, and future returns in the financial markets. But, at bottom, the data that is provided tacitly ignores the most fundamental single characteristic of investing: *Uncertainty*.

I go quickly to first principles: T*he stock market is not an actuarial table*. Yet the projections provided by financial advice websites seem to me to cast an aura of predictability—if not certainty, surely high relative assurance—on the numbers that pop up on our computer screens. But, as ever, the output is highly sensitive to the input. Consider, for example, a retirement plan for a 30-year old investor, investing 6% of a $50,000 income—with a 3% company match—in a 401(k) plan, salary growing at 5% per year until planned retirement at age 65, when he began to draw upon his nest-egg to meet expenses. If he believes that the stock market's annual return will be 12%, at his actuarial life expectancy of 90 years the accumulated capital would be $2,827,101. (Note the precision!) If, on the other hand, the market return turns out to be 9%, he runs out of money at age 81—a zero balance, and nine years too soon at that. But believe me, no one in the world knows whether the future return on stocks will be 12%, 9%, 5%, or anything else. So, pauperhood at that age is just as likely as a $2.8 million nest-egg.



The craze of the moment is the Monte Carlo simulation, not merely calculating the sequential returns of asset classes, but mixing up the annual returns in a sort of Waring blender approach that shows ranges of possibilities. But even the most exotic technology can't help us to predict which mutual funds will win, and it often produces fund selections that are truly bizarre. Further, history tells us little about future market returns because, as September 11 so poignantly reminds us, low-probability, high-impact events occur unpredictably in investing as well as in

life. When the fund industry uses information technology to present investors with hypothetical information clothed in the mantle of precision, we mislead them. We would be giving better advice to long-term investors if, instead of offering complex advice that implicitly encourages investors to try to outguess the unguessable and to try to select winning stock funds based on their past returns, we offered a simple, basic asset allocation plan balanced between a stock index fund and a bond index fund. Despite its patent simplicity, such an investment strategy, it seems to me, is the ultimate *killer app*.

(7) A Better Cost Structure?

With all of the enhancements in mutual fund operations, communications, services, and infrastructure that have been made possible through technology, its important to ask whether it has made this industry more cost-effective. In short, has our technology initiative made our cost structure better or worse?

There is no industry wide data on cost-effectiveness,[1] so I can use only Vanguard as my model. The cost of information technology is our largest single cost, last year accounting for some $450 million of our $1.3 billion dollar operating budget—some 40% of the total, vs. 18% a decade earlier. Technology, obviously, doesn't come cheap! Indeed, our tech expenditure is more than six times the $70 million we spend on marketing, and 15 times the $30 million we spend on the in-house portfolio management of our index, quantitative, and fixed-income funds. We have become, perhaps more than any other firm in our field, *a virtual company*.

The huge commitment to technology we've made over the past 15 years has given our shareholders many more services, much more information, greater speed and reliability, and enhanced record-keeping security. But there is no evidence that it has increased our productivity. In 1995, with our assets at $140 billion (after adjusting for market appreciation) we had over 3,900 crewmembers, or 27.2 per $1 billion of assets. With assets at $560 billion today—$400 billion if we adjust for market appreciation—and 11,000 crewmembers, we still have 27.6 crewmembers per $1 billion. In fairness, if we adjust for the improvement in our service

[1] By offering its services on an at-cost basis, Vanguard is unique in the industry. Other fund complexes are operated by external management companies with their own shareholders, in return for a fee that averages about 1.2% per year, including money market, bond funds, and stock funds. The largest single portion of fund cost is the managers' pre-tax profits, accounting for at least 40% of the fee they receive.

quality—the sort of *hedonic* adjustment that government statisticians use to calculate the true value of, for example, computers—we probably have become slightly more cost-efficient.

While we know that e-accounts and e-prospectuses, as well as automated telecommunications are, unit by unit, 50% to 95% cheaper than the traditional means of providing information, those gains seem to have been countered by the substantial ongoing development costs of offering the Next New Thing—that great breakthrough in service enhancement that may lie just beyond the horizon. So while technology, overall has not given us a better cost structure, our huge tech expenditures have not given us a worse one either.

For Better or Worse

In sum, information technology in the mutual fund industry has clearly given us the opportunity to better serve investors, if not in investment performance—which simply isn't a realistic possibility—then in better products, better information, better communications, better services, better financial advice, and a better cost structure. But in too many cases we have abused the opportunity, and in each of these areas have made some things worse. On balance, I fear, by focusing on mechanical service improvements rather than on education and human needs, that the marriage of technology and mutual funds has made more investors poorer then it has made richer. So far, then, it has not been a productive union.

But there is no reason we can't make it a happy marriage. To achieve that goal, we must push technology to the highest and best use for our clients—to educate, to inform, to implement. It is foolish and short-sighted for the fund industry to adapt to the Internet. We've done too much of that already. Rather than being the *servant* of the incredible technology that rests in the palm of our hand, we must be its *master*. Our long-run interest is hardly served by facilitating a focus on the ephemeral and the short term, by laying out for investors a panoply of funds that at birth are doomed to death at an early age, and by encouraging investors to treat their funds as if they were individual stocks. Our interests are best served when we finally force technology to deliver the substantial economies of scale we must achieve, and pass those economies along to our shareholders.

To do these things, the fund industry must change. We must return to the fundamental principle that mutual funds are best used as long-term investments. We cannot allow the kind of casino capitalism that has run amok in recent years to be a permanent fixture of the industry. Trading in fund shares is not only a loser's game for shareholders, it places roadblocks in the way of the implementation of sound strategy by fund managers. Technology, for all its gee-whiz wonder, is both bane and blessing, and I hope that this industry gives far more thoughtful consideration to curbing the powerful monster we have created. Fund executives and information technology leaders must keep in mind not only information, speed, cost, and efficiency, but common sense, foresight, and wisdom, for our prime responsibility is to help the human beings who have entrusted their hard earned dollars to us to a more secure financial future.

A Word of Advice for Technology Professionals

I'll close these remarks by delivering on my promise to offer some advice as to how you technology professionals might best invest their own savings in the years to come. Let me be frank, and give you three "**do's**," and three "**don'ts**." First, if you want to at once save your time and effort, avoid sleepless nights, enjoy whatever returns the financial markets are generous enough to provide, and dedicate the lion's share of your energies to your careers in the exciting, challenging, and rapidly-changing profession in which you ply your trade, **do** invest in low-cost stock index funds and low cost bond index funds, in whatever proportion fits your needs, circumstances, and risk tolerance.

Second, **do** start your thinking with a baseline balance of 50/50 between stocks and bonds, and then adjust the stock portion *upward* as: 1) you have more earning years ahead of you; 2) smaller assets at stake; 3) less need for investment income; and 4) greater courage to ride out the inevitable—and likely extreme—swings in stock prices. Conversely, as these considerations are reversed, adjust the 50% stock ratio *downward*.

Third, **do** prepare yourself for financial market returns that are considerably lower than most of you have seen in your lifetimes. The annual rate of return over the past 20 years (through 2000) has averaged 6% for money market investments, 9% for bonds, and 17½ % for stocks. (The typical mutual fund, I reiterate, has earned about 75% of those returns, say, 5%,

7%, and 13%, respectively.) But today money market instruments yield about 2½%—not 6%—and bonds less than 6%—not 9%—so the handwriting is on the wall.

In stocks, of course, the handwriting on the wall is harder to read, but the math is less than mysterious. Stocks are likely to provide *earnings growth* that will parallel the growth of our economy, most likely—but never certainly—6% in nominal terms. Add to that figure the *current dividend yield*—a measly 1½%—and the future *investment return* on stocks would average 7½% per year. *Speculative* return—whether investors will pay more or less for $1 of earnings (i.e., the price-earnings ratio)—may increase or reduce that total. But with stocks selling at a (normalized) 22 times earnings today, I believe the P/E is more likely to go down than up.

A drop to 18 to 20 times, for example, would reduce the investment return over the next decade by one or two percentage points, taking the market return to 6½% or even 5½%. (If the P/E rises—unlikely in my view—the return could be 8½% or 9½%). If that tentative range seems wrong to you, you can use my simple methodology to calculate future stock returns for yourself. Just insert your own idea of earnings growth, and of the P/E ratio in 2011. But don't get carried away! And always hold *some* stocks, for no one, least of all I, can predict future returns with accuracy.

Components of Stock Market Return

	1980 - 2000	2001 - 2011
Initial Dividend Yield	+5.7%	+1.5%
Earnings Growth	+6.3	+6.0
Investment Return	+12.0%	+7.5%
Speculative Return*	+5.4	-2.0
Calculated Market Return	+17.4%	5.5%
Initial P/E Ratio	9.2x	22.0x
Final P/E Ratio	26.4x	18.0x

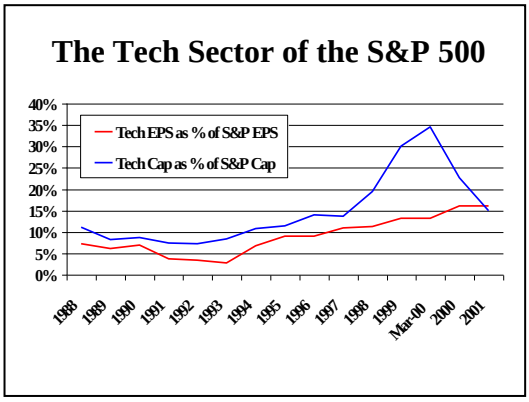
*Impact of P/E Change

And now to the **don'ts**. First, **don't** use those mathematics to predict the future of technology stocks. While the methodology is the same—dividend yield plus earnings growth plus change in P/E—the confidence level is minuscule in such an explosive field. While we forgot it during the great tech bubble, the value of a technology stock, like any stock—and any stock *market*—is simply the discounted value of its future cash flow. No, the market value of a

stock is *not* about concepts; not revenue growth, nor price-to-sales, nor site visits, nor eyeballs, nor the growth rate in the exciting early years of a new venture. Whether we're talking about the New Economy or the Old Economy, the market value of a stock is about *money*—tomorrow's earnings capitalized in today's dollars.

Second, **don't** make an excessive commitment to any individual stock (*especially* employer stock) or to technology stocks as a group. If the past year and a half haven't taught you that lesson, then you either aren't paying attention, or you are truly brilliant (or lucky!). Technology is a competitive business, changing at exponential speed, and rapid future growth is hardly assured for *any* company.

You should be aware that the technology sector of the market has provided a steady 12% to 16% of the market's *earnings* during recent years, meaning that earnings growth has been no more than average. But the tech sector began the decade at 8% of the market's *value*, rose to 35% (!) at the market high in March 2000, before tumbling to 15% currently, a figure more in keeping with its earning potential. Even though that relationship looks a lot more like fair value, the tech share of earnings this year is crumbling and its earnings visibility is close to zero. That means very high risk, as well as high return potential. That stock index fund I recommended to you earlier, obviously, also has 15% in technology stocks today. In an uncertain world, that's enough concentration for any investor, especially for you who earn your living there.



Finally, if you are concentrated in technology stocks today, **don't** stay the course. The broadest possible diversification is the best possible diversification, and you'd best get on with an all-market index strategy right away. Just because you may have done the wrong things in the

past doesn't require that you be wrong forever. Start today to alter your portfolio gradually. Begin with 25% of your equity holdings, and over, say, the next year or two, make the full conversion of your individual holdings to whatever index-based asset allocation fits your circumstances.

Then, when you complete your program, get investing as far out of your mind as you can. Look at your portfolio no more often than once a year, but don't change it, except to reduce the stock allocation a bit every five years or so. I can't predict how much you will have in your account when you reach retirement, but I can predict—with as much certainty as is possible in the uncertain world in which we live—that it will be, not only considerably larger than the account of anyone you know who has put the same amount of money to work in a different fashion, but far less time-consuming and worrisome.

Yes, you will be one of those fortunate souls who has been well served by this industry, and you will look at the wealth you have accumulated with a smile on your face. So, just go out and do it. And while you're about it, if you work in the mutual fund industry, use your knowledge and your common sense to help us make the marriage between technology and mutual funds *better*, not *worse*, so that fund investors will be *richer*, not *poorer* in the years ahead.