

Extreme Return Reversal in the Stock Market

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Suggested Citation: Mark Hirschey, "Extreme Return Reversal in the Stock Market: Strong Support for Insightful Fundamental Analysis," *Journal of Portfolio Management*, vol. 29, no. 3 (Spring 2003): 78-90.

Revised: October 2002

* I wish to thank Christine Hauschel and an anonymous referee for helpful comments on an earlier draft.

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Mini-Abstract: Market Overreaction.

Abstract: According to the Efficient Market Hypothesis, market returns are unpredictable and random around long-term market norms. In a perfectly efficient market, historical returns offer no useful insight in the formation of future return expectations. Behavioral finance theory suggests otherwise. Even if nobody can predict when the market will take a severe drop (e.g., down 20%), the Overreaction Hypothesis suggests that forward-looking returns will be above average *after* severe market drops.¹ As predicted by the Overreaction Hypothesis, market evidence shows that severe downturns in the overall market are consistently followed by superior returns during the succeeding 12 months. Therefore, when investors overreact by giving extreme weight to recently negative returns, they run the risk of missing subsequent above-average rates of return. Going forward, the Overreaction Hypothesis predicts a reversal of sharp losses following the collapse of the Internet stock bubble and devastating terrorist attacks on New York City and Washington, D.C.

Digest: Experienced investors know that competitor entry in highly profitable, high growth industries causes above-normal profits to regress toward the mean. Conversely, bankruptcy and exit allow the below-normal profits of depressed industries to rise toward the mean. However, in an efficient market, current prices incorporate all relevant evidence, including information about the mean reversion in business profits, and stock market rates of return are expected to follow a random walk. In fact, the distribution of annual rates of return for the stock market closely resembles a normal distribution, or bell-shaped curve.

A different pattern in stock market returns, and one that provides strong evidence of extreme return reversal in stock market returns, is provided when one considers the pattern of long-term market returns. Strong evidence of return reversal in stock market returns is suggested by the sequence of annual returns. Statistically speaking, there appears to be high negative autocorrelation in annual returns. Sharp reversals of extreme negative returns in the stock market are common. In a consistent pattern, bear markets with sharply negative annual rates of return tend to be followed by bull markets with robust positive returns. In the period following booming bull markets, market returns tend to revert towards long-term norms.

For some investors, especially those with a strong background in statistics, the idea of return reversal in market returns might be misinterpreted as a simple “regression to the mean.” However, the regression to the mean concept fails to explain return reversals in the S&P 500, where returns following vicious bear markets substantially exceed long-term averages rather than regress toward long-term market norms. The regression to the mean concept also fails to explain return reversals in Nasdaq following vicious bear markets and boisterous bull markets.

The extreme reversal in stock market returns reported in this article is consistent with the market Overreaction Hypothesis. While the stock market appears to be highly efficient in rapidly incorporating information that affects prices in the short run, it systematically fails to process more complex and longer run information in an efficient manner. Stock market overreaction can be explained by research in experimental psychology that shows people often overreact to unexpected dramatic events. In revising their beliefs, individual investors may overweight recent information and underweight prior base-rate data on an ongoing basis. Information about return reversal in stock market returns, and theory from the field

of behavioral finance, is useful to investors if it helps them understand and predict stock market behavior. Given the magnitude of recent stock-market declines, and the sharply negative stock-market reaction to devastating terrorist attacks in New York City and Washington, D.C., the Overreaction Hypothesis predicts that a vigorous new bull is imminent.

KEY WORDS: Behavioral finance, market efficiency.

Extreme Return Reversal in the Stock Market

*Mr. Market lets his enthusiasm or his fears run away with him,
and the value he proposes seems ... little short of silly.*

--- Benjamin Graham (1973, p. 108)

The Intelligent Investor

Economic theory explains the often-observed mean reversion in business profits over time as a typical characteristic of the competitive environment. Unexpected good fortune in the form of rising prices or falling costs translates into above-normal profits that act as a magnet for new competition. Favorable imbalances of demand and supply tend to be quickly remedied by increasing competitor supply which leads to a reduction in firm demand, falling prices and diminishing profits. This process continues until equilibrium quantities and prices are restored and business profits reflect only a risk-adjusted normal rate of return. At that point, competitors and potential entrants expect only a fair rate of return on investment. Similarly, when unfavorable imbalances of demand and supply exist, a decrease in supply leads to an increase in firm demand, rising prices and rising profits. Again, this process continues until equilibrium quantities and prices are restored, and both established competitors and potential entrants are promised the opportunity for a fair risk-adjusted rate of return on investment.

Economic theory that describes a mean reversion in business profits over time is broadly accepted because of its simple and compelling logic. Such theory also enjoys broad acceptance because it has telling real-world predictive capability. High business profits often lead to booming capital expenditures and higher employment. Eventually, such expansion in an industry causes the marginal rate of return on investment to fall. Conversely, low business profits typically lead to falling capital expenditures, layoffs, and plant closings. Eventually, such industry contraction leads to rising rates of return for survivors. In short, economic theory that describes a mean reversion in business profits over time has compelling descriptive and predictive capability.

At the same time, economic theory is incapable of describing or predicting a similar mean reversion in investor profits over time. In a perfectly efficient capital market, knowledgeable investors always accurately price equities in light of all relevant economic considerations, including the expected mean reversion in business profits over time. Despite business-cycle dependent business profits, there would be no effect on investor profits from a perfectly anticipated business cycle. Only the unexpected effects of business cycles, and the unexpected mean reversion of business profits, would influence investor profits in a perfectly efficient capital market. If mean reversion in market returns (investor profits) over time were prevalent in the securities markets, theory from the fields of statistics and/or psychology might offer relevant explanation.

The purpose of this paper is to document evidence of return reversals in U.S. equity market returns over time. Following periods where the equities market has significantly outperformed long-term norms, periods of significant under performance are observed. Conversely, after periods where the U.S. equities market has significantly under performed long-term market norms, periods of significant out performance are observed. Importantly, the degree by which above-normal market performance reverts to below-market performance during subsequent periods cannot be explained by conventional statistical theories describing the well-known process of regression to the mean. Similarly, the extent to which below-normal market performance reverses to above-market performance during subsequent periods cannot be explained as a simple manifestation of the regression to the mean phenomenon. Rather, return reversal in stock market returns offers added support for the Overreaction Hypothesis as explained by theories from the field of psychology. This article argues that contributions from the fields of economics, statistics, and psychology are needed to understand the process giving rise to a return reversal in stock

market returns over time. Findings reported here suggest that investor focus on extreme outcomes can become counterproductive to long-term investment success.

Mean Reversion in Business Profits

Business cycles are a much-studied characteristic of the macro economy. The National Bureau of Economic Research defines recession as a period of significant decline in total output, income, employment, and trade. Usually lasting from six months to a year, recessions are marked by widespread contractions in many sectors of the economy. A growth recession is a recurring period of slow growth in total output, income, employment, and trade, usually lasting a year or more. These two concepts are often observed in tandem. For example, a growth recession may encompass a recession. In such instances, the economic slowdown usually begins before the recession starts, but ends at about the same time. Slowdowns also may occur without recession, in which case the economy continues to grow, but at a pace significantly below its long-run growth potential. While economists are not very good at predicting when recessions or business expansions will develop, they are very good at explaining the dynamic process that occurs over the course of the business cycle.

During recessions and business slowdowns, profits typically fall. Layoffs and losses mount, especially for fringe competitors. Through bankruptcies and plant closings, industry output shrinks to meet lower demand, and the seeds of the next business recovery are sown. As business recovers, losses disappear and profits resume at levels sufficient to maintain capital investment. Just the opposite occurs when an unexpected burst in demand causes an unforeseen burst in business profits. During economic expansions, entry and nonleading firm growth eat into the high profit margins of industry leaders, and company rates of return on investment fall towards long-time industry norms.

For both companies and industries, expansion and contraction occurs based upon the relationship between the internal rate of return on investment and the marginal cost of capital. Capital expenditures rise when the internal rate of return on investment exceeds the marginal cost of capital. Capital expenditures fall when the internal rate of return on investment is less than the marginal cost of capital. In the language of finance, an increase in investment is suggested whenever the net present value of individual projects exceeds zero.

At any point in time, firm and industry profit rates vary widely. Over time, however, these profit rates tend to converge toward the overall average of a 10-12% annual rate of return on invested capital. Experienced investors know that competitor entry and growth in highly profitable industries causes above-normal profits to regress toward the mean. Conversely, bankruptcy and exit allow the below-normal profits of depressed industries to rise toward the mean. For example, drugs, health care services, and medical supplies were among the most profitable U.S. industries during the late 1980s as an aging population and government-sponsored health programs caused the demand for health care to skyrocket. In the late 1990s, however, a proliferation of new drug therapies, cost-containment measures, and government regulations conspired to limit profit-making opportunities in health care. As a result, profit and sales growth in health care turned downward. Over the next decade, it is not likely that health care industry profits will dramatically exceed all-industry averages. In that event, they will have regressed toward the mean profit level. At the same time, major air carriers such as United, American, and Delta typically earn meager profits, at best, because they operate in an industry with a homogeneous product (safe air travel) and huge fixed costs. As a result, price competition is vicious. Nevertheless, profit rates for the airlines were bound to rise during the late-1990s because the industry could not continue to sustain the enormous losses incurred during the early-1990s. Bankruptcy and exit allow prices and profits to rise toward a risk-adjusted normal rate of return for survivors.

Return Reversal in the S&P 500 and Nasdaq

Champions of the efficient market hypothesis (EMH) argue that economic theory and evidence consistent

with mean reversion in business profits have no meaningful implications for investment analysis and portfolio management. The EMH states that security prices fully reflect all available information for all securities at every point in time. Individual and professional investors buy and sell stocks under the assumption that they have discovered a divergence between intrinsic value and market price. When market price is below perceived intrinsic value, buyers aggressively acquire and bid up the price of such securities. When market price is above perceived intrinsic value, sellers aggressively abandon such securities and prices fall. Through their market activity, each buyer and each seller is behaving in such a way as to imply that they somehow know more than the person acting on the other side of each transaction. However, if the stock and bond markets are perfectly efficient and current prices fully reflect all available information, then neither buyers nor sellers have an informational advantage. In an efficient market, both buyers and sellers have the same exact set of information. Everyone knows that the business cycle is apt to affect business profits, but nobody knows how to make investment profits based upon that information.

On an empirical basis, the EMH hypothesis is closely tied to the random walk concept. With respect to the stock market, random walk theory simply asserts that stock price movements do not follow any patterns or trends over time. Past price action cannot be used to predict future price movements. All subsequent price changes represent arbitrary departures from previous prices. When information arises about a stock or the market as a whole, the news spreads very quickly and tends to be quickly reflected in security prices. The logic of the random walk idea is not that market prices are erratic. It is simply that when the flow of information is unimpeded, all of today's news is reflected in today's stock prices. Tomorrow's price changes reflect only tomorrow's news. By definition, news is unpredictable and random. Thus, price changes that result when news is released must also be unpredictable and random.

Although stocks can be expected to advance over long periods of time, it is well accepted that day-to-day rates of return in the stock market exhibit what might be called a random walk with drift. Daily rates of return on common stocks have a slight upward bias, or upward drift, given the long-term positive expectation for investor rates of return. Random walk theory asserts that the overwhelming characteristic of short-term rates of return in the stock market is their unpredictability.

As shown in Figure 1, the distribution of rolling 12 month rates of return for the Standard & Poor's 500 from 1950 to the present (October 2002) closely resembles a normal distribution, or bell-shaped curve, with an average annual return around 9.7%, and a standard deviation of annual returns of 15.5%. Over this roughly 50-year period, there were 609 rolling 12 month return periods. A similar pattern emerges when annual rates of return are depicted for other major stock-market indexes, like the Nasdaq Composite Index. Stock-market indexes tend to move together over extended time frames.² The distribution of rolling 12 month annual rates of return for the Nasdaq Index from its founding on February 5, 1971 to the present (357 periods) also resembles a normal distribution, or bell-shaped curve, with an average annual return around 13.6%, and a standard deviation of annual returns of 25.6%. These distributions depict the conceptual predictions of random walk theory.

A different pattern in stock market returns, and one that provides strong evidence of return reversal in stock market returns, is provided when one considers the pattern of long-term market returns. Evidence on the degree of return reversal as revealed by the sequence of annual returns is shown in Figure 2. Notice that while rolling 12 month annual rates of return on the S&P 500 and Nasdaq are noisy, both converge over time toward long-term averages. Statistically speaking, this is caused by negative autocorrelation in annual returns. For the S&P 500, the degree of negative autocorrelation in annual returns is a statistically significant -7.2%; for the more volatile Nasdaq, the degree of negative autocorrelation in annual returns is a statistically significant -10.2%.

Strong further evidence of return reversal in market returns is given in Table 1. In the last half of

the twentieth century, the worst 12-month period for the S&P 500 ended in September, 1974. Experienced investors remember the fall of 1974 as the culmination of the worst bear market of our lifetimes. Brutal bear markets were also experienced in the 12-month period ending May, 1970 and August, 2001. Notice how these worst-10 bear market periods, where the S&P 500 fell by an average -29.2%, were followed by periods with robust positive returns that averaged 17.4%. However, it is important to note that these worst-10 bear market periods are not fully independent. This makes consideration of larger samples of poorly performing markets interesting. In this vein, it is interesting to note that returns for the worst-30 bear market periods, where negative historical 12-month returns of -21.8% for the S&P 500, are followed by above-normal returns in the following year of 13.6%. For the worst-10% (or 60) bear market environments for the S&P 500, large negative market returns of -17.5% are followed by above-normal market returns of 14.2% in the subsequent 12 months.

As shown in Table 1, mean reversion in S&P 500 returns is evident in the period following robust bull market expansions, but this influence is weaker than that seen following severe bear market contractions. In the last half of the twentieth century, the best 12-month period for the S&P 500 ended in June, 1983. Experienced investors remember 1982 as the start of the greatest bull market in stock market history, and that bull market got off to a wonderful start. Splendid bull markets were also experienced in the 12-month periods ending July, 1997 and March, 1998. Notice how these booming best-10 bull markets saw the S&P 500 rise by an average 45.7%. On average, subsequent 12-month returns were a more conventional 8.2% per year. It is also interesting to note that the best-30 bull market periods depict mean reversion in market returns with historical 12-month returns of 40.1% followed by an average 9.3% in the following year. For the best-10% (or 60) bull market environments for the S&P 500, above-average market returns of 35.2% reverted toward market norms of 10.6% in the subsequent 12 month period.

Robust evidence of return reversal in market returns is evident in the more volatile Nasdaq stock market. In timing and relative magnitude, return reversal for Nasdaq tend to amplify the S&P 500 experience. Since the February, 1971 introduction of the Nasdaq Index, but prior to the most recent experience since the market peak in March, 2000, the worst 12-month period for Nasdaq ended in September, 1974. Notice how the worst-10 bear market periods for Nasdaq, where the Index fell by an average -50.8%, were followed by periods with much more modest returns that averaged -12.8%. The worst-30 bear market periods for Nasdaq also depict return reversal in market returns with historical 12-month returns of -36.4% followed by positive returns in the following year of 0.6%. For the worst-10% (or 35) bear market environments for Nasdaq, sharply negative market returns of -34.3% were followed by flat market returns of 0.0% in the subsequent 12 month period.

Potent evidence of return reversal in market returns is also evident for Nasdaq in the period following vigorous bull market expansions. Notice how the best-10 bull markets saw Nasdaq rise by an average 80.3%. On average, subsequent 12-month returns were a sharply negative -17.1% per year. It is also interesting to note that the best-30 bull market periods for Nasdaq depict return reversal in market returns with historical 12-month returns of 62.7% followed by an average -7.0% in the following year. For the best-10% (or 35) bull market environments for Nasdaq, above-average market returns of 56.4% reverted to below-market norms of -2.6% in the subsequent 12 month period.

Non-overlapping Period Analysis

An obvious advantage of the overlapping period analysis described in Table 1 is that it uses all available data to consider the possibility of extreme return reversals following extraordinary 12 month market returns. These data strongly suggest that extraordinary historical returns give rise to a reversal in forward-looking returns. Extreme return reversal appears especially prevalent in the case of unusually negative historical returns. When historical returns on the S&P 500 and Nasdaq fall below arbitrary popular benchmarks of -10% (signifying a 12 month correction), or -20% (signifying a 12 month bear

market), above-average market returns are consistently observed during the subsequent 12 month period.

A possible concern with the data reported in Table 1 is that such a rolling 12 month-period analysis involves overlapping periods. However, this is not an overwhelming concern. Table 2 shows that extreme return reversal is also prevalent when non-overlapping periods are analyzed.

Since 1950, there have been 14 unique instances when the overall market, as measured by the S&P 500, has suffered a sustained market correction of at least -10% in historical 12 month returns. On average, such corrections in the S&P 500 last 4.25 months and involve a decline of -14.1%. During the subsequent 12 month period, forward-looking investors consistently earn above-average market returns of 14.3% per year. Since 1950, there have only been 5 unique periods when the overall market, as measured by the S&P 500, has suffered a sustained bear market of at least -20% in 12 month returns. On average, these bear markets in the S&P 500 last 3.00 months and involve a decline of -24.7%. During the subsequent 12 month period, forward-looking investors consistently earn above-average market returns of 14.1% per year.

A similar pattern of extreme return reversal is also obvious for the more volatile Nasdaq. Since 1971, there have been 9 unique instances when Nasdaq has suffered a sustained market correction of at least -10% in historical 12 month returns. On average, Nasdaq corrections last 7.11 months and involve a decline of -20.0%. During the subsequent 12 month period, forward-looking Nasdaq investors consistently earn above-average market returns of 21.0% per year. Since 1971, there have been 7 unique periods when Nasdaq has suffered a sustained bear market of at least -20% in 12 month returns. Nasdaq bear markets average 5434 months in duration and involve a decline of -28.2%. During the subsequent 12 month period, forward-looking Nasdaq investors earn above-average market returns of 15.7% per year.

Thus, it seems fair to conclude that the extreme return reversal phenomenon described in Table 1 is not caused by any distortion or bias due to the use of overlapping time periods.³

Return Reversal or Simply Regression to the Mean?

For some investors, especially those with a strong background in statistics, the idea of extreme return reversal in the stock market might be misinterpreted as a simple manifestation of a more familiar statistical concept called “regression to the mean.”

In the last half of the nineteenth century, Sir Francis Galton was among the earliest and most respected British advocates of using statistics to study regularities in natural phenomena. During the 1860s, Galton searched for weather patterns as a means for improving weather forecasts. This was path-breaking use of the probability concept. His 1875 experiments on how specific factors affect the size and weight of fruit and sweet peas convinced Galton that important traits could be statistically isolated, and shown subject to what he called “reversion towards the average characteristics of the species.” Galton’s further study of inheritance patterns within leading Victorian families led him to believe that there was also a natural tendency for human characteristics, talent and character to regress towards the population average. Because Galton equated average characteristics with mediocrity, he called this tendency “regression towards mediocrity.”

Sir Francis Galton (1886) formalized his regression towards mediocrity concept in a paper titled “Regression Towards Mediocrity in Hereditary Stature.” Focusing on height across generations, Galton related the height of children to the average height of their parents. After controlling for gender differences, children and parents had the same mean height. Interestingly, Galton found the average height of children from taller parents was closer to the mean height of all children than to the mean height of their parents. The same thing happened when he started with children. The average height of parents with taller children was closer to the mean height of all parents than to the mean height of their children. This is now recognized as the regression to the mean concept. It is a statistical relationship and not a genetic phenomenon.

Regression to the mean is a statistical relationship that occurs whenever one analyzes two measures that are imperfectly correlated and a nonrandom sample from the overall population of one such measure, such as historical and forward-looking stock market returns. As shown in Figure 1, the frequency distributions of historical 12 month returns for both the S&P 500 and Nasdaq appear normally distributed and look like “bell-shaped” curves. Regression to the mean theory suggests that when samples of pre-test historical stock market returns for vicious bear markets are isolated, for example, post-test forward-looking market returns should have an average that is closer to the overall population mean than to the sample average for vicious bear markets. Similarly, regression to the mean theory suggests that when pre-test historical samples of returns for booming bull markets are isolated, post-test forward-looking market returns should have an average that is closer to the overall population mean than to the bull market sample average. Purely on a statistical basis, market returns for the sample post-test period can be expected to wind up closer to the population mean than their bear or bull market sample pre-test means were to the population mean. Purely on a statistical basis, sample means for market returns can be expected to regress toward the population mean from the pre-test (historical) to the post-test (forward-looking) periods.

To see why regression to the mean might occur in the stock market, consider the fact that the sample of historical bear markets is defined simply on the basis of poor historical performance. When market returns are isolated for the worst 10% of all market environments, what are the chances that during the post-test period that exact group will once again be associated with the lowest ten percent market environments? That probability is small, of course. Even if just a few post-test periods display more typical market returns, the group mean return during the post-test period will have to be closer to the population mean than to the pre-test mean. The same is true at the other end of the annual return spectrum. If a sample of bull markets is isolated simply on the basis of high annual returns during the pre-test historical period, market returns during the post-test forward-looking period are apt to be closer to the overall population mean than to the sample average for the pre-test period.

The regression toward the mean phenomenon occurs whenever one draws an asymmetric sample from the overall population. If a sample of market returns were drawn randomly from the overall population, the sample and the population would be expected to have the same pre-test and post-test average. It will happen forwards in time, that is from historical to forward-looking returns. It will happen backwards in time, that is from forward-looking returns to historical returns. The less correlated are historical and forward-looking returns, or any two variables, the greater is the regression to the mean. The percent of regression to the mean in any given situation is given by the formula:

$$P_m = 100(1 - r)$$

where P_m is the percent of regression to the mean and r is the correlation between any two measures.

For example, if $r = 0.5$, there is 50% regression to the mean. With a correlation of 0.5 between historical and forward-looking returns, the sampled group mean for forward-looking returns can be expected to move *fifty percent* of the distance from the pre-test historical mean to the population average annual rate of return during the post-test period. If the correlation is a small 0.2, the post-test average return can be expected to regress 80% of the distance toward the population mean. If there is no correlation between pre-test historical market returns and post-test forward-looking market returns, post-test sample returns can be expected to “regress” all the way to the population mean. It is worth thinking about what this last case means with respect to the EMH. With zero correlation between historical and forward-looking market returns, knowing historical returns gives absolutely no information about forward-looking returns. In that event, an investor’s best guess as to how the market will do during any future period, irrespective of historical bear and bull markets, is the population average rate of return.

In Table 1, notice how S&P 500 returns during the 12 months following robust bull markets

conform closely with long-term market norms. As a result, the regression to the mean concept offers a valid explanation of forward-looking market returns for the S&P 500 during the period immediately following robust bull markets. However, also notice how the regression to the mean concept fails to explain why S&P 500 returns in the 12 months following vicious bear markets substantially exceed rather than regress toward long-term market norms. The regression to the mean concept also fails to explain why Nasdaq returns in the 12 months following vicious bear markets substantially exceed rather than regress toward long-term market norms. Also observe how Nasdaq returns in the 12 months following boisterous bull markets are highly negative, rather than simply regress toward market averages.

It is fair to conclude that the regression to the mean concept fails to provide adequate explanation of the return reversal patterns evident in Table 1. As a result, alternate explanation(s) must be sought.

Overreaction Hypothesis

The return reversal in S&P 500 and Nasdaq returns reported in this article is consistent with the market Overreaction Hypothesis proposed by Werner F. M. DeBondt and Richard Thaler. In an early article, DeBondt and Thaler (1985) report that the stock market appears to be highly efficient in rapidly incorporating information that affects prices in the short run, but systematically fails to process more complex and longer run information in an efficient manner. Even some of the most staunch defenders of the EMH and the earliest critics of “behavioral” research in finance, tend to agree with this basic premise. For example, in his discussion of DeBondt and Thaler’s original research, Peter L. Bernstein (1985, p.807) wrote: “... let us give the Efficient Market Hypothesis its due as an explanation of how markets work in the short run, even if we can reject the hypothesis in the long run.”

In a follow-up article, DeBondt and Thaler (1990) observe that while most economists recognize that not everyone is fully rational, the existence of irrational agents in the stock market is often dismissed as irrelevant. They investigate security analysts as one possible source of irrationality in financial markets, and find that security analysts have a tendency to make forecasts that are too extreme, given the predictive value of the information available to the forecaster. In fact, forecasted changes are simply too extreme to be considered rational. They suggest the behavior of the security analyst community as one possible source of long-term overreaction in the equity markets.

DeBondt and Thaler’s path breaking research has given rise to a broadening stream of academic inquiry that gives strong support to the premise of long-term overreaction in the stock market. For example, Michaely, Thaler and Womack (1995) finds that the magnitude of short-run price reactions to dividend omissions are greater than for dividend initiations. Contrary to the EMH, in the year following such announcements, stock prices continue to drift in the same direction, though the drift following omissions is stronger and more robust. This post-dividend initiation/omission price drift is distinct from and more pronounced than that following earnings surprises. Dreman and Berry (1995) examine the importance of earnings surprises within the context of contrarian investment strategies. They report that positive and negative earnings surprises affect “best” and “worst” stocks in an asymmetric manner that favors worst stocks. They demonstrate that stocks are not immediately priced at an appropriate level after an earnings surprise. Rather, over a prolonged period of time (at least five years), stock prices revert to the mean, with low-P/E stocks outperforming and the high-P/E stocks underperforming the market. This evidence is consistent with the overreaction hypotheses that investors misprice best and worst stocks because their expectations are too one-sided. More recently, Nam, Pyun, and Avard (2001) investigate the mean reverting pattern of monthly returns for NYSE, AMEX and Nasdaq indexes using asymmetric non-linear smooth-transition GARCH models. These models illustrate pattern of asymmetric mean reversion and risk decimation, support the market overreaction hypotheses, and corroborate arguments for contrarian portfolio strategies.

In a comment on Internet stock pricing in the spring of 1999, Thaler (1999) wrote that his survey

of professional investors revealed that the median respondent thought that the intrinsic value of a portfolio of five Internet stocks (America Online, Amazon.com, eBay, Priceline.com, and Yahoo!) was only 50 percent of the market price. “Suppose,” Thaler (1999) wrote, “the “professionals” are right and these multibillion dollar companies are worth only half of their current prices. Suppose further that this valuation is the consensus of Wall Street experts. How can such a situation exist? The answer is that it may be an equilibrium (although not a “rational equilibrium”) as long as the Wall Street experts are not the marginal investors in these stocks.” A number of other authors also questioned peak valuations of Internet and “new era” growth stocks. In an earlier paper, I likened the pricing of Internet stocks to an earlier craze for tulips, the tulip mania (Hirschey, 1998). I argued that the EMH is a useful working hypothesis, and that investors may be primarily rational and typically price securities in a rational fashion. Nevertheless, outbreaks of crowd behavior, typified by extraordinary popular delusions and madness, are a possibility. In a similar vein, Chan, Karceski, and Lakonishok (2000) and Hirschey (2001) describe the excessive pricing of large-cap growth stocks late-1990s as reflective of investor overreaction.

That investors sometimes overreact seems clear, *why* investors overreact is yet uncertain. Progress on this front has been slow, perhaps because many that researchers in the investments field are better schooled in economics and statistics than in psychology. DeBondt and Thaler (1985) submit that stock market overreaction can be explained by research in experimental psychology that shows people often overreact to unexpected dramatic events. In revising their beliefs, individual investors may overweight recent information and underweight prior base-rate data on an ongoing basis. For example, momentum-based trading strategies are a formalization of the recency effect; speculators simply buy what seems to be working. In the period up to the March 2000 peak, so long as Internet stocks were rising, speculators kept buying and didn’t stop to worry about fundamental valuation.⁴

The practical usefulness of information about return reversal in stock market returns, and theory from the field of behavioral finance, is documented to the extent that it helps investors understand and predict stock market behavior. The hypothesis that a cognitive bias, or investor overreaction to a long series of bad news, could produce predictable mispricing is inherently testable. While the data presented in this article suggest support for the Overreaction Hypothesis, this support would be strengthened considerably with corroborative future evidence. For example, Table 3 depicts recent historical returns for the S&P 500 and Nasdaq. Clearly, the new millennium has been rough on investors. Many previous adherents of “new era” growth stock investing now decry the “obvious” excesses of speculators participating in the recent Internet stock bubble. However, when one considers the magnitude of recent declines in light of the long-term (base rate) data provided in Tables 1 and 2, it seems quite plausible that present investors who dump equities in favor of fixed-yield instruments may be making a similar mistake. Data in Tables 1 and 2 suggest that forward-looking returns on the S&P 500 and Nasdaq are apt to be strongly positive. According to the Overreaction Hypothesis, a vigorous new bull market would appear to be just around the corner.

Conclusions and Implications for Portfolio Management

Well-accepted economic theory and evidence documents the mean reversion in business profits over time. At the same time, the EMH posits that this predictable reversion to the mean in business profits holds no importance for investors. In a perfectly efficient market, all relevant information, including trends in business profits, are fully incorporated in stock prices. Both short and long-run rates of return in a perfectly efficient stock market follow a random walk. From an efficient markets perspective, any perceived tendency for mean reversion in stock market returns can be dismissed as a simple manifestation of the well-known regression to the mean concept from the field of statistics.

In contrast, stock market evidence and behavioral finance research on the Overreaction Hypothesis are consistent with a predictable process of long-term return reversal in stock market returns.

If investors systematically overweight recent bad news about negative market returns, investor fear can push stock prices far below fundamental economic values. Similarly, if investors systematically overweight recent good news about positive market returns, investor greed can push stock prices above fundamental economic values. In both instances, cognitive bias among investors can lead to predictable mispricing.

The high degree of negative autocorrelation evident in annual rates of return for the S&P 500 and Nasdaq suggest that long-term returns in the stock market are not random. Instead, this evidence is consistent with the notion that, in the short run, stock prices may in fact be susceptible to extraordinary swings driven by investor sentiments of greed and fear. In the long run, however, trends in stock prices mirror real changes in business prospects as measured by revenues, earnings, dividends, and so on. As a result, periods with extraordinary above-normal market returns tend to be followed by periods of sub-par performance. Similarly, intervals of sharply below-normal market returns tend to be followed by stretches of above-normal performance.

More than a simple prescription to “buy fear” or “sell greed,” evidence of return reversal in stock market returns gives strong support for the relevance of insightful fundamental analysis. In his classic book *The Intelligent Investor*, Benjamin Graham (1973) describes the relationship between the intelligent long term investor and market fluctuation using his now famous Mr. Market metaphor. The intelligent investor has a business partner, Mr. Market, who offers to buy or sell shares in the business at a price that varies from day to day. Sometimes, Mr. Market’s idea of value is justified by business developments. At other times, Mr. Market lets his enthusiasm or fear get the best of him and proposes silly prices. Graham (1973) writes that a sensible businessmen will sell out when Mr. Market quotes a ridiculously high price, or buy when the price is ridiculously low. In Graham’s (1973, p. 109) words: “... price fluctuations have only one significant meaning for the true investor. They provide him with an opportunity to buy wisely when prices fall sharply and to sell wisely when they advance a great deal. At other times, he will do better if he forgets about the stock market and pays attention to his dividend returns and the operating results of his companies.”

With respect to inherently unpredictable moves in the overall market, the point of this paper is simple but important for investment management. As suggested by the EMH, perhaps nobody can predict when the market will take a protracted severe drop (e.g., down 20%). However, after the market has taken such a drop, the overreaction hypothesis suggests that forward-looking returns will be above average. In response to a protracted severe drop in the overall market, the Overreaction Hypothesis suggests that prudent investment managers should adopt a fully invested and diversified position in high-beta stocks.

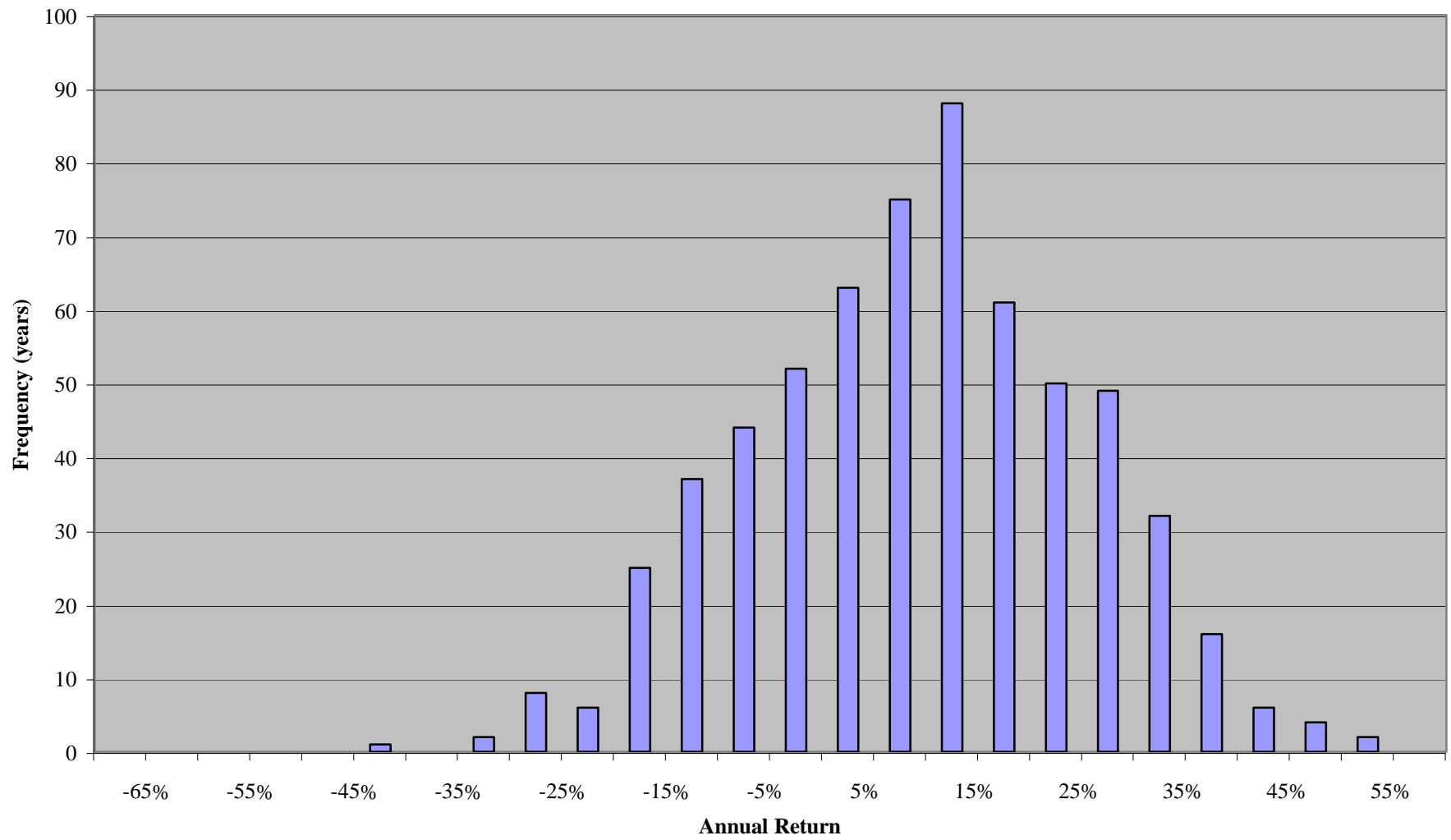
Footnotes

1. Even if a money manager cannot predict sharp breaks in the market, The Overreaction Hypothesis offers a means for profiting from protracted sharp market downturns. After the market has taken such a downturn, the Overreaction Hypothesis predicts above-average forward-looking returns and the prudent manager will emphasize high-beta stocks in portfolio selection. By way of analogy, while nobody appears able to accurately predict rain, everybody knows what to do when it's raining. If you want to go outside and stay dry, use an umbrella and/or put on a raincoat.
2. For example, over the 357 rolling 12 month return periods between the initiation of the Nasdaq Index on February 5, 1971 and August 1, 2001, the degree of correlation between the S&P 500 and the Nasdaq is a very high 82.6%. The S&P 500 and Nasdaq capture important dimensions of trends in the overall equity market, and include a number of common component companies. Nevertheless, Nasdaq is more greatly influenced by prices for small cap and technology stocks. The correlation between the S&P 500 and other large cap stock indexes, like the Dow Jones Industrial Average, tends to be much higher (94.4% over this period).
3. Table 2 shows that extreme return reversal is prevalent over the entire period despite sharply negative forward-looking returns for the S&P 500 and Nasdaq during the present bear market. These data illustrate how atypical present market returns are when compared with market norms, and the potential for a sharp reversal of returns in the coming period.
4. In March 2000, a well-known security analyst admitted to me in a private conversation that he couldn't recommend purchase of America Online on the basis of it representing an attractive value (i.e. "value stock"), or argue that it was reasonably priced on the basis of its growth prospects (i.e., "growth at a reasonable price). Yet, he rated the stock a Strong Buy. "Why?", I asked. "People seem willing to pay these prices," he replied.

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Exhibit 1
A. S&P 500 Return Frequency (1950-present)



B. Nasdaq Return Frequency (1971-present)

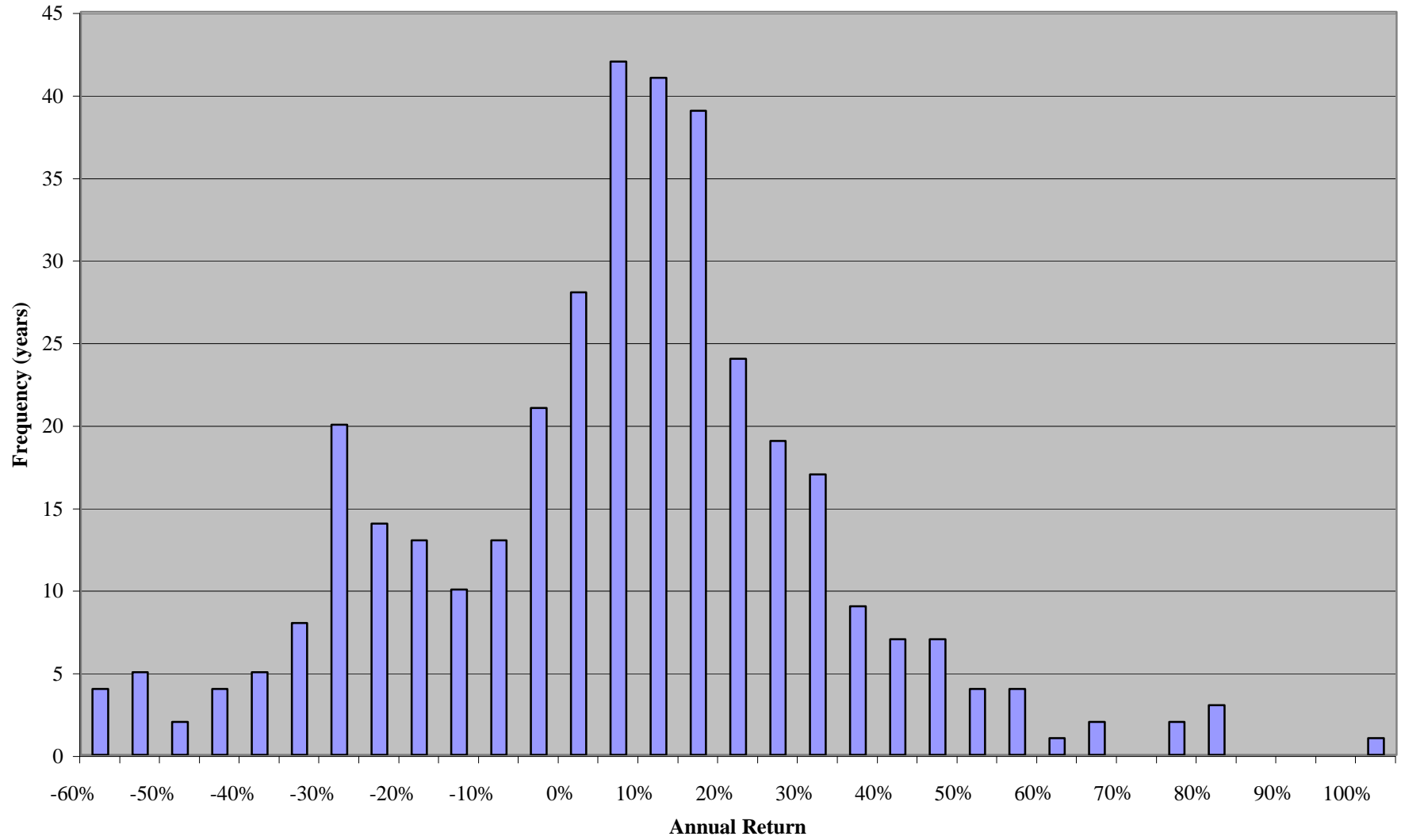
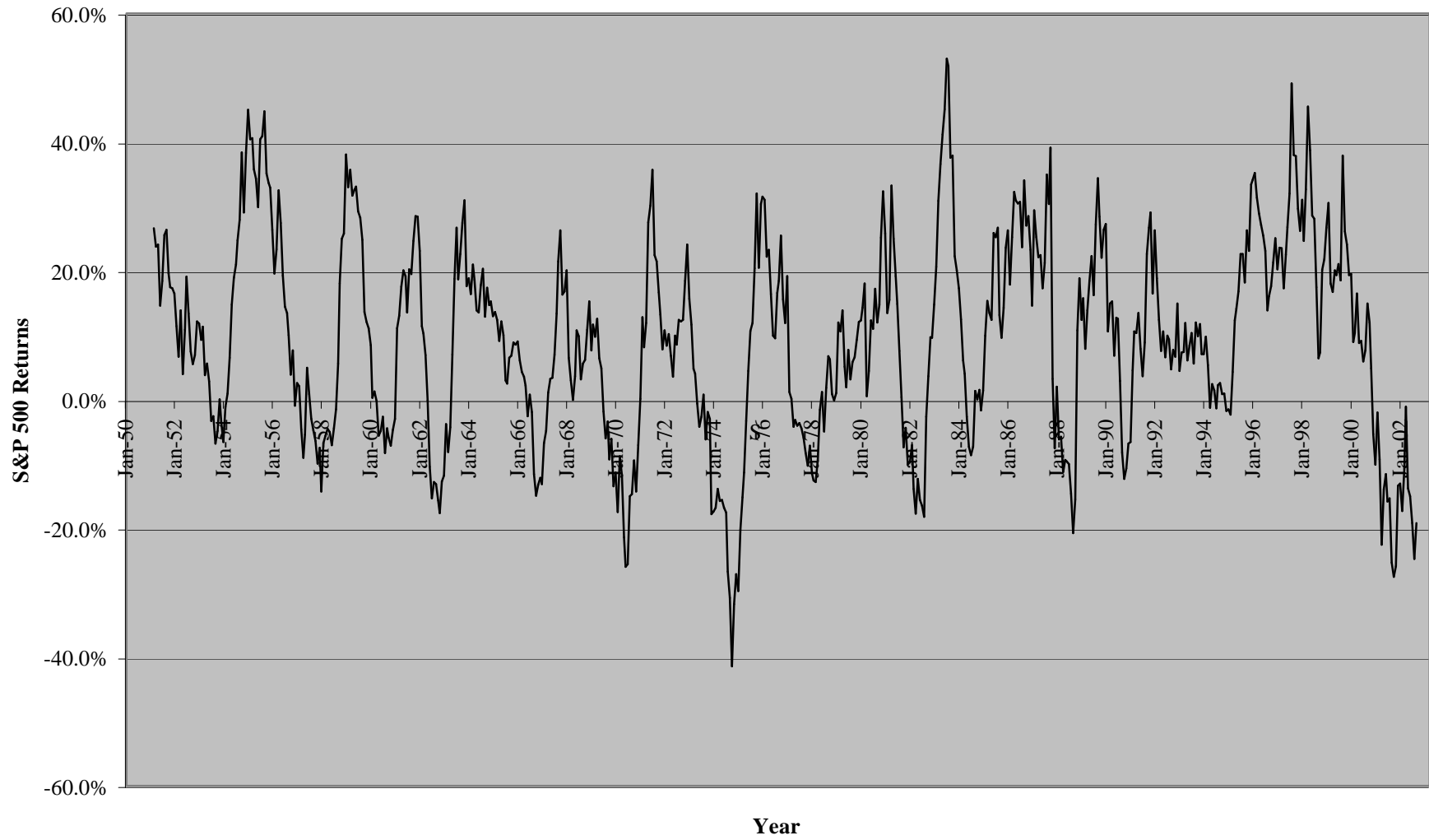


Exhibit 2
A. S&P 500 Rolling 12 mo. Returns (1950-present)



B. Nasdaq Rolling 12 mo. Returns (1971-present)

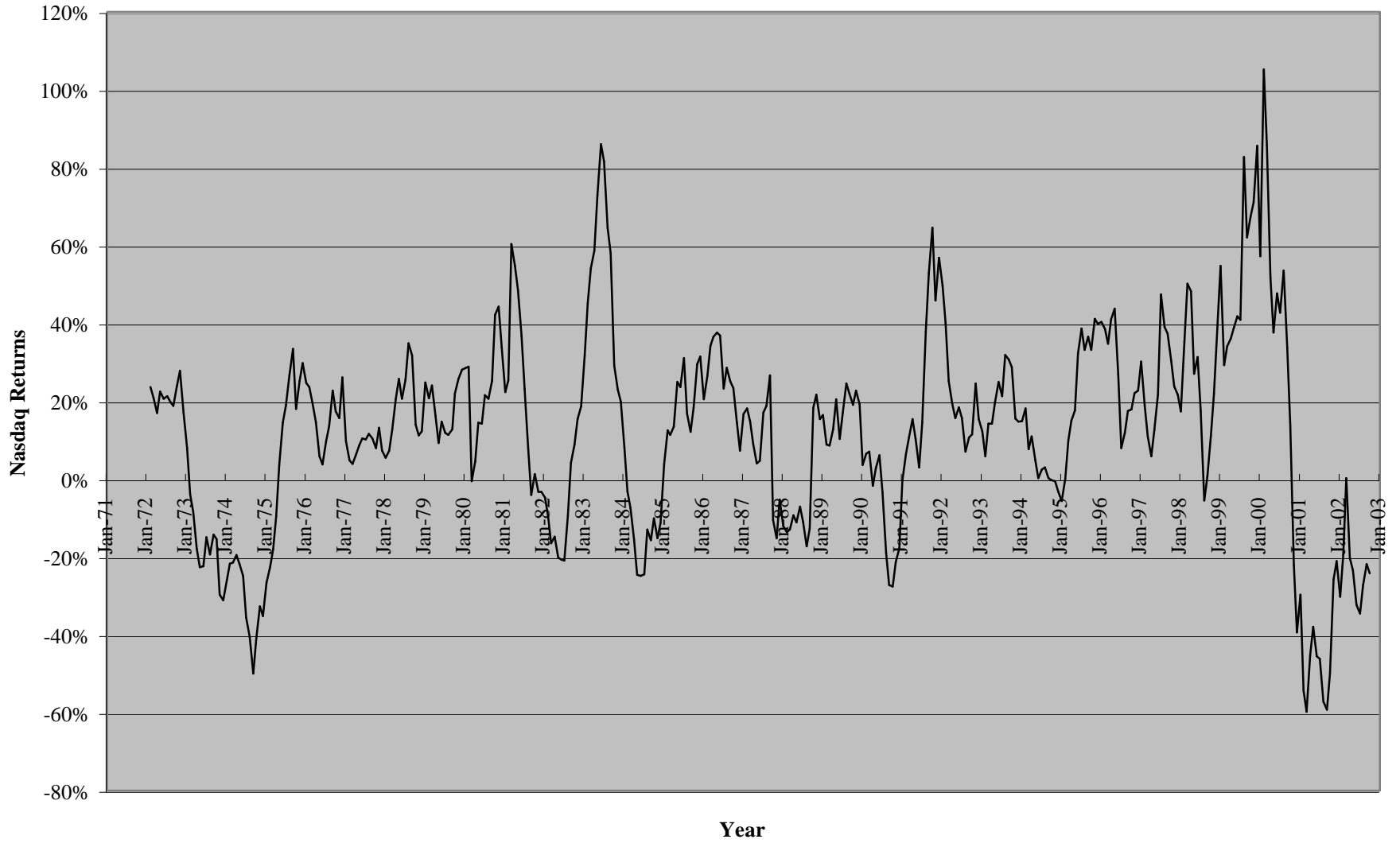


Exhibit 3

Worst and Best Historical 12 month Returns

Month Ending	Historical 12 mo. Returns	Forward- looking 12 mo. Returns	Month Ending	Historical 12 mo. Returns	Forward-looking 12 mo. Returns
<i>Ten Worst Historical S&P 500 Returns</i>			<i>Ten Worst Historical Nasdaq Returns</i>		
September-74	-41.4%	32.0%	March-01	-59.8%	0.3%
October-74	-31.8%	20.5%	September-01	-59.2%	-21.8%
August-74	-30.8%	20.4%	August-01	-57.1%	-27.2%
December-74	-29.7%	31.5%	February-01	-54.2%	-19.5%
September-01	-27.5%	-21.7%	September-74	-49.9%	33.5%
November-74	-27.1%	30.4%	October-01	-49.8%	-24.1%
July-74	-26.7%	11.9%	July-01	-46.2%	-34.5%
May-70	-26.0%	30.2%	June-01	-45.5%	-32.3%
October-01	-25.9%	-16.8%	April-01	-45.2%	-20.2%
June-70	-25.6%	35.7%	October-74	-40.8%	18.0%
Worst 10	-29.2%	17.4%	Worst 10	-50.8%	-12.8%
Worst 30	-21.8%	13.6%	Worst 30	-36.4%	0.6%
Worst 10%	-17.5%	14.2%	Worst 10%	-34.3%	0.0%
<i>Ten Best Historical S&P 500 Returns</i>			<i>Ten Best Historical Nasdaq Returns</i>		
June-83	52.9%	-8.6%	February-00	105.3%	-54.2%
July-83	51.8%	-7.3%	June-83	86.0%	-24.8%
July-97	49.1%	17.4%	March-00	85.8%	-59.8%
March-98	45.5%	16.8%	December-99	85.6%	-39.3%
May-83	45.1%	-7.3%	August-99	82.7%	53.6%
December-54	45.0%	26.4%	July-83	81.6%	-24.4%
August-55	44.8%	10.0%	May-83	72.9%	-24.6%
April-83	41.2%	-2.7%	November-99	71.1%	-22.1%
July-55	40.9%	13.5%	October-99	67.5%	13.6%
February-55	40.6%	23.3%	October-91	64.6%	11.5%
Best 10	45.7%	8.2%	Best 10	80.3%	-17.1%
Best 30	40.1%	9.3%	Best 30	62.7%	-7.0%
Best 10%	35.2%	10.6%	Best 10%	56.4%	-2.6%
Overall Averages (1950-)	9.7%		Overall Averages (1971-)	13.6%	
S.D.	15.5%		S.D.	25.6%	
Correlation	-7.2%		Correlation	-10.2%	
Number of 12 mo. Returns	609		Number of 12 mo. Returns	357	

Exhibit 4
Recent Bear Markets and Subsequent 12 mo. Returns

Time Period	Duration (in months)	Average Historical 12 mo. Returns	Average Forward-looking 12 mo. Returns	Time Period	Duration (in months)	Average Historical 12 mo. Returns	Average Forward-looking 12 mo. Returns
<i>S&P 500 -10% 12 mo. Corrections (1950-present)</i>				<i>Nasdaq -10% 12 mo. Corrections (1971-present)</i>			
December 1957	1	-14.3%	38.1%	April 1973-March 1975	24	-26.0%	-5.8%
May-December 1962	8	-13.7%	22.7%	March-July 1982	5	-18.6%	70.7%
August-December 1966	5	-13.0%	20.2%	April-December 1984	9	-17.2%	22.4%
November 1969-January 1970	3	-14.1%	1.9%	October-November 1987	2	-12.8%	20.0%
March-August 1970	6	-19.1%	24.9%	January-March 1988	3	-12.9%	11.3%
October 1970	1	-14.3%	13.2%	May 1988	1	-11.1%	20.5%
November 1973-March 1975	17	-21.5%	7.7%	September 1988	3	-13.6%	21.3%
October 1977	1	-10.3%	0.9%	August 1990-December 1990	5	-22.5%	51.6%
December 1977-February 1978	3	-12.3%	7.9%	November 2001-October 2001 (?)	12	-45.5%	-23.3%
November 1981	1	-10.1%	9.6%				
February-July 1982	6	-15.7%	43.1%				
March 1988	1	-11.2%	13.9%				
June-October 1988	4	-15.2%	26.6%				
September-October 1990	2	-11.5%	27.9%				
December 2000	1	-10.1%	-13.0%				
March-October 2001 (?)	8	-19.8%	-16.4%				
Averages	4.25	-14.1%	14.3%	Averages	7.11	-20.0%	21.0%
<i>S&P 500 -20% 12 mo. Bear Markets (1950-present)</i>				<i>Nasdaq -20% 12 mo. Bear Markets (1971-present)</i>			
April-June 1970	3	-24.3%	31.1%	May-June 1973	2	-22.5%	-23.3%
July 1974-January 1975	7	-29.7%	25.4%	November 1973-March 1974	5	-26.0%	-27.0%
August 1988	1	-20.7%	34.4%	May 1974-February 1975	10	-33.0%	21.9%
March 2001	1	-22.6%	-1.1%	May-July 1982	3	-20.5%	80.2%
August -October 2001 (?)	3	-26.2%	-19.2%	May-July 1984	3	-24.6%	26.6%
				September-November 1990	3	-25.3%	54.5%
				November 2001-October 2001 (?)	12	-45.5%	-23.3%
Averages	3.00	-24.7%	14.1%	Averages	5.43	-28.2%	15.7%

Table 3
The New Millenium Has been Rough on the S&P 500 and the Nasdaq

Month Ending	Exhibit 5	
	S&P 500 Historical 12 mo. Returns	Nasdaq Historical 12 mo. Returns
January-00	9.0%	57.2%
February-00	10.3%	105.3%
March-00	16.5%	85.8%
April-00	8.8%	51.8%
May-00	9.1%	37.7%
June-00	6.0%	47.7%
July-00	7.7%	42.8%
August-00	14.9%	53.6%
September-00	12.0%	33.7%
October-00	4.9%	13.6%
November-00	-5.3%	-22.1%
December-00	-10.1%	-39.3%
January-01	-2.0%	-29.6%
February-01	-9.3%	-54.2%
March-01	-22.6%	-59.8%
April-01	-14.0%	-45.2%
May-01	-11.6%	-37.9%
June-01	-15.8%	-45.5%
July-01	-15.3%	-46.2%
August-01	-25.3%	-57.1%
September-01	-27.5%	-59.2%
October-01	-25.9%	-49.8%
November-01	-13.3%	-25.7%
December-01	-13.0%	-21.1%
January-02	-17.3%	-30.2%
February-02	-10.7%	-19.5%
March-02	-1.1%	0.3%
April-02	-13.8%	-20.2%
May-02	-15.0%	-23.4%
June-02	-19.2%	-32.3%
July-02	-24.7%	-34.5%
August-02	-17.0%	-23.5%
September-02	-21.7%	-21.8%
October-02	-16.8%	-24.1%
Overall Averages	9.7%	13.6%
S.D.	15.5%	25.6%