Journal of Economic Perspectives—Volume 15, Number 1—Winter 2001—Pages 41–54

The Internet and the Investor

Brad M. Barber and Terrance Odean

The Internet is changing how information is delivered to investors and the ways in which investors can act on that information. It has lowered both the fixed and marginal costs of producing financial services, thus enabling newer, smaller companies to challenge established providers of these services. On-line brokerage firms, such as E*Trade and Ameritrade, are among the most vivid and successful financial service firms to emerge in the last decade.[1] Other firms, which provide on-line financial advice, research tools, and financial information, have also emerged.[2] These e-commerce firms are transforming the way traditional services are delivered and offering a vast assortment of new services.

As a result, investors entering the market today have options unheard of ten years ago. From 1995 through mid-2000, investors opened 12.5 million on-line brokerage accounts—a number projected to grow to more than 42 million by 2003 (Cerulli Associates, 2000; Robertson Stephens, 2000). In 1998, on-line trading accounted for about 37 percent of all retail (that is, noninstitutional) trading volume in equities and options (U.S. General Accounting Office, 2000, p. 7). In a

[1] Ameritrade at ⟨http://www.ameritrade.com⟩ offered discount brokerage services beginning in 1975, but offered Internet-based trading in 1994. E*Trade Securities, Inc., was founded in 1992; its website ⟨http://www.etrade.com⟩ was launched in 1996.

[2] For a review of investment websites, see "The Best of the Net: Top Investment Web Sites" (1999), which lists over 400 finance-related websites.

■ *Brad M. Barber is Associate Professor of Finance and Terrance Odean is Assistant Professor of Finance, both at the Graduate School of Management, University of California at Davis, Davis, California. Their e-mail addresses and websites are ⟨bmbarber@ucdavis.edu⟩ and ⟨http://www.gsm.ucdavis.edu/~bmbarber⟩, and ⟨odean@ucdavis.edu⟩ and ⟨http://www.gsm.ucdavis.edu/~odean⟩, respectively.*

typical trade, an investor downloaded data from the Internet about a high tech firm before placing an on-line order that may have been executed on an electronic communication network.

Lower costs and more alternatives clearly benefit investors. However, the new investment environment also may have a dark side. Many of today's investors are new to the market. Placing trades directly, rather than through a broker, can give such investors an exaggerated sense of control over the outcome of their trades. The vast amount of on-line investment data available will enable investors to confirm their prior beliefs and may lead them to become overconfident in their ability to pick stocks and other securities. Faster feedback may focus investor's attention on recent performance. Furthermore, investors have in recent years put themselves at greater risk by concentrating their trading in e-commerce companies, which are notoriously difficult to value, and by borrowing to invest at unprecedented rates. Markets in which valuations are uncertain, investors are active and inexperienced, and money to invest is readily available are prone to speculative bubbles, which can hurt all investors. In this article we discuss how technological developments associated with the Internet are likely to affect investors and financial markets.

The Changing Landscape for Brokerages and Stock Exchanges

Technology that allows services traditionally provided by people in buildings to be replaced by services provided by software and computers is challenging traditional practices in the brokerage industry and stock exchanges.

A single stock trade at a traditional full service brokerage typically involves multiple telephone conversations between a customer and a broker. The pros and cons of the trade may be discussed; the broker may take the opportunity to reinforce the personal relationship with the customer; the order is placed; and execution is confirmed. Later, the customer may call periodically to inquire how the stock is doing. If the order is a limit order (that is, an order to sell when or if a stock reaches a certain price, or to buy when or if a stock falls to certain price), several calls may ensue before execution is confirmed or the order is cancelled. A telephone-based discount brokerage can save money by replacing the full service broker with a less personal, less well-paid telebroker, but two trades will still take roughly twice as many person-minutes as one.

On-line brokerages replace people and telephones with computers and code. The start-up fixed costs of setting up an on-line firm are far lower than setting up a traditional full-service brokerage. An on-line brokerage needs far fewer employees, most of whom may work at one central location. Based on financial statements, Merrill Lynch employs 20,200 financial consultants and other investment professionals and, assuming an average commission of $210 per trade, handles 124,000 commission-generating transactions per day, while E-Trade employs 2,800 people and handles approximately 283,000 transactions a day (Credit Suisse First Boston,

2000).[3] Once fixed costs are incurred, the marginal cost of executing trades through an on-line brokerage is very low. The marginal costs of services such as enabling a customer to review a portfolio or the status of trades are essentially zero, and such services can be provided 24 hours a day, every day.

While brokerage firms are using technology to reduce the cost of placing orders, exchanges are using technology to reduce the cost of trade execution. For several years, the transactions of many of the world's stock exchanges, such as the Paris Bourse, have taken place inside computers. The New York Stock Exchange and Nasdaq, on the other hand, though in many respects automated, still rely heavily on people to transact stock trades. Electronic communications networks, such as Island ⟨http://www.island.com⟩, Instinet ⟨http://www.instinet.com⟩, and Archipelago ⟨http://www.tradearca.com⟩, are challenging the traditional markets by providing low cost trading and liquidity through electronic limit order matching systems. For example, on Island, investors can place limit orders that are immediately executed if there is a matching order; if there is no matching order, the order is displayed on the BookViewer—a free real-time representation of Island's limit order book—until a matching order is received or the order is cancelled.

Electronic communication networks are able to reduce dramatically the personnel needed to clear trades. The approximately 3000 people who work on the floor of the NYSE cleared an average of 671,300 trades a day in 1999. With 85 employees, Island cleared an average of 321,007 trades a day in the first half of 2000.[4]

Along with electronic communication networks, there are other alternative trading systems to meet the needs of various investors. These alternative trading systems are generally not registered as a broker or exchange with the SEC, thus distinguishing them from electronic communication networks. Crossing-networks, for example, temporally aggregate liquidity; one such network, Posit, matches submitted bids and offers six times a day (at 9:15, 10:15, and hourly from 11 to 3), pricing each trade at the midpoint of the best posted bid and offer.

The ultimate goal of a well-functioning stock market is to bring together all possible buyers and sellers, so that the market price reflects the combined preferences of all participants. Alternatively, a market may become fragmented, so that instead of trades happening in the public market, they happen in a sectioned-off subset of the market. Fragmentation can result in higher profits for whomever can section off the market, but losses for investors and trade execution that is perceived

[3] Merrill Lynch does not disclose its number of commission-generating transactions per day. For the quarter ending June 2000, Merrill reported commission revenue of $1.642 billion. In 1999, Sallie Krawcheck, an analyst with Sanford C. Bernstein and Co., estimated the average commission at Merrill was $210 per trade.

[4] Actually, Island reports about twice as many trades, but unlike the NYSE, Island double-counts its trades by counting both the buyer and the seller. The number and value of trades are reported on the NYSE and Island web sites at ⟨http://www.nyse.com⟩ and ⟨http://www.island.com⟩. The number of employees at the NYSE is from their website. The number of employees at Island is as of July 2000 per our e-mail correspondence with Island officials.

as (and indeed may be) fundamentally unfair. With more and more on-line trading venues becoming available, there is a concern that markets may become fragmented. However, as long as different markets are accessible on-line, so that search engines can seek out the best prices available in any venue, then the overall force of the Internet will be to consolidate the market. In effect, the network will become the market.

Incumbent brokerage firms, like Merrill Lynch, and incumbent exchanges, like the NYSE, continue to dominate the financial markets. At the end of 1999, based on data from annual reports, Merrill Lynch had $1.5 trillion in private client accounts or assets under management while E*Trade had $29 billion. During 1999, the NYSE handled nearly $9 trillion of stock trades, while Island handled roughly $1.5 trillion. However, the incumbents face a serious challenge from the upstarts, in part because the people at incumbent firms have established ways of doing business that may hinder their ability to respond to the upstarts.[5]

The Market for Financial Advice

To the extent that the eliminated middlemen in brokerages and exchanges do no more than facilitate transactions, the cost savings of disintermediation is a consumer boon. But in cases where the intermediary also provides advice, the gain or loss to consumers will depend on the value of the lost advice. On-line investors typically don't receive investment recommendations from brokers whom they personally know. Instead, they turn to numerous sources of fundamental and technical market information, to chatroom gossip, to on-line journalists, and to sophisticated advice engines.

Such cyberspace advice is nearly costless to reproduce. However, its quality varies greatly. If investors are unable to distinguish high quality advice from low, they are unlikely to pay more for quality. Indeed, with so much information available for free on the Internet, many investors will be unwilling to pay anything for advice alone.

One likely outcome is that payment for advice will need to be packaged with other services or revenue streams. As investors become sensitive to high commissions as a method of paying for advice, full-service brokerage firms are moving towards charging customers an annual fee proportional to the size of the account (so-called "wrap fees"). Such percentage of assets fees have worked well for mutual funds. While investors are quite sensitive to explicit costs such as mutual fund loads,

[5] For example, while many small trades are executed on the NYSE's Superdot system, specialists resist electronic trading systems which could erode their share of large trade volume. Similarly, retail brokerage houses have historically relied on brokers to distribute services to their clients. While brokerages, such as Merrill, have recently introduced on-line trading, individual brokers may be slow to embrace on-line trading, fearing that it may erode their client base.

at least at present their fund choices appear insensitive to the annual percentage fee funds charge (Barber, Odean and Zheng, 2000).

The advice that most benefits the average investor is long-term financial planning and asset allocation—as opposed to specific stock or asset selection. Since such advice is not needed frequently, investors will be reluctant to pay an explicit fee for it on an ongoing basis. In this area, financial advice is likely to become increasingly stratified. Investors who are comfortable with technology and have relatively uncomplicated finances will turn to on-line advice engines.[6] Fees for these will be low or packaged with other services. Other investors with more complex needs will turn to financial advisors such as brokers or financial planners. These advisors will work with a mix of proprietary and nonproprietary technology-based tools to provide semi-custom advice. We suspect that independent advisors will increasingly associate themselves with larger organizations that can afford to provide these technology-based tools. Price competition from on-line advice engines will also lead financial advisors to provide more services—for example, tax planning, tax preparation, estate planning, and insurance planning—to differentiate themselves from the on-line providers. Historically, financial advisors have charged a fee (typically 1 percent) based on assets under management. While it is unclear to us what contract is optimal for financial advisors, it is likely that the fees for financial advice will drop as technology drives the marginal cost of providing many forms of advice to zero. Finally, the most lucrative segment of the advice market, the wealthy, will continue to receive personal financial advice.

In addition to changing how traditional financial advice is delivered, the Internet will facilitate new forms of advice and new investor services. Programs monitoring the actions of individual investors could analyze trading behavior and then suggest improvements or, based on past purchases, market new financial products. Programs monitoring the actions or opinions of many investors could forecast future trends. Websites will offer new ways to trade, some quicker, some cheaper, some automatically, some involving entire portfolios.

Decisions of On-line Investors

Investors in general and on-line investors in particular now make decisions in a very different environment than investors in the past. They have access to far more data. They often act without personal intermediaries. They can conduct extensive searches and comparisons on a wide variety of criteria. A critical—and largely unexplored—research question is how this different environment affects the decision-making of investors.

[6] Currently, financial advice is provided on-line by many firms including Financial Engines ⟨http://www.financialengines.com⟩, Acumation ⟨http://www.acumation.com⟩, Morningstar ⟨http://www.morningstar.com⟩, and mPower ⟨http://www.mPower.com⟩. See Punishill (2000) for a review of many of these on-line advice engines.

The proposition that more information leads to better decision-making is intuitively appealing. But the truth of the proposition depends on the relevance of the information to the decision and on how well-equipped the decisionmaker is to use the information. Take, for example, a roulette wheel. Suppose all possible information about the wheel was available to you—where it was made, out of what, and to which specifications, as well as the past outcomes of every spin of that wheel. Armed with all these data, you would still not be able to predict the one thing that matters—where the ball lands next. So, too, in a market that is efficient in the semi-strong sense, investors can have access to all publicly available information and still not be able to profit from that information.

What if the roulette wheel has subtle biases? Some numbers may come up a bit more often than they should. If so, then a sophisticated gambler who knows all past outcomes and has the right analytical tools might be able to gain a slight statistical edge. Others, however, wouldn't have the ability to do the requisite analysis, and the knowledge that the possibility of beating the wheel exists might encourage them to perceive spurious patterns in the data—as people tend to do (Gilovitch, Vallone and Tversky, 1985). Similarly, abundant data may encourage investors to try to beat a market that isn't fully efficient, but that few have the ability to beat through skill.

In our work, we have argued that the Internet has brought changes to investing which may bolster the overconfidence of on-line investors by providing an illusion of knowledge and an illusion of control, while also changing the decision criteria to which investors attend (Barber and Odean, 2000a).

By one account, every on-line investor has access to over three billion pieces of financial data; those who are willing to pay have access to over 280 billion pieces.[7] However, when people are given more information on which to base a forecast or assessment, their confidence in the accuracy of their forecasts tends to increase much more quickly than the accuracy of those forecasts (Oskamp, 1965; Hoge, 1970; Slovic, 1973; Peterson and Pitz, 1988). In fact, at some point, actual predictive skill may decline as information rises, due to information overload (Stewart, Heideman, Moniger and Reagan-Cirincione, 1992; Keller and Staelin, 1987). Thus, additional information can lead to an *illusion of knowledge*.

A greater volume and variety of information is more likely to feed this illusion of knowledge. When people who initially disagree on a topic are given arguments on either side of the issue, they become further polarized in their beliefs (Lord, Ross and Lepper, 1979). They are impressed by the arguments with which they already agree and they discount opposing views. Not only are people more im-

[7] This estimate was provided by Inna Okounkova at Scudder Kemper. These estimates are based on financial information readily available on the web. For example, an investor can download daily high, low, closing prices, volume, and returns data from Microsoft's investor website ⟨http://moneycentral.msn.com⟩ for up to 10 years for all publicly traded stocks in the U.S. Assuming 10,000 publicly traded stocks with an average history of five years, these data alone represent 63 million bits of information.

pressed by arguments they favor, but they actively seek out confirming evidence.[8] For this reason, investors are more likely to visit chatrooms of like-minded investors and, if controversies ensue, they are likely to be convinced by those with whom they already agree. Investors who believe that additional information makes them better investors are unlikely to seek out or attend to evidence that indicates otherwise.

Thus, on-line investors are likely to become overconfident. They may believe that they have more ability to perform tasks such as stock-picking than they actually do. Data providers encourage this belief with ads such as one (from eSignal) that promises: "You'll make more, because you know more." In theoretical models, overconfident individual investors trade more actively and more speculatively than they otherwise would, hold underdiversified portfolios, have lower expected utilities, and contribute to increased market volatility (Odean, 1998).

In an empirical study of investors at a large discount brokerage who switched from phone-based to personal computer-based trading, we find that after going on-line, investors tend to trade both more actively and more speculatively (Barber and Odean, 2000a). Corroborating evidence that the Internet encourages trading comes from the behavior of participants in company 401(k) plans. At companies that adopted web-based interfaces for plan participants during the 1990s, turnover in 401(k) accounts increased by 50 percent; there was no such increase in trading activity for firms without web-based access (Choi, Laibson and Metrick, 2000). Perhaps investors that switched from phone-based to on-line trading anticipated higher trading levels; though less plausible, perhaps companies that adopted web-based interfaces for 401(k) participants anticipated the greater trading needs of their employees. Neither of these studies can prove that the Internet causes increased trading, but they are strongly suggestive of such a link. In our research, we find that investors who trade more actively tend to earn lower returns (Barber and Odean, 2000b; Barber and Odean, 2001). For example, a subsample of active traders at one nationwide discount broker lagged the return on the market by 6 percent annually from 1991 to 1996 (Barber and Odean, 2000b).

The theme of control is pervasive in the advertising of financial e-commerce firms. One Ameritrade ad, for example, states that on-line investing "is about control." Balasubramanian, Konana and Menon (1999) list "feeling of empowerment" as one of seven basic reasons given for switching to on-line trading by visitors to an on-line brokerage house's website. Psychologists find that people behave as if their personal involvement can influence the outcome of chance events—an effect labeled the *illusion of control* (Langer, 1975; Langer and Roth, 1975; for a review, see Presson and Benassi, 1996). This literature documents that overconfidence occurs when factors ordinarily associated with improved performance in skilled situations—such as choice, task familiarity, competition, and active involvement—are present in situations at least partly governed by chance. The problem is that investors are likely to confuse the control they have—over which investments they

[8] See Rabin and Schrag (1999) for an analysis of the implications of confirmation bias.

make—with the control that they lack—over the return those investments realize. As a result, they are likely to trade too often and too speculatively.

The Internet also seems likely to change what information investors focus on, because it reduces the cost of some kinds of information more than others. For example, the Internet especially facilitates comparisons of real time data, and thus has changed investors' focus by emphasizing the importance of speed and immediacy. While the serious individual investor of a decade ago may have checked stock positions once a day in the morning paper, casual investors now check theirs several times a day. Many more investors pay attention to short term—even intraday—return trends than ever before. Firms tout their ability to deliver real time data or to execute investors' orders rapidly. One advertisement warns: "Trading at home? Slow can kill you." Since information that captures attention tends to influence decisions unduly, short-term trends may increasingly influence individual investor trading.

The Internet can also make other comparisons easier. For example, it may increase price competition for products for which price comparison was previously more difficult.[9] New information tools could enable investors to compare the quality of trade execution provided by different brokerages and thus extend the trading costs that investors consider beyond commissions.

How On-line Investors Affect Markets

Many recent academic articles have argued that after the increases in stock prices over the last decade, the expected equity premium is low and perhaps negative (Lee, Myers and Swaminathan, 1999; Fama and French, 2000; Shiller, 2000). Is the stock market in the midst of a speculative bubble? It is probably impossible to resolve this question without the benefit of hindsight. Outside of a laboratory experiment, it is very difficult to test whether a stock is mispriced. Furthermore, to some economists it is nearly tautological that the market price of a stock is the "right" price. Occasionally, however, the market provides an unequivocal manifestation that mispricing can occur.

The case of 3Com and Palm is such an event. On March 2, 2000, 3Com sold somewhat over 5 percent of the shares in its newly created Palm unit—about 4 percent in an initial public offering and about 1 percent to a consortium of firms—intending to distribute the remaining shares to 3Com shareholders later that year. Based on the number of shares outstanding, each share of 3Com included ownership of 1.5 shares of Palm. Yet on March 2, 3Com closed at $81.81

[9] For example, Brown and Goolsbee (2000) find that term life insurance prices have dropped with the rise of Internet usage and that prices have dropped most dramatically for demographic groups likely to use the Internet. The price drops benefited not only the on-line shoppers, but their demographic groups as a whole. Brown and Goolsbee estimate a consumer savings of at least $115 million and perhaps as much as $1 billion per year.

and Palm at $95.06. An investor who bought shares of Palm could have instead bought the same number of shares of 3Com for less money and ended up owning 1.5 times as large an interest in Palm plus an interest in 3Com's non-Palm operations. To put the same point another way, at the close on March 2, the value of 3Com's shares in Palm was approximately $51 billion, while the market value of 3Com's equity—including its shares in Palm—was $28 billion. Either the market was valuing the non-Palm portions of 3Com at a negative $23 billion—even though the non-Palm portions of 3Com had in November 1999 reported an operating income of about $750 million over the previous 18 months—or investors were seriously overpaying for Palm (Lamont, 2000).

All relevant information about Palm and 3Com was readily available to on-line investors prior to Palm's IPO. After the IPO, the relative mispricing was simple to understand and was discussed both on-line and in print; for examples from the mainstream news media, see Rapoport (2000a, b). Yet three months after the IPO, the market value of 3Com minus the market value of its Palm shares was still only $4 a share, less than half the value of 3Com's cash. Shares of Palm were distributed to 3Com shareholders in July 2000. As of mid-August 2000, the value of Palm had dropped by 65 percent from its March 2, 2000, close, while the value of 3Com (including the July distribution of Palm) was roughly similar to its March 2 close.

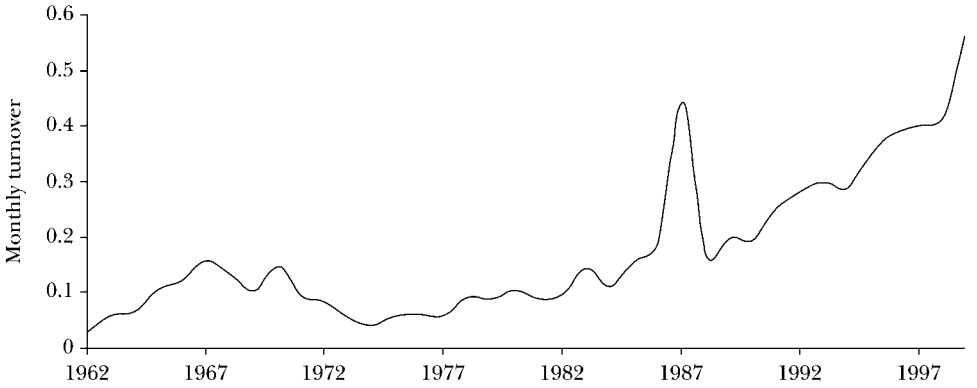
The experimental economics literature has spelled out the conditions that are most conducive to prolonged mispricing and speculative bubbles: when the ratio of inexperienced to experienced investors is high; when there is greater uncertainty about the future value of a security; and when investors have more cash to invest relative to the value of the security (Smith, Suchanek and Williams, 1988; Caginalp, Porter and Smith, 2000; see Shiller, 2000, for further discussion of speculative bubbles).[10] E-commerce—and the lengthy bull market—have helped to create these conditions.

Many recent investors are inexperienced. Between 1995 and 1998, the number of households investing directly in stock grew by over 30 percent (Kennickell, Starr-McCluer and Surette, 2000). In 1975, 31 percent of household financial assets were held in equities and mutual funds, according to Federal Reserve Flow of Funds data; by 1998, that figure had nearly doubled to 61 percent. Perhaps even more pertinent, half of the more than 200,000 brokers, financial planners, and advisors advising investors today began their careers in the 1990s (Goldstein and Krutov, 2000).

The current generation of investors is trading very actively by historical standards. Stock market turnover can be calculated as half the dollar volume of trades—the half is so as not to count both the buyer and seller on the same

[10] Speculative bubbles can also be manifestations of the "winner's curse." In auctions where bidders have different but unbiased beliefs about an object's value, the high bidder is likely to be an individual whose initial estimate of value exceeds the object's true value. The winner's curse is more likely when there are more bidders, when the dispersion of opinions about the value of whatever is being auctioned is great, and when price is set primarily by those with the highest opinion of value. See Thaler (1988) in this journal for an overview of the winner's curse.

Figure 1
Difference in Annual Turnover, Most and Least Actively Traded Decile of Stocks, 1962 to 1999



Note: During each calendar year, stocks are sorted into deciles on the basis of average monthly turnover. Monthly turnover is calculated as half the dollar volume of trades divided by the average of beginning-of-month and end-of-month market capitalization (price times shares outstanding).

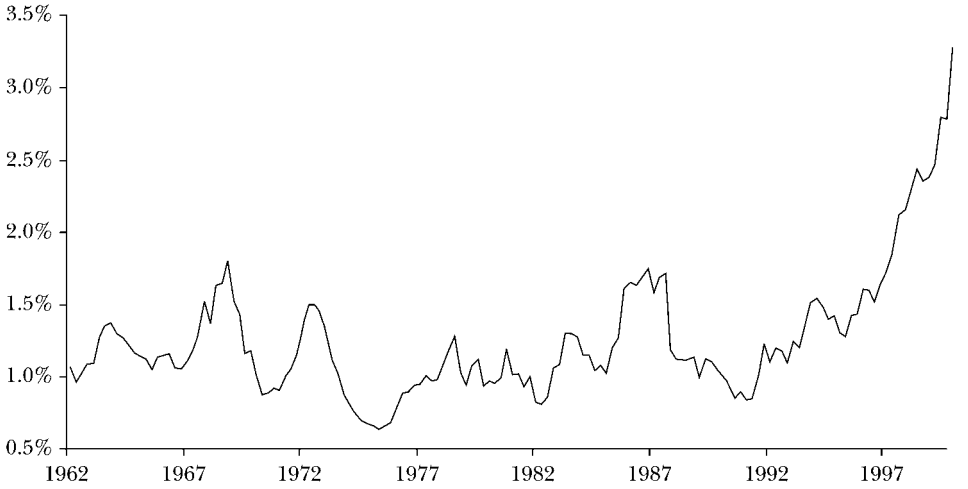
trade—divided by the market capitalization, which is price times shares outstanding. By this measure, turnover on the New York Stock Exchange was 78 percent in 1999, the highest since 1929. Furthermore, trading is highly concentrated in a few stocks. Figure 1 graphs the difference in annual turnover for the deciles of the most and least actively traded stocks each year from 1962 to 1999. Trading volume is more concentrated in high-turnover stocks in the late 1990s than at any time in the last four decades.

These investors are flush with cash, partly because of a robust economy, and partly because they are borrowing aggressively. "Margin debt" measures the dollar value of stock purchased with borrowed money. Figure 2 graphs the ratio of aggregate margin debt to disposable income from 1962 to 1999. Borrowing rises dramatically after 1995, more than doubling previous highs.

These very active investors are often making decisions in a situation of high uncertainty. On-line investors have concentrated their trading in e-commerce and other high-tech firms.[11] Many e-commerce firms have novel, untested business plans. Many have little or no earnings. Values are based on distant projections, about which there is much disagreement. However, due to the illusions of knowledge and control, and the tendency of people in an information-rich environment to become more set in their beliefs, the volume and variety of information available

[11] Each day Ameritrade, an on-line brokerage firm, lists the ten stocks purchased by the largest percentage of its customers. These stocks are overwhelmingly from high technology industries. For example, on July 26, 2000, the Ameritrade investors' top ten purchases were Nokia, Worldcom, Texas Instruments, Lucent Technologies, Motorola, JDS Uniphase, Infospace, Applied Materials, Juniper Networks, and RF Micro Devices.

Figure 2
Margin Debt for U.S. Households Divided by Disposable Personal Income



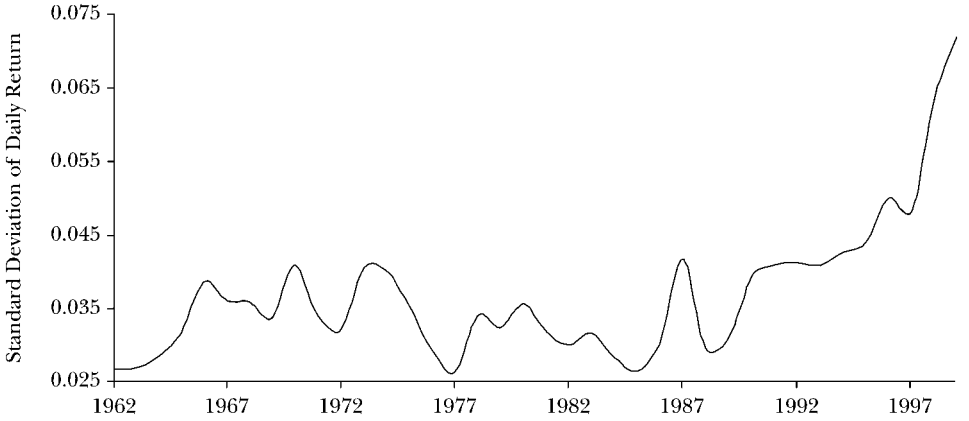
Source: Goldstein and Krutov (2000).

on-line have probably led to greater dispersion of beliefs and greater investor overconfidence.

One measure of these heterogeneous beliefs and uncertainty is the volatility of stock returns. Volatility will be high when investors disagree about the distribution of future returns and the marginal investor who sets price is constantly changing. Alternatively, even if all investors do agree about the distribution of future returns, volatility will be high if that distribution has high variance. The volatility of individual stocks has increased dramatically since the 1960s (Campbell, Lettau, Malkiel and Xu, 2001), though the causes of this increased volatility are not well understood. Figure 3 graphs the average monthly volatility of the stocks investors are trading most actively—those in the highest annual turnover decile each year. In the 1990s, the volatility of these high-turnover stocks rose to nearly double its highs from the previous three decades levels.

There is even a relatively new breed of market participant known as "day traders"—that is, retail customers of brokerage firms who attempt to make profits intra-day on small changes in the prices of stocks (North American Securities Administrators Association, 1999)—who may also affect price for some securities. Though the number of professional day traders is notoriously difficult to estimate, by some accounts there are fewer than 5000 (Tunick, 1999). Nonetheless, in spring 2000, new orders originating from firms that cater to day traders made up approximately 20 percent of the new orders flowing into Nasdaq stocks (Angel, 2000). Some day traders place thousands of orders a day. Their horizons are short and their access to information immediate. Little is known about their trading strategies, because firms that cater to day traders have been generally reluctant to provide access to the trading records of their clients. Some day traders may add to market

Figure 3
Average Monthly Volatility of the Stocks in the Highest Annual Turnover Decile Each Year



Note: For each stock, we calculate the standard deviation of daily returns within a calendar year. The figure shows the average daily standard deviation of stocks with the highest average monthly turnover during the year.

depth by providing instant liquidity, while those who try to profit from short-term momentum cycles probably increase market volatility. Which effect dominates remains an unresolved empirical question.

In short, the advent of e-commerce has coincided with conditions conducive to speculative bubbles. It is sometimes argued that speculative bubbles cannot persist because rational investors will recognize overvalued stocks and sell these stocks short until mispricing is corrected. As a practical matter, it may be difficult or impossible to borrow shares to short—as in fact was the case for Palm in the example given earlier.[12] But more generally, the rational would-be arbitrageur must recognize the possibility that mispricing may last for a long time and may get worse before it gets better (Shleifer and Vishny, 1997) resulting in margin calls and, for all but the best-financed arbitrageurs, possible forced losses. Furthermore, the truly rational would-be arbitrageur must recognize the possibility that betting against the market valuation will prove misguided—which is a powerful reason for arbitrageurs to limit the size of their bets.

[12] Some stocks are more difficult to borrow for shorting than others. A recent change to NASD Rule 3370 permits members to use a "Hard to Borrow" list in determining the availability of shares to borrow prior to permitting short sales (Federal Register, Vol. 65, No. 62, March 30, 2000, Notices). Stocks, such as Palm, with low institutional ownership may be more difficult to borrow (Lamont, 2000). Furthermore, the *Wall Street Journal* (August 18, 1999, p. C1) reports that initial public offerings (IPOs) may be difficult to borrow "because the stock certificates haven't yet been distributed to investors. Moreover, the SEC makes shorting IPOs difficult under a rule that prevents brokerage firms in the underwriting syndicate from 'extending credit,' or making loans, on IPO shares for 30 days. (These loans typically are made through margin accounts.)"

An Afterthought on Corporate Governance

Some day the Internet's ability to connect people could profoundly affect investor influence on corporate governance. Many individual investors today do not participate in shareholder votes. However, the adoption of electronic shareholder voting may change investor involvement. Just as organizations such as the California Public Employees Retirement System (CALPERS) have been able to rally institutional investors around issues of corporate governance, advocacy groups may be able to use the Internet to build coalitions of individual shareholders. Individual investors could vote not only on governance but also on issues of social responsibility. Thus, the combination of the Internet and shareholder voting could become a new tool for organizations promoting corporate responsibility, environmental action, or consumer welfare. Coalitions of proxy-voting shareholders could someday wield a perceptible influence on the policies of the corporations they own, thereby leading to a democratization of corporate America.

■ *We appreciate the comments and assistance of James Angel, Brad De Long, Phil Fortuna, Alan Krueger, Igor Krutov, James Marks, Daniel Meyer, Inna Okounkova, Jay Ritter, George Sofianos, Ryan Tagal, Michael Waldman, and Jason Zweig. We are particularly grateful to Timothy Taylor, who provided valuable guidance in the editorial process. Shane Shephard provided valuable research assistance.*

References

Angel, James. 2000. "404 Error: Liquidity Not Found," working paper, Georgetown University.

Balasubramanian, S., P. Konana and N. Menon. 1999. "Understanding On-line Investors: An Analysis of Their Investing Behavior and Attitudes," Working paper, University of Texas, Austin.

Barber, Brad M. and Terrance Odean. 2000a. "On-line Investors: Do the Slow Die First?," working paper, UC Davis.

Barber, Brad M. and Terrance Odean. 2000b. "Trading is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors." *Journal of Finance.* 55, pp. 773–806.

Barber, Brad M. and Terrance Odean. 2001. "Boys Will be Boys: Gender, Overconfidence, and Common Stock Investment," forthcoming *Quarterly Journal of Economics.*

Barber, Brad M., Terrance Odean and Lu Zheng. 2000. "The Behavior of Mutual Fund Investors" Working paper, UC Davis.

"The Best of the Net: Top Investment Websites." 1999. *AAII Journal.* September.

Brown, Jeffrey R. and Austan Goolsbee. 2000. "Does the Internet Make Markets More Competitive? Evidence From the Life Insurance Industry," working paper, Harvard University.

Caginalp, Gunduz, David Porter, and Vernon Smith. 2000. "Momentum and Overreaction in Experimental Asset Markets," working paper, University of Arizona.

Campbell, John Y., Martin Lettau, Burton Malkiel, and Yexiao Xu. 2001. "Have Individual Stocks Become More Volatile? An Empirical Exploration of Idiosyncratic Risk," *Journal of Finance*, forthcoming.

Cerulli Associates. 2000. "The Internet and Financial Product Distribution," March.

Choi, James J., David Laibson and Andrew Metrick. 2000. "Does the Internet Increase Trading? Evidence from Investor Behavior in 401(k) Plans," working paper, Harvard University.

Credit Suisse First Boston. 2000. "On-line Brokerage Quarterly Roundup: June Quarter, 2000" August.

Fama, Eugene and Kenneth French. 2000. "The Equity Premium," working paper, University of Chicago.

Gilovitch, Thomas, Robert Vallone and Amos Tversky. 1985. The Hot Hand in Basketball: On the Misperception of Random Sequences. *Cognitive Psychology*. 17, pp. 295–314.

Goldstein, Michael L. and Igor Krutov. 2000. "The Future of Money Management in America," Bernstein Research Report.

Keller, Kevin L. and Richard Staelin. 1987. "Effects of Quality and Quantity of Information on Decision Effectiveness." *Journal of Consumer Research*. 14, pp. 200–13.

Kennickell, Arthur B., Martha Starr-McCluer and Brian J. Surette. 2000. "Recent Changes in U.S. Family Finances: Results From the 1998 Survey of Consumer Finances," Federal Reserve Bulletin.

Hoge, Robert D. 1970. "Confidence in Decision as an Index of Perceived Accuracy of Information Processing." *Psychonomic Science*. 18, pp. 351–53.

Lamont, Owen. 2000. "Guilty as Charged: Violations of the Law of One Price in Financial Markets," working paper, University of Chicago.

Langer, Ellen J. 1977. "The Psychology of Chance." *Journal for the Theory of Social Behavior*. 7, pp. 185–207.

Langer, Ellen J. 1975. "The Illusion of Control." *Journal of Personality and Social Psychology*. 32, pp. 311–28.

Langer, Ellen J. and Jane Roth. 1975. "Heads I Win, Tails it's Chance: The Illusion of Control as a Function of the Sequence of Outcomes in a Purely Chance Task." *Journal of Personality and Social Psychology*. 32, pp. 951–55.

Lee, Charles M. C., James Myers and Bhaskaran Swaminathan. 1999. "What is the Intrinsic Value of the Dow?" *Journal of Finance*. 54, pp. 1693–1741.

Lord, Charles, Lee Ross and Mark Lepper. 1979. "Biased Assimilation and Attitude Polarization: The Effects of Prior Theories on Subsequently Considered Evidence." *Journal of Personality and Social Psychology*. 37, pp. 2098–2109.

North American Securities Administrators Association. 1999. "Report of the Day Trading Group: Findings and Recommendations," August. Washington, D.C.

Odean, Terrance. 1998. "Volume, Volatility, Price and Profit when All Trades are Above Average." *Journal of Finance*. 53, pp. 1887–1934.

Oskamp, Stuart. 1965. "Overconfidence in Case-study Judgments." *Journal of Consulting Psychology*. 29, pp. 261–65.

Peterson, Dane K. and Gordon F. Pitz. 1988. "Confidence, Uncertainty, and the Use of Information." *Journal of Experimental Psychology*. 14, pp. 85–92.

Presson, Paul K. and Victor A. Benassi. 1996. "Illusion of Control: A Meta-analytic Review." *Journal of Social Behavior and Personality*. 11, pp. 493–510.

Punishill, Jaime. 2000. "Overhauling Financial Advice," Forrester Research Report, February.

Rabin, Matthew and Joel Schrag. 1999. "First Impressions Matter: A Model of Confirmatory Bias." *Quarterly Journal of Economics*. 114, pp. 37–82.

Rapoport, Michael. 2000a. "IN THE MONEY: Palm - 3Com Value Gap Persists, And Widens." Dow Jones News Service, March 10.

Rapoport, Michael. 2000b. "IN THE MONEY: Now Market Thinks 3Com Non- Palm Operations Have Value." Dow Jones News Service, May 9.

Robertson Stephens. 2000. "eFinance Update," August.

Saxton, Jim. 2000. "The Roots of Broadened Stock Ownership," Joint Economic Committee, United States Congress.

Shleifer, Andrei and Robert W. Vishny. 1997. "The Limits of Arbitrage." *Journal of Finance*. 52, pp. 35–55.

Shiller, Robert. 2000. *Irrational Exuberance*. Princeton: Princeton University Press.

Slovic, Paul. 1973. "Behavioral Problems of Adhering to a Decision Policy," Working paper, Oregon Research Institute, Eugene, Oregon.

Smith, Vernon L., Gerry L. Suchanek and Arlington W. Williams. 1988. "Bubbles, Crashes, and Endogenous Expectations in Experimental Spot Asset Markets." *Econometrica*, pp. 1119–1151.

Stewart, Thomas R., Kenneth F. Heideman, William R. Moninger and Patricia Reagan-Cirincione. 1992. "Effects of Improved Information on the Components of Skill in Weather Forecasting." *Organizational Behavior & Human Decision Processes*. 53, pp. 107–34.

Thaler, Richard. 1988. "The Winner's Curse." *Journal of Economic Perspectives*. 2, pp. 195–206.

Tunick, Britt. 1999. "Day Traders Working Hard to Influence How the Profession is to be Defined." *Securities Week*. 26:21, May 24, p.3.

U.S. General Accounting Office. 2000. "Online Trading: Better Investor Protection Information needed on Brokers' Websites," May.