



# Rubble Logic: What Did We Learn from the Great Stock Market Bubble?

Clifford S. Asness

*It's not what we don't know that hurts us; it's what we know for sure that just ain't so.*

Mark Twain

The *Financial Analysts Journal's* 60th anniversary happens to coincide with the five-year anniversary of the peak of the Great Stock Market Bubble of 1999–2000. The proximity in time, with just a bit of distance, makes this year an appropriate time to consider what we may have learned from this momentous event.

"Rubble Logic" is what should be left over now that we have passed through "Bubble Logic," the title of an unpublished book draft (Asness 2000a) that was my contribution to a small but stalwart group of practitioners and academics arguing back in 1999–2000 that the stock market, and technology stocks in particular, were priced at unsustainably high levels.<sup>1</sup> Several members of this group have shared that work in the *FAJ*, which makes this review especially appropriate as part of the 60th anniversary commemoration. "Bubble Logic" was my disparaging term for the tortured stories and sometimes outright lies necessary to justify prices in 1999–2000. Now that the bubble has burst, the most important question is: What have we learned from this devastating experience?

Before continuing, I must disclose certain inadequacies in this article's title and subtitle. First, the term "rubble" is misleading. Stock prices today, although not at bubble levels, are still quite high—something certainly not conveyed by the term "rubble." Second, although I repeatedly discuss lessons we have "learned," many of these lessons are things we knew before the bubble but collectively forgot during those heady times. Third, whether we have even now fully internalized the lessons is questionable. Finally, I treat these lessons as if everyone agreed on what we have learned, but obviously, they are simply my opinions. A more accurate title would be "Things I Believe We Already Knew about Investing but Forgot during the Bubble and May Still Be Forgetting Now, So It Is Probably a Good Idea to Go Over Them Again." Unfortunately, although more accurate, it is very long, fails to rhyme with my original work, and completely lacks pith.

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*Editor's Note:* The views and opinions expressed in this article are those of the author and do not necessarily reflect the views of AQR Capital Management, LLC, its affiliates, or its employees.

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Good advice and accurate pricing are too important to be left to the kind of "logic" we saw in the Great Bubble, so a postmortem is crucial for analysts and managers.

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## Long-term average stock returns are a poor forecaster of the future

*I don't know much about history, and I wouldn't give a nickel for all the history in the world. History is more or less bunk.*

Henry Ford

On the face of it, using historical stock returns as a reasonable forecast for the future seems unimpeachable. It is certainly common, and the method is simple and clear. Basic statistical analysis is conducted on stock returns over some long-term period, and the future returns are expected to act similarly.

But although seemingly reasonable, this method can produce some strange results. For instance, suppose investors carried out this exercise in July 1982. They would have found an average annualized compound real (above U.S. Consumer Price Index inflation) return on the S&P 500 Index since the end of World War II (i.e., January 1946) that would lead to a forecast of 4.9 percent returns a year. Over the next 17 1/2 years (through the end of 1999), however, the average annual real return on stocks turned out to be 15.3 percent. Updating the calculation from 1946 through the end of 1999—a longer period, so it might make the investor more sure of the method—would result in an annual average return of 8.4 percent over inflation. That's a nice return to expect in the future! But over the next few years—from the end of 1999 through the end of 2004—the average annualized real return on the S&P 500 turned out to be -5.0 percent. (Whoa, nobody said anything about negative!) Finally, looking at the whole period at the end of 2004 (1946–2004) provides an average annual return on stocks of 7.2 percent over inflation. QED.

This example is contrived, because it uses particular extreme end points and then looks at returns over only the next few years, but although intentionally extreme, it makes the important point that forecasts derived from past averages, even if long-term averages, are often actually backwards. That is, after periods of strong returns, trailing average returns are higher than normal, and because these periods almost always come with increases in valuation, expected returns are actually lower for the future. When it comes to forecasting the future, especially when valuations (and thus historical returns) are at extremes, the answers we get from looking at simple historical average returns are bunk.

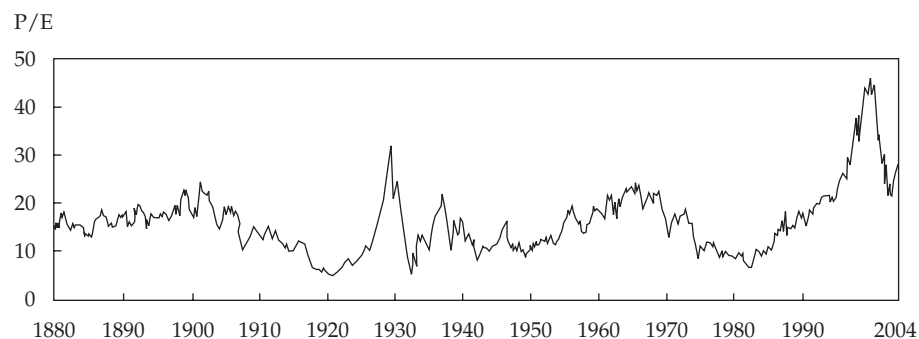
## Higher prices today mean lower expected returns tomorrow

*A fanatic is one who can't change his mind and won't change the subject.*

Sir Winston Churchill

In the case of P/Es, I am the fanatic. I have been showing the same evolving valuation information in **Figure 1** and **Table 1** for at least six years. Figure 1 shows the P/E multiple of the S&P 500 for 1881–2004 based on Robert Shiller's (2000) method of using the 10-year average of real earnings for the "E" in P/E.<sup>2</sup>

**Figure 1. S&P 500 P/E, 1881–2004**  
(price divided by 10-year real earnings)



Note: Annual dates are as of December.

**Table 1. S&P 500 Returns Starting from Different P/Es, 1927–2004**

Low	High	Return	
		Median (annual)	Worst (total)
5.2	10.1	10.9%	46.1%
10.1	11.9	10.7	32.0
11.9	14.6	10.0	4.0
14.6	17.2	7.6	–20.9
17.2	19.9	5.3	–32.0
19.9	31.7	–0.1	–35.5
31.7	46.1	Here be dragons!	

Table 1 presents the data for each rolling decade for 1927–2004 and puts it into one of six buckets based on the starting value of the P/E multiple. So, we can examine the future 10-year performance of the S&P 500 (in real terms) when starting out in each bucket.

First, note in Table 1 that median future returns (average returns produce similar results) fall sharply with rising starting P/Es. Next, consider the hallowed property of equity returns—that stocks never lose if held for the long term. Well, if a decade is your idea of the long term, then this adage is true only when prices start out in the lower three valuation buckets. When prices start out more expensive, there are decades when stocks not only lose to inflation but lose big.<sup>3</sup>

In short, starting equity valuation is a powerful long-term forecaster of future stock returns, but admittedly, valuation is perilously close to irrelevant when forecasting the short term. Investors are always admonished to ignore the short term, however, when it comes to potential losses on equities but told, at the same time, that valuation does not matter because stocks often advance in the short term even when expensive. To the contrary, although the story in Table 1 is far from perfect if examined in more depth (stocks certainly do well in some decades despite starting out expensive), Table 1 shows that a long-term investor should seriously consider entry price.<sup>4</sup>

Finally, please note the last row of the table. “Here Be Dragons” is a phrase once used on old maps for parts of the world that had not been visited yet. Results for P/Es in this range do not make it into the table because we have not yet observed a 10-year period starting from these rarified levels. We did visit this new world briefly in 1999–2000, but we did not stay long. So far since then, the table is being filled in with, as you would expect, negative real returns.

## Today’s high stock prices have two possible meanings

*More than any other time in history, mankind faces a crossroads. One path leads to despair and utter hopelessness. The other, to total extinction. Let us pray we have the wisdom to choose correctly.*

Woody Allen

The current S&P 500 P/E (around 27) puts the market in the high end of the highest bucket in Table 1 for which we have observed a full decade. An immediate logical conclusion might be to expect a zero real return on stocks over the next decade. This expectation may be less obvious than it sounds. Historically, stocks have done poorly when starting out very expensive for two reasons (this explanation works in reverse for cheap prices). The first is that when stocks are expensive, they are “lower yielding,” whether measured in dividends or earnings, which implies that (barring any further valuation changes or large changes in growth rates) returns will be lower. The second is that valuations can change, and historically, when they have started out high, they have subsequently fallen—that is, reverted to the mean. Thus, those buying stocks when they were expensive suffered a double whammy. Both reasons were clearly at work for those buying near the peak in 1999–2000. The future from here is hard to predict because we do not know whether mean



reversion in P/Es has to happen. If it does not, stocks will still be expected to return less in the future than they have historically (because of the lower-yield effect) but will not return zero as in Table 1. Estimates based on using a Gordon-type dividend discount model (which effectively assumes steady-state valuation) lead to forecasts of about 4 percent real returns (6–7 percent nominal returns if inflation stays in the 2–3 percent range). These figures are low in light of history but not a 10-year disaster.

P/Es might, in fact, stay at these lofty levels. I am keenly aware of the dangers of forecasting anything like a “permanently high plateau” for valuations, which has always been wrong before, but the intellectual argument that P/Es have on average, in fact, been too low throughout history is not without teeth. Academics have long had a name for the idea that equities have been too cheap—the “equity premium puzzle.” Essentially, according to most economic models, stocks have been too good a deal.

Equity exposure is far cheaper to get these days than in the past, which means that, even if gross returns are lower, net returns may be comparable, so investors are justified in paying permanently higher P/Es and receiving permanently lower gross (but not net) returns. If, after 100 years, investors have finally figured out the equity premium puzzle or are responding to this changing cost structure, prices may not have to fall sharply over the next few years. It also means that the lower-return environment is here to stay. A truly long-term investor or an investor with more future cash flows than present cash (and a borrowing constraint) does not necessarily favor permanently higher prices and lower returns simply to avoid a crash.

Although high prices have usually led to sharp price declines in the past (and then better returns going forward), intellectual honesty demands that we recognize the other possibility—no long-term mean reversion in prices but permanently lower expected returns.<sup>5</sup>

There are caveats. Those who might accept the idea that investors are truly cognizant of, and comfortable with, a lower equity risk premium in the future must also accept some sobering facts. First, the following logic does not hold: “Sure the risk premium is lower, but I have learned that equities always win if you hold them for at least 20 years, so lower but guaranteed positive returns are still good.” Equities have, in fact, never lost to inflation over any 20-year historical period. But that fact is more a statement about their past average returns than about their risk. If the equity risk premium is much smaller in the future, the probability of equities losing over a 20-year period is much larger than if the premium were higher. Second, investors need to use the lower equity premium when making plans. So, pension funds with their assumed market returns and individuals with their “when can I retire” spreadsheets have to assume equities will rise at about a nominal 6–7 percent a year (and a whole portfolio, including bonds, with costs, taxes, and inflation, will rise considerably less). It is inconsistent to believe that stock prices do not have to fall now (because people have learned to accept a lower equity risk premium) and still to use a 10+ percent a year return assumption.

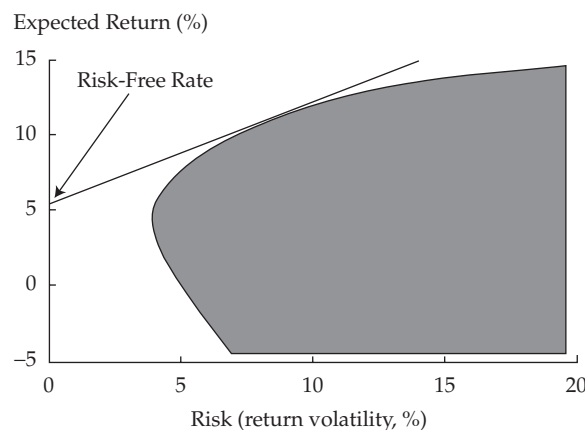
The question of whether high prices mean permanently low returns or near-term very bad returns followed by more historically normal results is one of the most crucial puzzles currently facing capital markets. Little can change the high probability that high prices lead to lower expected returns in the future, but the timing is very much up in the air.

## **Long-term investors should not be 100 percent in stocks**

*Take calculated risks. That is quite different from being rash.*

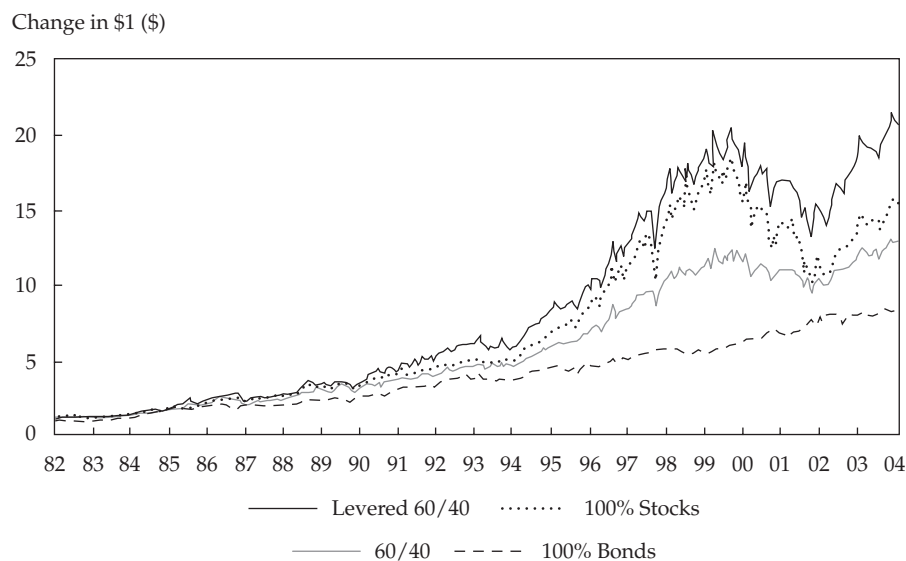
George S. Patton

A bit of conventional wisdom that was particularly rampant during the bubble days is that long-term investors should be 100 percent in equities. It is wrong. Recall from that first long-ago finance class the diagram in **Figure 2**. It illustrates the concept that under certain assumptions, all investors should own the same portfolio of risky assets and should lever that portfolio if they want more expected return for risk or add cash (delever it) if they want less risk (expected return). Forget the baggage of the capital asset pricing model that often comes with the diagram; the principle is more general. Subject to some real-world constraints (transaction costs, bankruptcy risk, etc.), investment decisions should clearly be made in two steps. First, find the best portfolio of risky assets (highest return per risk); then, lever or delever based on personal preferences for risk.

**Figure 2. Return vs. Risk Efficient Frontier**

Suppose an investor tried this approach with U.S. stocks and government bonds and ran the experiment through the recent bull market (1982–2004). **Figure 3** shows the growth of \$1 in four portfolios. In order of final finish, 100 percent equities is not the top finisher. The best portfolio is called “Levered 60/40,” and it is based on the realized prior 20-year volatility of the 60/40 stocks/bonds portfolio levered to a volatility equal to 100 percent stocks. Because the 60/40 portfolio unlevered is less volatile than 100 percent stocks, the Levered 60/40 portfolio involves borrowing and buying more of the 60/40 portfolio until it is as historically volatile as stocks. This portfolio wins by a healthy margin. Moreover, the worst periods—something to consider when examining any levered strategy, which by definition entails bankruptcy risk—are generally more benign for Levered 60/40 than for 100 percent equities.

On the one hand, this experiment is not entirely fair because I used a T-bill and no transaction costs to lever, which is clearly aggressive.<sup>6</sup> On the other hand, I considered only government bonds as the alternative to equities. Broadening the asset mix (to, e.g., corporate bonds, international assets, commodities) would

**Figure 3. Performance of Four Portfolios: Growth of \$1, 1982–2004**

strengthen the empirical results. Much of the bang from this analysis comes from the fact that, although bond returns have historically lagged stock returns, the reason is primarily that bonds are less volatile assets, not that they have far lower Sharpe ratios.

Constraints permitting, and with reasonable costs and a reasonable mix of assets, I doubt that even the most aggressive long-term investor would want to own a portfolio of 100 percent stocks; it forgoes the benefit of diversification, which increases risk-adjusted return.

## International diversification is not a waste of time

*You should always go to other people's funerals; otherwise, they won't come to yours.*

Yogi Berra<sup>7</sup>

A legion of academic and practitioner papers has questioned the diversification benefit of adding international equities to a U.S. equity portfolio. These authors usually make an argument like the following: The whole idea of diversifying is for downside protection, but the worst days, weeks, and months for international equities occur at similar times and magnitudes as they do for U.S. equities. So, why bother?<sup>8,9</sup>

Investors looking for international equities to protect them during a U.S. crash are indeed looking in the wrong place. But the diversification benefits of international equity investing should be judged over the same time frame as U.S. equity investing. Many fans of equity investing will tolerate nearly any amount of pain in the short term while preaching that we must keep our eyes on the long-term prize. But when they examine international diversification, they focus on how it works over days, weeks, or months. Not fair.

**Table 2** is from an analysis of international diversification over longer horizons from multiple countries' perspectives (Asness, Krail, and Liew, forthcoming). The table shows returns for worst 1-year, 5-year, and 10-year periods. For each country, we examined, from the home country's perspective, the home country's worst case and the worst case for a simple global portfolio that equally weighted the countries. From every country's perspective for each time horizon, worst-case returns for a simple global portfolio are better than for the home country. Furthermore, in most cases, they are materially better. The quintessential recent example is Japan. In the United States, many learned papers in the past 15 years have attacked the idea of diversifying internationally; in Japan, the papers are probably arguing the exact opposite. Unless one country is going to permanently outperform the other, both sets of papers cannot be right.

Table 2 is only a five-country example, the portfolios were not capitalization weighted, and the example does not deal with transaction costs and taxes, but the data are highly indicative. Theory and common sense both suggest that, with no systematic differences in expected returns, a more diversified portfolio is safer

**Table 2. Returns to International Investing, 1950–2004**

	Worst 1 Year		Worst 5 Years		Worst 10 Years	
	Home Country	Global Portfolio	Home Country	Global Portfolio	Home Country	Global Portfolio
Home Country						
Japan	–45.0%	–43.0%	–50.3%	–44.9%	–53.8%	–42.9%
Germany	–54.4	–42.6	–53.3	–46.2	–44.6	–35.5
United Kingdom	–60.8	–45.9	–65.7	–33.1	–61.3	–21.9
France	–53.0	–43.4	–52.9	–41.5	–57.9	–21.2
United States	–47.5	–45.4	–46.4	–37.7	–39.9	–11.3
Average	–52.1%	–44.1%	–53.7%	–40.7%	–51.5%	–26.5%
Average difference between Global and Home portfolios		8.0%		13.0%		25.0%

*Notes:* Returns are continuously compounded and inflation adjusted. Reported returns are not annualized. Differences are in percentage points.



than a less diversified portfolio. Unless you have a strongly held view that your country will deliver superior returns over the ensuing long term (and, please, if you believe it, do so for a better reason than “it has done better for a while”), the case for international diversification is rock solid.

## Dividends are good and for some surprising reasons

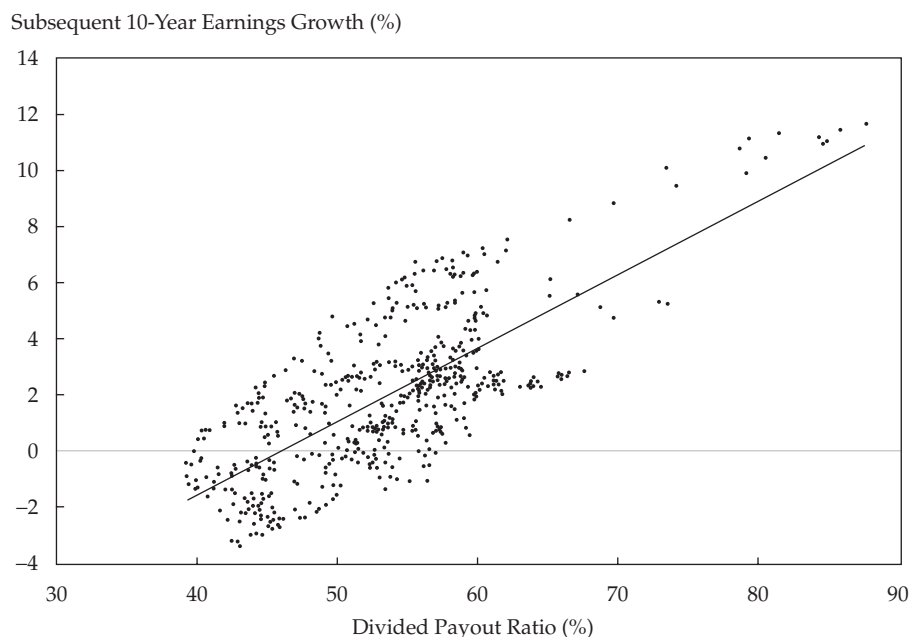
*How little you know about the age you live in if you think that honey is sweeter than cash in hand.*

Ovid

In the heyday of the bubble, companies were particularly reticent to pay dividends. In fact, paying dividends was in some ways a black mark. It said to the market that you had no confidence in your growth opportunities. Many authors (e.g., Arnott and Bernstein 2002) have pointed out the historical importance of dividends to the total long-term return on stocks. They cannot, however, prove that dividends are actually necessary. If companies pay less in dividends but reinvest the money prudently, investors are no worse off (and, considering the effect of taxes, perhaps better off) because lower dividend payments show up as higher earnings growth. This outcome fits common sense well and, although not a precise version, is much in the spirit of the Modigliani–Miller dividend irrelevance theorem. Long-term dividend irrelevance should be the “base case” theory. The “bubble case” theory would be the notion that (1) companies are so flush with growth opportunities that paying dividends would be crazy and (2) those not paying dividends will grow *more* than fast enough to make investors whole for the forgone dividends.

One way to examine the accuracy of these two theories is shown in **Figure 4**. The *x*-axis represents the starting dividend payout ratio (dividends paid divided by the previous year’s earnings) every rolling month for the S&P 500 for all post–World War II decades. The *y*-axis shows the subsequent 10-year earnings growth. According to the base case (dividend irrelevance), the line of best fit should be downward sloping; that is,

**Figure 4. Payout Ratios and Earnings Growth, 1946–2001**



Source: Modeled on Exhibit 2 from Arnott and Asness (2003), which built on work of Bernstein (1997a, 1997b).



as the company pays out fewer dividends, it should grow more. The line for the bubble case should be similar, although we would expect a more extreme downward slope as the forgone dividends did more than their share as reinvestment.

Well, the line is not downward sloping, certainly not sharply downward sloping; rather, it is clearly upward sloping. When companies collectively pay out more in dividends, their collective earnings tend to grow strongly faster over the next decade than when they pay out less.<sup>10</sup>

We do not know why this startling result exists. A working hypothesis involves how corporate managers behave and what they believe when paying or not paying large dividends. When companies pay out large dividends (relative to earnings), it may mean they are confident that the future will be bright (companies loathe cutting dividends, so they would not pay them if the future looked grim). Also, when companies pay large dividends, they are forced to be frugal in choosing investment projects (or ask the capital markets for more money when needed), so perhaps they then choose investments more wisely. Conversely, when companies pay out small dividends, they either may know they are running on fumes (as when earnings were inflated in 1999) or are engaged in “empire building” (that is, managers like to run big companies and may imprudently overinvest in bad projects when they have abundant reserves of company cash).

Thus, historically, dividends are not simply an important part of total stock returns; they are an important aspect of corporate governance. Not a bad combination.

### **Earnings do not grow at 10 percent a year**

*History is the version of past events people have decided to agree upon.*

Napoleon Bonaparte

During the bubble, the aggregate five-year earnings growth forecast from Wall Street analysts hit 15 percent a year for the S&P 500 and 30 percent a year for the NASDAQ 100 Index. Those figures exemplify the forecasting of growth above any possible reality. And it occurs often, albeit usually in milder form. Companies routinely claim they expect double-digit future growth, and commentators on cable business news will repeatedly state that 10 percent growth for the aggregate market is pretty much the norm.

Unfortunately, the past 75 years, a period marked by great performance of the U.S. economy and stock market, demonstrate that 10 percent is way too high. Realized EPS growth for S&P 500 stocks has been less than 2 percent above inflation for this period (see, e.g., Arnott and Bernstein; Ibbotson and Chen 2003). At the individual stock level, Chan, Karceski, and Lakonishok (2003) showed that despite analysts’ willingness to aggressively forecast the growth of individual companies, they are incredibly bad at forecasting the relative long-term (with long-term really being anywhere past a year out) growth of companies.

Some analysts accept the past data but predict a much brighter future. They have many reasons. One argument is that companies pay fewer dividends than they used to and thus will grow faster. As noted, this argument is historically backward. Another is that productivity growth is and will remain strong. If true, the outcome will be great for all our standards of living, but historically, productivity growth has benefited consumers, and perhaps labor, more than the owners of capital. The Internet boom is a perfect example: Prices went down dramatically for consumers, but profits were tiny.

Finally, we need to translate real EPS growth into nominal growth, which is what most people use in practice. If we take a forecast of 2 percent long-term real EPS growth and add it to an assumed steady 2–3 percent inflation from now on, we find that history favors a 4–5 percent long-term nominal EPS growth for the future. I bet Wall Street does not agree.





## The Fed Model must be fought

*A nickel isn't worth a dime today.*

Yogi Berra

The so-called Fed Model is a popular, simple, one-step model for valuing the stock market.<sup>11</sup> The Fed Model values the stock market by comparing the inverse of the P/E of the S&P 500, called the earnings yield or E/P, with the yield on the 10-year U.S. T-bond, Y. If  $E/P > Y$ , the stock market is deemed cheap; if  $E/P < Y$ , stocks are expensive;  $E/P = Y$  is considered the fair-value point.

The arguments in favor of the Fed Model generally follow one of two lines of reasoning. One is its apparent common sense: When stocks are paying more than bonds, stocks are cheap, and vice versa. The second is that, empirically, it “works.” **Figure 5** shows that the stock market’s E/P and the bond market’s Y have clearly moved together over time.

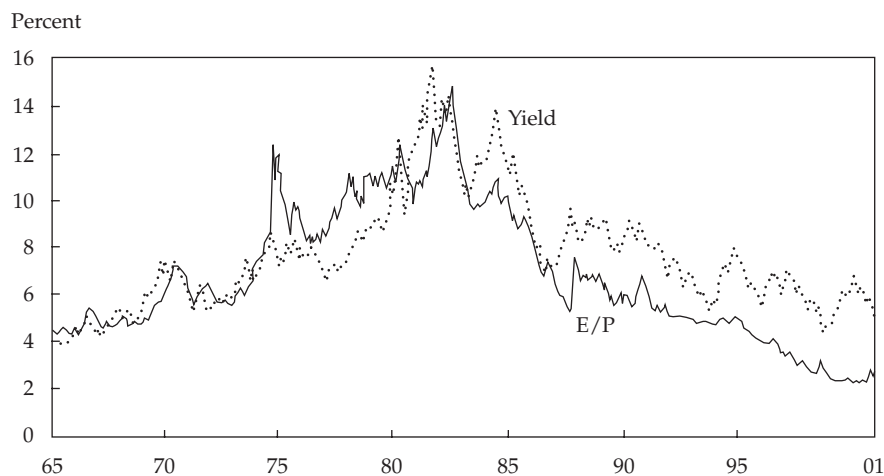
Neither of these lines of reasoning is valid. First, the Fed Model is not simply common sense. The fatal flaw in the Fed Model is the comparison of a real (invariant-to-inflation) quantity with a nominal quantity. This comparison is often called the “money illusion” and is certainly not common sense.<sup>12</sup>

Second, Figure 5 shows only that investors have used the Fed Model to price stocks for the past 40 years; it does not show that they were correct to do so. I believe they used the Fed Model in error and to their own detriment.<sup>13</sup>

So, the Fed Model is based on flawed logic. What happens when investors consistently use a model that is wrong? Well, consider **Figure 6**.

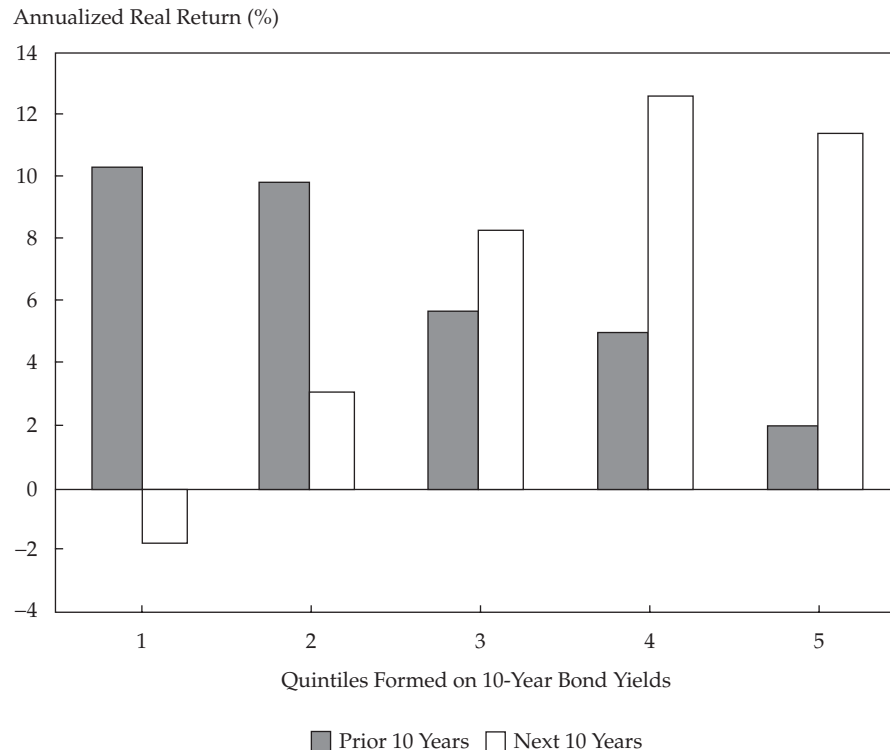
Figure 6, which draws on Asness (2003), shows each month from 1965 onward in one of five buckets based on the level of interest rates that month. So, Bucket 1 represents the months where Y ended in the bottom 1/5 of all months (very low interest rates), and Bucket 5, the top 1/5 (very high interest rates). The dark bars represent the average real return of the stock market for the prior 10 years before the month in question. The result is the stuff of Fed Modeler dreams. When interest rates were low, the stock market, on average, performed phenomenally (more than 10 percent above inflation). This relationship is monotonically declining, ending in a paltry average real return of 2 percent when interest rates were at their highest. There is only one small problem: The dark bars are 10-year periods ending in either low or high interest rates. The white bars represent average real returns over the *next* 10 years. They are completely backward from a Fed Model perspective. Future real returns rise as interest rates increase. The average real return on the S&P 500 when starting from the lowest interest rates is actually negative. Looking forward, the best time to buy stocks is actually when interest rates are high. It is, if you will, an Anti-Fed Model.

**Figure 5. Earnings/Price vs. Yield, 1965–2001**



Source: Modeled on Exhibit 1 in Asness (2003).

**Figure 6. Annualized Real Returns to Stock Portfolios Based on 10-Year Bond Yields, 1965–2001**



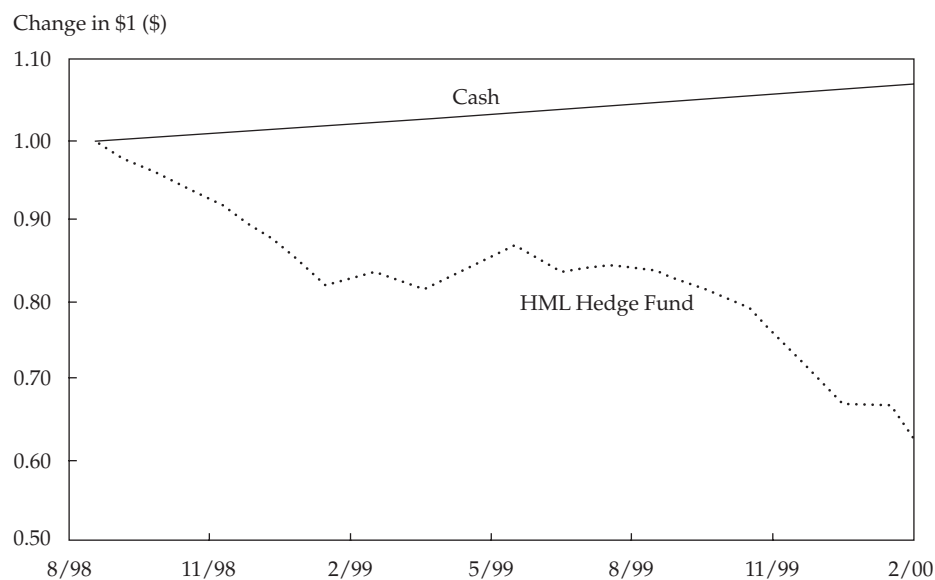
The reason is really simple. Investors have indeed historically (since 1965 or so) used the Fed Model to price stocks, but again, they have been wrong to do so. The dark bars work so nicely because when interest rates are low (high), investors are currently paying an inflated (depressed) P/E for stocks based on their Fed Model, so it is a good (bad) time to *have* owned stocks for the last 10 years. By the same token, these inflated prices mean it is a bad (good) time to own them for the *next* 10 years. It is not the interest rates that are actually relevant; rather, it is the P/E on the stock market that comes along with high or low rates. The Fed Model is useful only for explaining the error that investors rather consistently seem to make when pricing stocks, not for justifying that error.<sup>14</sup> It is very strange to see investors consistently making an error and then recommending that error to future investors on precedent—which is precisely what strategists advocating the Fed Model are doing.<sup>15</sup>

## Value wins in the long term

*Let us be thankful for the fools. But for them the rest of us could not succeed.*<sup>16</sup>

Mark Twain

Before the bubble, value investing, the idea of buying out-of-favor stocks at low prices and shunning glamorous stocks at high prices, was favored by many academics and perfectly respectable on Wall Street (Graham and Dodd 1934). Then, the logic of the bubble said value investing “does not work anymore.” This logic appeared to be right for a while. **Figure 7** illustrates the poor performance of one well-known version of a value strategy during the bubble period. HML stands for “high book-to-market stock minus low book-to-market stock.” The solid line is the growth of a dollar invested in cash, and the dotted line is the growth of a dollar invested in cash plus the HML excess return during the bubble. This investment is called the

**Figure 7. Bubble Performance of a Value Strategy, August 1998–2000**

Note: Returns are gross of transaction costs and fees.

Source: Returns are from Kenneth French's website, available at [mba.tuck.dartmouth.edu/pages/faculty/ken.french/](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/).

"HML Hedge Fund" because it is the gross return on a hedge fund that went long the H stocks and short the L stocks (so, during the bubble, it was long a lot of "old economy" stocks and short a lot of "new economy," technology, stocks).

The total gross return on this normally well-behaved value strategy was a devastating –41 percent (nearly 50 percent below the cash return) and with few up months to give the manager and clients hope—not a situation even the most stoic long-term investor found easy to tolerate.

Value proponents at the time could respond with a graph like that shown in **Figure 8**, in which the period begins in 1926. Their argument was that value had a long history of producing positive returns and the then-recent poor returns were just a blip.

Of course, during the bubble, such protestations were dismissed as theoretical, visionless, and (most damning) "driving by looking through the rear-view mirror" because, obviously, the giant dip at the end of the period was not an aberration but the new economy taking over forever.

**Figure 9**, which extends Figure 8 through the present, speaks for itself. After a brief departure (brief from a historical, not a personal, perspective; living through it took eons), value is back on trend. The view in the now-*schadenfreude*-tinted rear-view mirror once again looks quite scenic.

### **"Arbitrage" has real limits; everyone votes on stock prices**

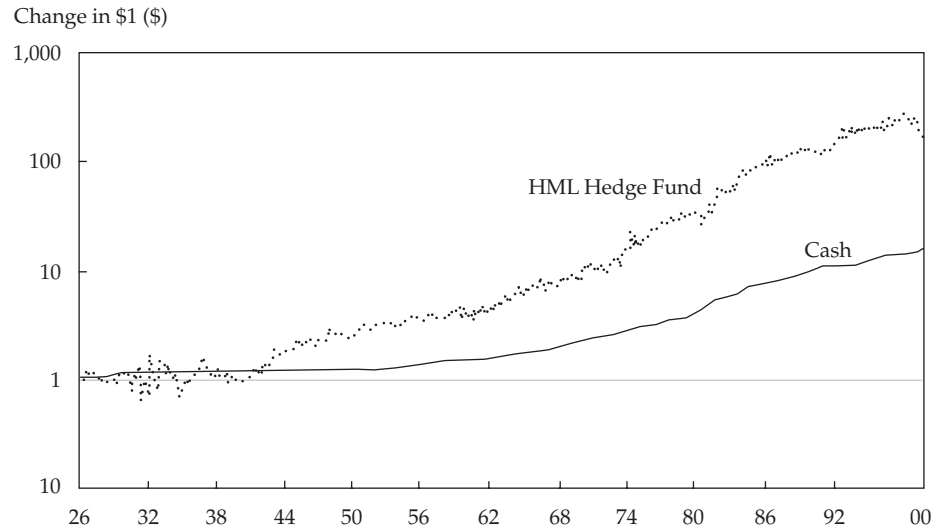
*It has been said that democracy is the worst form of government except all the others that have been tried.*

Sir Winston Churchill

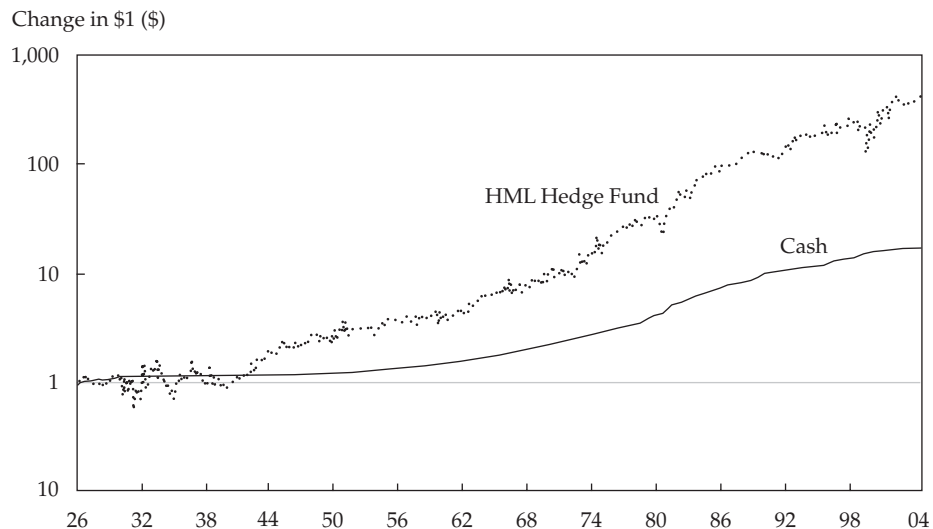
How many have thought something like the following? "It does not matter if a few, or even many, fools exist; market prices will still be accurate if there are rational arbitrageurs out there"? I did, and it is not true. Shleifer and Vishny (1997), who used the term "the limits of arbitrage," showed that even a sure thing is not a sure thing if one faces any form of bankruptcy risk (e.g., the risk in 2000 that a value manager would go



**Figure 8. To-Date Performance of a Value Strategy, 1926–2000**  
(log scale)



**Figure 9. Long-Term Performance of a Value Strategy, 1926–2004**  
(log scale)



out of business before the investor could be proven right). More recently, Fama and French (2004) showed us formally that unless the stupid and misinformed exactly cancel each other out (i.e., for every stupid person overpricing something there is one underpricing it), their net views will be reflected in prices. The Fama–French idea is similar in spirit to the work of Shleifer and Vishny. It recognizes that the “rational arbitrageur” does not find sure things but simply good bets when someone else is being stupid. And every good bet still has risk. Thus, rational arbitrageurs will *reduce* mispricing—but not enough to drive prices back to fully rational levels, because doing so would be too little gain for too much risk.



In the Bubble Logic of 1999–2000, many investors thought the market could not be wrong, so (as a tautology) prices must be rational and perhaps “the market” was seeing something all of us could not see. If the foolish all get a vote, however, and have an impact on final prices, then at times, more fools are more foolish than normal—and the result could be a bubble.

## Wall Street and the media are not looking out for you

*I don't want any yes-men around me. I want everybody to tell me the truth even if it costs them their jobs.*

Samuel Goldwyn

From the perspective of post-bubble 2005 after the many scandals, the observation that Wall Street is not looking out for you should be less than Earth shattering. Still, the idea of benevolent rock-star analysts and strategists dispensing sage and useful advice to investors was an important part of the bubble.

Wall Street exists largely to sell stocks and bonds and to broker stock and bond transactions in both directions, not to make intellectually honest arguments. Similarly, the media exist to sell media. Speaking the truth may or may not be in both of their long-term interests, but investors must recognize that it is not always done. Most importantly, both groups do far better in a bull than in a bear market, and both behaved poorly during the bubble.

Of course, some strategists spoke their bearish minds, and some analysts said “sell” before it became fashionable, and some clear-headed members of the media bored their editors by not going for the hype. But these laudatory examples were simply the occasional exceptions that proved the overwhelming rule.<sup>17</sup>

The very idea of Wall Street making impartial recommendations about its own products is a strange one. Imagine a General Motors “transportation strategist” telling consumers, “We kind of like cars in here, maybe some light trucks in a portfolio context . . .” Similarly, a large part of Wall Street’s business is selling *new and used* stocks and bonds, which strangely they do make recommendations about.

Moreover, stock returns are basically unforecastable in the short run, and in the long run, only valuation works, which is just bad TV. Imagine a Wall Street guru saying, “Stocks will return an expected 6–7 percent over the long haul, but frankly, we, and everyone else, have no idea what will happen in the next few weeks or months or even years.” Now, think of it repeated every day. Not only is it not bullish; what is worse, it is boring! The long-term story is boring precisely because, as a long-term story, it appropriately changes quite slowly. So, both the bullish bias and the bias toward avoiding the boring are working against the consumer here, and it is unlikely that Wall Street’s peculiar practice of recommending its own products, with ever-evolving rationales, will soon change.<sup>18</sup>

## You cannot trust Wall Street to compare apples to apples

*“I'd say he's done more than that.” When asked if first baseman Don Mattingly had exceeded expectations for the current season.*

Yogi Berra

The bubble saw the rise of the concept of *pro forma* analysis. Since then, *pro forma* has been ridiculed by legions of open-eyed commentators, but sadly, it does not die. In concept, there is nothing wrong with looking at a company’s earnings excluding something that is, in the analyst’s opinion, truly nonrecurring. Companies themselves decide what to do in their *pro forma* statements, however, and sell-side analysts (although perhaps not the lapdogs of 1999) usually follow the companies’ choices. And firms that gather and report earnings use what the majority of these analysts decide they should use. It is a scary system.

For a common form of *pro forma* abuse (see Asness and Casscells, forthcoming), consider the following typical statement among sell-side strategists: “We calculate the current P/E of the S&P 500 to be about 16 [or some other close-by number]. This is right in the range of historical average P/Es, so the market’s valuation is on sure footing.” The tricky part is that when an analyst calls a P/E of 16 about average, the analyst is usually calculating the current P/E for the S&P 500 from “forecasted” “operating” earnings. Both



words are dangerous. “Forecasted” generally means “higher than today and probably higher than what will really occur tomorrow,” and “operating” is a form of *pro forma* calculation that throws out bad things. Operating P/Es are almost always lower than trailing GAAP P/Es, and the historical evidence about long-term average P/Es comes mainly from trailing GAAP numbers. In fact, our history of forecasted operating P/Es (from 1976 on) shows that, on average, they are about 25 percent less than trailing P/Es—thus averaging about 12. Moreover, the period from 1976 to today is still, net, a period of expensive stock prices, so the true long-term average of forecasted *pro forma* P/Es is probably even lower than 12. Thus, analysts should not compare today’s forecasted operating P/Es of around 16 with the historical average of GAAP trailing P/Es and declare current prices average; they should compare the forecasted P/Es with the much lower historical average of similar forecasted operating P/Es and should note that stocks are still quite expensive.

Finally, I will note one good use of *pro forma*. I am *pro forma* 6’ 2” tall and have all my hair. Sadly, my wife is a stickler for GAAP.

### Options issuance is an expense

*A lie told often enough becomes the truth.*

Vladimir Ilyich Lenin

For years, by winning a calculated campaign of lobbying in favor of misinformation, companies have avoided expensing their stock option grants by relegating these expenses to footnotes. I have reviewed already the many arguments for expensing options and refuted the many illogical arguments to the contrary (Asness 2004). Those who argue (generally for self-serving purposes) that corporate managers should be allowed to give themselves companies without even recording the cost should be ashamed of themselves.

Option expensing seems to be on the way to becoming mandatory. I will believe it when it is a fact, because many vested, venal, and vengeful interests are against it.<sup>19</sup> Of course, when option expensing becomes mandatory, we will probably soon afterward have a new entry into the *pro forma* sweepstakes as many companies choose to report *pro forma* earnings that delete the very real expense of options.<sup>20</sup>

### Timing the market is not all bad

*The generation of random numbers is too important to be left to chance.*

Robert R. Coveyou

Oak Ridge National Laboratory

During the heyday of the bubble, Wall Street had a particularly schizophrenic relationship with the strategy based on short-term forecasting called “market timing.” On the one hand, a substantial amount of the bubble was built on short-horizon investing in general. An obvious example is the rise of the day trader. A more subtle example is Wall Street strategists at the time touting their “year-end price target” for the S&P 500. They might not have called this practice “timing,” but if acting on a short-term forecast is not timing, what is it?<sup>21</sup> Of course, when investors even considered *selling* their stocks, they would be treated to a lengthy discourse on Wall Street conventional wisdom (this time mostly from the buy side) that market timing is an investing sin.

My comments in this section will also be schizophrenic. I strongly agree with the general recommendation not to regularly engage in short-term market timing, but I take serious issue with the idea that you should never engage in *long-term* timing because such a policy aids and abets bubbles. And I take serious issue with Wall Street’s favorite antitiming argument.

First, let me say that 99 times out of 100, “avoid market timing” is a good piece of advice. The transaction costs, tax effects, and general unpredictability of the market—all make timing a dicey proposition.

However, what Wall Street is often really saying is, “Ignore the price of what I am selling you.” Wall Street is in the business of selling you stocks and does not want you leaving the market. Now, if a salesperson of any other purchase told you to ignore the price because “it will all work out over the very long run,” you would run clutching your wallet. In particular, to bolster its antitiming case, Wall Street often uses the evidence of how much return you can miss by being out of the market for just a little while. But amazingly,



the same people completely leave out the almost symmetrical upside if you are right. Of course, a short-term bet has a downside, but it also has an upside! So, although perhaps usually good advice, “do not try to time the market” cannot mean ignore price entirely, and it cannot be based on looking only at the negative possible outcomes. If being price sensitive means timing the market but timing the market is a cardinal sin, then prices have no anchor to reality. Thus, although I agree that short-term market timing is almost always a bad idea, changing your exposure to the stock market based on current prices with a long horizon in mind, and perhaps acting only at extremes, seems like a form of market timing that would be beneficial to those willing to follow such a strategy and to healthy markets in general.

### **The general public is full of bored, innumerate gamblers<sup>22</sup>**

*After years of disappointment with get-rich-quick schemes, I know I'm gonna get rich with this scheme . . . and quick!*

Homer Simpson

Many people are natural gamblers; they like to be entertained and are not good at math. For example, many people like lotteries (Statman 2002)—which are entertaining games that have negative expected returns and offer the small chance of a huge payoff. Many people like the casino's video poker game. It has fun flashing lights, and as with lotteries, the player loses on average (and certainly if the game is played long enough) but over short intervals, can win for a while. In both these cases, presumably even the most innumerate player knows that the enterprise is a negative-expected-value game (although they might not put it that way).

Now, consider on-line trading, particularly during the bubble. It is obviously a ton of fun, and it was clearly sold as a positive-expected-return game with huge positive skewness (remember those truck drivers in the commercials with their own private islands). What if Las Vegas could follow this strategy—could convince their video poker players that they would actually win on average and win more the longer they played? You would have to pry the players out of their seats with the Jaws of Life!

The nature of these bored, mathematically challenged investors relates to the lessons of the rubble because, as discussed earlier, they all get a vote on stock prices. Many people still see the stock market as entertainment, a chance to get rich quick, or both, and many are still doing the math wrong.

### **Do-it-yourself trading is a bad idea**

*If at first you don't succeed, failure may be your style.*

Quentin Crisp

Countless exhortations can be heard (they were particularly prevalent during the bubble but are still very much in vogue) to individuals to “take control” of their own financial future by making their own trades and investments (usually online). A typical exhortation is, “Yes, you can!” when it comes to managing your own active investment portfolio. I am here to tell you, “No, you can't!”

Forget the prior section's misanthropy, which, if accurate, calls attention to an obvious hurdle (the average person's innumeracy and gambling problem). There is simply massive evidence that professional full-time active managers with degrees in this field have great difficulty beating low-cost index funds. Yes, perhaps the professionals have some biases, constraints, and distractions, and perhaps a smart person dedicated full-time to active management of his or her own money might clobber the indices. As down-home, golly gee nice as it sounds, it is not likely.

Consider these common exhortations: “With as little as one hour a week of homework, you can pick great stocks!” Or “You should just buy what you know”—implying that your common sense is better than the efforts of highly motivated professionals. You cannot pick great stocks this way, and your common sense is not better. You can trade your own stocks to entertain yourself—and to hope for the big payoff. And just like such entertainment and hope at Las Vegas, it has a cost.



## Have we collectively “learned” these lessons?

*Thank you for sending me a copy of your book. I'll waste no time reading it.*

Moses Hadas

Despite many negative signs, I see some positive portents that we have learned many of the lessons of the bubble. The idea that long-term returns from here will be low has certainly gained traction. The stock market return forecasts of Wall Street strategists are still higher than what is likely to occur, but they have come way down from their former steady median forecasts of 15 percent a year. Most importantly, prices are now only high versus history, not insane.

However, all is not rosy. The debate on Social Security offers an interesting window into whether we have learned to avoid thinking in Bubble Logic. A crucial issue in this debate involves investing Social Security funds in the stock market, either through private accounts or directly by the government. Casual study of the widespread arguments in favor of such a policy reveals the following Bubble Logic:

- quoting long-term historical stock returns to determine the expected stock return for today's Social Security investor (i.e., ignoring current valuation);
- noting that investors have never lost in stocks if held for long periods, such as 20 years (i.e., ignoring that at a lower risk premium, stocks will lose with much higher probability in the future, even over the long term);
- most egregiously, acting as if we all, collectively, even had the option of investing *more* retirement money in stocks. We do not. In the short term, we cannot collectively move \$1 net into stocks because we can only buy them from someone else, presumably someone saving for her or his retirement, so we cannot all invest more in stocks. All we can do is force prices higher and the long-term risk premium even lower.<sup>23</sup>

If at any point I had felt that the need for this retrospective article had faded with the receding of the bubble, the Social Security debate, with its mix of old and new Bubble Logic, has rejuvenated me.

## Some constructive advice

*Investing is simple, but not easy.*

Warren Buffett

Despite all the criticism I have leveled at our collective understanding, we basically know how to invest. A good analogy is to dieting and diet books. We all know how to lose weight and get in better shape: Eat less and exercise more. But as Warren Buffett would say, that is simple—but not easy. Investing is no different.

Some simple, but not easy, advice for good investing and financial planning in general includes

- diversify widely,
- keep costs low,
- rebalance in a disciplined fashion,
- spend less,
- save more,
- make less heroic assumptions about future returns,
- when something sounds like a free lunch, assume it is not free unless very convincing arguments are made—and then check again,
- stop watching the stock markets as if they were on ESPN, and
- work less on investing, not more (after finishing this article, of course).

Perhaps the most important advice, in true Hippocratic fashion, is: Do No Harm! You do not need a magic bullet. Little can change the fact that current expected returns on a broad set of asset classes are low versus history, and explicitly or implicitly “levering up” low expected returns to make them high is not usually a great idea. Stick to the basics with discipline, and ignore Bubble Logic.





## Conclusion

*Speak the truth, but leave immediately after.*

Slovenian Proverb

The stock market is quite wonderful. It is a long-term wealth creator and democratizer. It is a bringer of economic efficiency, and aside from bubble times, it prices things far more accurately than any other system yet devised. Furthermore, stock prices, although not “rubble” or even down to long-term averages, are indeed far more reasonable today than when they were a true bubble back in 1999–2000. Clearly, whether the lessons of Bubble Logic have been learned sufficiently or not, they are far closer to being learned today than a few years ago. Expected returns to investors following “simple but not easy” investing are positive, and although returns are low historically, they are still reasonable. My message, if not optimistic, is not nearly as deeply pessimistic as it was five years ago.

As cynical as I have been about “strategists” and “analysts” and salespeople of many stripes, this criticism is also, almost by definition, a statement of the importance of these people doing their jobs well in a free capitalist society. We have certainly seen what happens when they do it poorly. The societal importance of careers in finance is often downplayed in comparison with the many other paths that more obviously and directly aid people. Perhaps that view is justified by how Wall Street has performed to date, but if the investment manager and the analyst do their jobs well, they provide good advice and accurate pricing—which are exceptionally important and something to be proud of because capitalism depends on them and freedom and abundance depend on capitalism. Good advice and accurate pricing are certainly too important to be left to Bubble Logic.<sup>24</sup>

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*Those who were kind enough to give me comments on this work are too numerous to mention by name; I thank them all. Also, I would like to thank my wife, Laurel; my partners, David Kabiller, Bob Krail, and John Liew; and Brad Asness—not simply for their comments but for listening to me rant and rave through much of the bubble and its aftermath, which was the catalyst for this article and its unpublished predecessor. Finally, of course, I would like to thank Al Gore, without whom there would be no Internet and, possibly, no Great Stock Market Bubble of 1999–2000 about which to write.*

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## Notes

1. In fact, given that the original “Bubble Logic” was never formally published, I am going to feel free to plagiarize my own work and use some parts of the original here. This plagiarism concerns me a bit as, frankly, I fear I may be litigious.
2. Some argue that using past 10-year average earnings may be inferior to using more current measures, such as trailing 1-year earnings or Wall Street forecasts of future earnings. Each method has obvious advantages and disadvantages. (I focus on Wall Street forecasts later.) The 1-year measure is more timely, but it may include many transient components that could render P/Es calculated from the earnings less meaningful. The earnings crash of 2001–2002 is an example. The 10-year measure is more dated but smooths the transients. In simple tests of the ability of each measure to forecast future (10 and 20 years forward) total earnings, the 10-year method of Shiller was a clear victor (these tests are available from the author).
3. Table 1 is impressive, but it suffers from some statistical weaknesses. We do not have many independent 10-year periods to observe, and the results have been strengthened by an in-sample bias, in that starting price is used to sort in-sample returns.
4. Some people criticize arguments like that implied by Table 1 by pointing to historical cases of stocks delivering attractive returns, even for a decade, when starting out at high prices. Even the best cases, however, generally decline as starting price rises. When prices are high, average future real returns are low; worst cases are much worse, and best cases are weaker, although not nonexistent. I am not claiming that valuation is a near-perfect forecaster. Rather, in 10-year regressions, it seems to forecast 30–40 percent of the variance of future stock returns. It will not always work over the next decade (nothing does), but to dismiss valuation as irrelevant when it gets a decade wrong is quite silly.
5. Actually, intellectual honesty demands that we review a third possibility—that higher valuation levels signal permanently higher levels of expected earnings and dividend growth and thus no lower expected returns in the short or long term. This future is supported by almost zero evidence in the data but cannot be ruled out as a possibility.
6. I am also being a little tricky in my choice of time period because 1982–2004 was not only a bull market for stocks but also a massive bull market for bonds. I have shown elsewhere (Asness 1996) that this section’s findings are general.



7. Disclaimer: I have not exhaustively checked whether my Yogi Berra quotations are truly his or merely attributed to him. I'll let Yogi explain with his purported comment "I really didn't say everything I said."
8. A much sillier argument, which was especially popular in the bubble, goes: U.S. equities have outperformed international equities for the past 5–10 years or so, so why bother? This argument propounds momentum investing pure and simple. U.S. equity has done better than international portfolios largely as a result of decades of upward revaluation. Forecasting more of the same kind of outperformance as when valuation changes were driving the outperformance is not only wrong; it is probably backwards.
9. Another version of this argument notes that correlations between countries go up during bear markets. This observation is accurate, but the more relevant problem is that all markets seem to go down at the same time.
10. Arnott and Asness (2003) conducted a bevy of robustness checks, in all of which, this result survived unscathed.
11. The Federal Reserve Board itself actually shows no tendency to favor the Fed Model; it is mentioned in obscure minutes of meetings and testimony along with many other models and hypotheses. Chairman Alan Greenspan has made several comments on the illusion underlying the Fed Model. Nevertheless, the name "Fed Model" wrongly implies a certain stamp of approval on this flawed metric.
12. The money illusion was perhaps first noted in this context by Modigliani and Cohn (1979).
13. As shown in Asness (2000b, 2003), the simple relationship between  $E/P$  and  $Y$  breaks down if extended back in time prior to 1965 but can be resuscitated if relative perceptions of stock and bond market risks are accounted for in the model. For a full discussion of flaws in the Fed Model, see Asness (2003).
14. In its role of explaining investor behavior, the Fed Model may be useful for the intrepid tactical asset allocator, but that short-term horizon is very different from the long-term horizon discussed here.
15. Many investors and analysts make the same error by using the venerable dividend discount model to value stocks. In a typical DDM, the analyst or strategist forecasts the future cash flows to a stock or the stock market, then discounts these cash flows back at some rate (often a U.S. Treasury rate plus a risk premium). When interest rates fall, the DDM's user often lowers the discount rate but *not* the forecast of future cash flows; thus, the user finds that the stock or stock market should rise in value. This approach is the same error made by the Fed Model, and those who use DDMs this way are subject to the same long-term consequences of grossly overpaying (underpaying) for stocks when interest rates are low (high). Similar logic is being applied to real estate investments, where the idea that low inflation/interest rates support a bullish real estate market is currently ubiquitous. This idea has to be wrong. Although real estate may appear more affordable when interest rates are low (because monthly payments are low), so, presumably, is average nominal income growth (the analogy to slower nominal corporate earnings growth in the Fed Model). More generally, how can a "real" asset (in both the literal sense and the sense of an asset that is an inflation hedge) change in fundamental value when only nominal, not real, interest rates change? Perhaps the next paper should be on the real estate bubble and the logic that powers it; the parallels are apt (and the five-year follow-up using the term "rubble" might be more literal).
16. I apologize to all my efficient market friends for the blatant behavioral bias implied in this quotation.
17. During the bubble, a queue formed of courageously bearish strategists and analysts who decided to "retire," often with the stated purpose of "spending more time with my family." They were replaced with happier, more bullish prognosticators—many of whom also discovered, in the bear market, that their families needed their attention.
18. I am not making a plea for regulation; everyone should have the right to his or her opinion. As a believer in caveat emptor, I would simply like to see the emptors start caveating more.
19. In fact, as this article is being prepared, the U.S. SEC is proposing, at industry request, to put off by another six months the requirement to expense. The reasons they give amount to "the dog ate my Black-Scholes spreadsheet" and make for some very sad reading.
20. One of the more amusing current financial stories is about companies changing their option policy now that options soon must be expensed. The reason many are giving is that they can no longer afford options. Let me be very clear: *Options were always and will always be expenses*. They are no more or less affordable now than before. What these companies mean is that they will not be able to lie about the expenses by hiding them in the footnotes.
21. There is nothing necessarily wrong with being short term. Short-term strategies, short-term momentum strategies in particular, might have validity (see, for instance, Jegadeesh and Titman 1993; Asness 1999). However, these strategies are probably not applicable to the average investor.
22. AQR Capital Management, LLC, would like to reemphasize that the views and opinions expressed herein are those of the author and do not necessarily reflect the views of AQR, its affiliates, or its employees. Should Cliff run for office one day, he intends to deny that this section exists.
23. In the long term, we can move more money into stocks because more stocks can be created. This process can have some positive effects (one person's expected return is another's cost of capital), but taken to excess, it encourages the creation of dicey ventures—as we certainly saw during the bubble.
24. Finally, by way of apology for all the quotations, here is one about me: "He wrapped himself in quotations—as a beggar would enfold himself in the purple of Emperors"—Rudyard Kipling.



## References

Arnott, Robert D., and Clifford S. Asness. 2003. "Surprise! Higher Dividends = Higher Earnings Growth." *Financial Analysts Journal*, vol. 59, no. 1 (January/February):70–87.

Arnott, Robert D., and Peter L. Bernstein. 2002. "What Risk Premium Is 'Normal'?" *Financial Analysts Journal*, vol. 58, no. 2 (March/April):64–85.

Asness, Clifford. 1996. "Why Not 100% Equities." *Journal of Portfolio Management* (Winter):29–34.

———. 1999. "The Power of Past Stock Returns." Working paper, AQR Capital Management.

———. 2000a. "Bubble Logic or How to Learn to Stop Worrying and Love the Bull." Unpublished manuscript, AQR Capital Management (June).

———. 2000b. "Stocks vs. Bonds: Explaining the Equity Risk Premium." *Financial Analysts Journal*, vol. 56, no. 2 (March/April):96–113.

———. 2003. "Fight the Fed Model." *Journal of Portfolio Management*, vol. 30, no. 1 (Fall):11–24.

———. 2004. "Stock Options and the Lying Liars Who Don't Want to Expense Them." *Financial Analysts Journal*, vol. 60, no. 4 (July/August):9–14.

Asness, Clifford, and Anne Casscells. Forthcoming. "Comparing Apples to Apples, the Stock Market Is Expensive." Working paper, AQR Capital Management.

Asness, Clifford, Robert Krail, and John Liew. Forthcoming. "International Diversification: Have We Missed the Forest through the Trees?" Working paper, AQR Capital Management.

Bernstein, Peter L. 1997a. "Stock/Bond Risk Perceptions and Expected Returns." In *Economics & Portfolio Strategy*, Peter L. Bernstein, Inc. (1 February).

———. 1997b. "Payouts and Payoffs and an Interesting Erratum." In *Economics & Portfolio Strategy*, Peter L. Bernstein, Inc. (15 March).

Carhart, Mark M. 1997. "On Persistence in Mutual Fund Performance." *Journal of Finance*, vol. 52, no. 1 (March):57–82.

Chan, L., J. Karceski, and J. Lakonishok. 2003. "The Level and Persistence of Growth Rates." *Journal of Finance*, vol. 58, no. 2 (April):634–684.

Fama, Eugene E., and Kenneth R. French. 2004. "Disagreement, Tastes, and Asset Prices." Working Paper No. 2004–03, Tuck Business School.

Graham, Benjamin, and David Dodd. *Security Analysis*. New York: McGraw-Hill (also see later editions).

Ibbotson, Roger G., and Peng Chen. 2003. "Long-Run Stock Returns: Participating in the Real Economy." *Financial Analysts Journal*, vol. 59, no. 1 (January/February):88–98.

Jegadeesh, Narasimhan, and Sheridan Titman. 1993. "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency." *Journal of Finance*, vol. 48, no. 1 (March):65–91.

Modigliani, F., and R. Cohn. 1979. "Inflation, Rational Valuation and the Market." *Financial Analysts Journal*, vol. 35, no. 2 (March/April):24–44.

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

Shleifer, Andrei, and Robert W. Vishny. 1997. "The Limits of Arbitrage." *Journal of Finance*, vol. 52, no. 1 (March):35–55.

Statman, Meir. 2002. "Lottery Players/Stock Traders." *Financial Analysts Journal*, vol. 58, no. 1 (January/February):14–21.

## ADVERTISEMENT