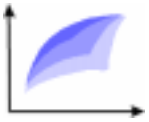
Efficient Frontier



An Online Journal of Practical Asset Allocation

Edited by William J. Bernstein
and Susan F. Sharin

Spring 2002

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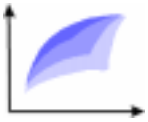


William J. Bernstein

Only Two Centuries of Data

We tend to think of the modern securities market as a wondrous newfangled machine, but in fact there's nothing new under the sun: There are nearly continuous records of bond prices in Europe going back to the 13th century, and stock prices have been quoted in France for well over 500 years.

What *is* new is our knowledge of the long-term returns of stock and bond *markets*. Not until Alfred Cowles III became interested in the topic in the wake of the 1929 crash was any light shone on the fortunes of capital-markets participants. What's truly curious is that the most detailed data comes from the U.S. market. After all, by the year 1792 when the famous agreement was signed under a buttonwood tree in lower Manhattan, there were already well-established bourses in London, Paris, Amsterdam, and the Hanseatic cities. The U.S. was a small and shaky, if glamorous, sideshow whose very existence was in doubt, and its markets were tiny compared to those in Europe. So it comes as a bit of a surprise that the longest and most solid returns series on stocks and bonds date nearly from the Buttonwood Agreement, whereas high-quality European data are almost impossible to come by before 1920.

Let's look at the returns of stocks and bonds in the 19th and 20th centuries. I've tabulated them both before and after inflation, mainly from Jeremy Siegel's database.

Before Inflation	1801-1900	1901-2000
Stocks	6.51%	9.89%
Bonds	4.99%	4.85%

After Inflation	1801-1900	1901-2000
Stocks	6.76%	6.45%
Bonds	5.23%	1.57%

Since investors eat real returns, it makes sense to focus on the bottom table. Notice how real stock returns have not changed that much, whereas real bond returns, while giving stocks a run for their money in the 19th century, lagged badly in the 20th century.

Modern investors tend to focus on the 20th century data, showing that stocks return almost 5% more per year than bonds, and ignore the more equivocal message of the 19th century. But it is not at all obvious that the older data are less relevant. Which do we believe? In the famous words of Paul Samuelson, "We have but one sample of history." And that sample contains only two centuries.

Which century we rely on is critical. If we believe the 5% margin of stocks over bonds in the 20th century, then stocks are a nearly riskless investment in the long term, because over long time periods, risk and return are the same. I discuss this phenomenon in "When Risk and Return Become the Same" also in this quarter's issue, but here's the short version: Stock enthusiasts are fond of pointing out that there are no 30-year periods when stocks returned less than bonds and that stocks are therefore less risky than bonds. But this is simply an artifact of their higher returns. If the 19th century data are relevant, then stocks clearly are riskier than bonds.

Which century is the anomaly: the 19th or 20th? I believe that flesh-and-blood historical analysis usually trumps statistical rigor. Let's transport ourselves 100 years back to the *fin de siècle*. The most noticeable financial fact of life you observe is that no one seems very concerned about inflation. Since 1800, inflation has actually been *negative*; a suit, pound of beef, or trip to the neighboring state actually costs *less* in nominal terms—the actual number of dollars—than it did in 1800! Even the medieval scholar, who may have been aware of the inflationary 13th or early 17th centuries, would reassure us that he could find no evidence of sustained average price rises in excess of one percent per year. After all, in 1900, as throughout almost all of recorded history, hard gold and silver *were* money.

So, in 1900, the 5% yield on high-quality bonds is awfully attractive. As far as anyone knows, this is a *real* yield. Stocks? They too yield 5%, but are fraught with risk. You perform a rigorous study of stock dividends over the past 30 years and discover that yields have hardly grown at all!

Assured of the better risk-adjusted expected return of fixed-income vehicles, you purchase your bonds, clip your coupons, and wait for the time machine to reappear and rescue you from the vicissitudes of unbridled capitalism and bad coffee. But it never comes. What does arrive, unfortunately, is the inflation wrought by two world wars, the death of the gold standard, and fiat money (even worse than the Fiat automobile). Suddenly, your bond coupons, which don't appreciate with inflation, aren't worth what you thought they'd be. After 100 years, the dollar has devalued by 95%, devastating bond returns. Stocks, on the other hand, have weathered the inflationary storm surprisingly well, since corporations were able to increase their revenues by raising prices. Your smarter and luckier cousin, who bought stocks, finds that for every dollar of dividends he collected in 1900 he now collects $70!

The net result of all this is that during the 20th century, bond prices got revalued

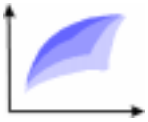
downward, as investors discovered that they were vulnerable to this new economic scourge, and stock prices were revalued upward, as investors discovered that they were relatively protected from fiat money.

With hindsight we can see that the 5% stock-bond return gap in the 20th century was the result of a totally unexpected inflationary burst produced by the abandonment of hard money. You can't abandon hard money twice, so a repeat is not possible. Though inflation might increase dramatically in the future, resulting in another high stock-bond return gap, it's at least as likely that inflation will remain tame for the foreseeable future, producing nearly equal stock and bond returns. More importantly, we now live in a world where investors have learned to extract an inflation premium from bonds and to expect inflation protection from stocks. This increases expected bond returns and reduces expected stock returns.

Which brings us back, as usual, to the Gordon Equation: The expected return of a stock or bond is equal to its income stream plus its growth. For stocks, this is (in nominal terms) 1.5% + 5% = 6.5%; and for bonds, 6.0% + 0% = 6.0%.

The twentieth century sure was a barn burner… welcome back to the nineteenth.

Efficient Frontier



William J. Bernstein

When Risk and Return Become the Same

One of the hoariest bits of conventional financial wisdom is that over the long run, the probability that stocks will outperform bonds approaches unity—that is, as your time horizon grows, stocks actually become *less* risky than bonds or even T-bills.

Wharton finance professor Jeremy Siegel, author of the classic *Stocks for the Long Run*, is largely responsible for this agreeable state of affairs. The good professor examined stock performance over time periods of different lengths and found that over progressively longer periods, the odds of stocks having a negative return or of underperforming bonds and T-bills gradually decreases to zero. He pointed out that from 1802 to 1997, stocks outperformed bills in 97% of 30-year periods and after 1871, they outperformed in 100% of 30-year periods. He concluded:

> *Although it might appear to be riskier to hold stocks than bonds, precisely the opposite is true: the safest long-term investment for the preservation of purchasing power has clearly been stocks, not bonds.*

The fallacy here is subtle and requires some explanation. Consider the investor who checks the stock page each day or imports his Yahoo! portfolio into a spreadsheet once every hour. For him, risk and return are entirely different things. Risk is the knot in his stomach as he sees his wealth slipping away in dribs and drabs, and occasionally in large jagged chunks during a bad market. Return, on the other hand, is what he is going to retire on 30 years hence.

Now, consider the investor who has been left a portfolio by an abusive uncle and, because of unpleasant memories, never looks at it until he needs the money. For him, risk and return are experienced at exactly the same moment—when the portfolio is liquidated. In other words, for the investor who never checks his portfolio, *risk and return are the same*.

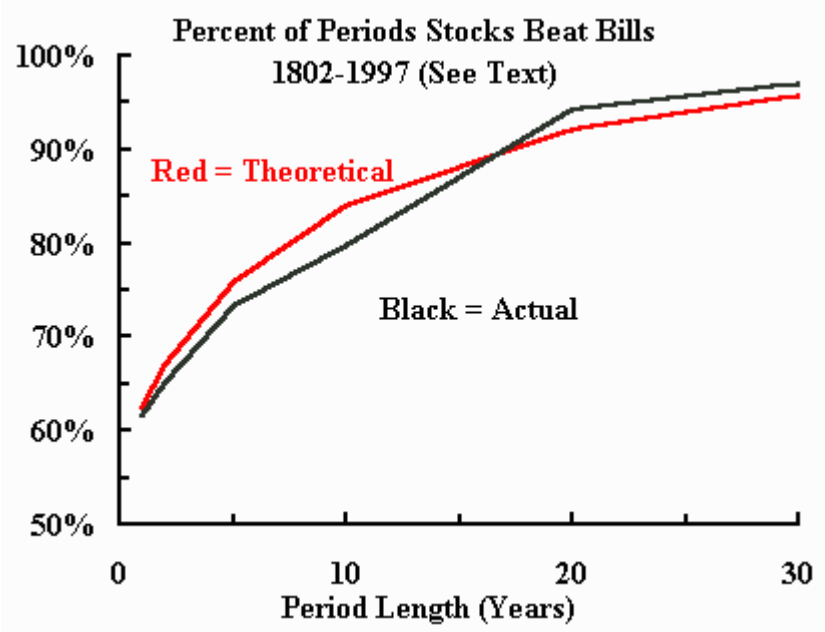
This is not trivial sophistry. *The reason that stocks are less risky than bonds and T-bills over long time periods is precisely because their returns have been much higher.* The emphasis here is on the past tense: *if in the future, stocks do not best bonds and bills by very much, then stocks will retain their risk.* Or, as put to me by Cliff Asness, "With a big cushion (risk premium) even a bad draw probably doesn't get you less

than bond performance over the long term."

Let's analyze this using some basic statistics. From 1802 until 1997, the period covered in *Stocks for the Long Run*, the return of stocks was 8.4% with a standard deviation of 17.5%. The laws of statistics tell us that the probability of a return worse than two standard deviations (2SD) below the mean is 2.3%. What does that mean?. At one year, we're talking about a return worse than -26.6% (8.4% minus 17.5% x 2) occurring about once every 43 calendar years.

What happens at ten years? Again, the laws of statistics tell us that with a random walk, the annualized standard deviation will be 17.5%/sqrt(10) = 17.5%/3.16 = 5.54%. So a minus-2SD ten-year annualized return is –2.68% (8.4% minus 5.54% x 2). And at 30 years, the minus-2SD return is +2%. So if the T-bill return is 3%, stocks will indeed underperform bills at the minus-2SD level over 30 years.

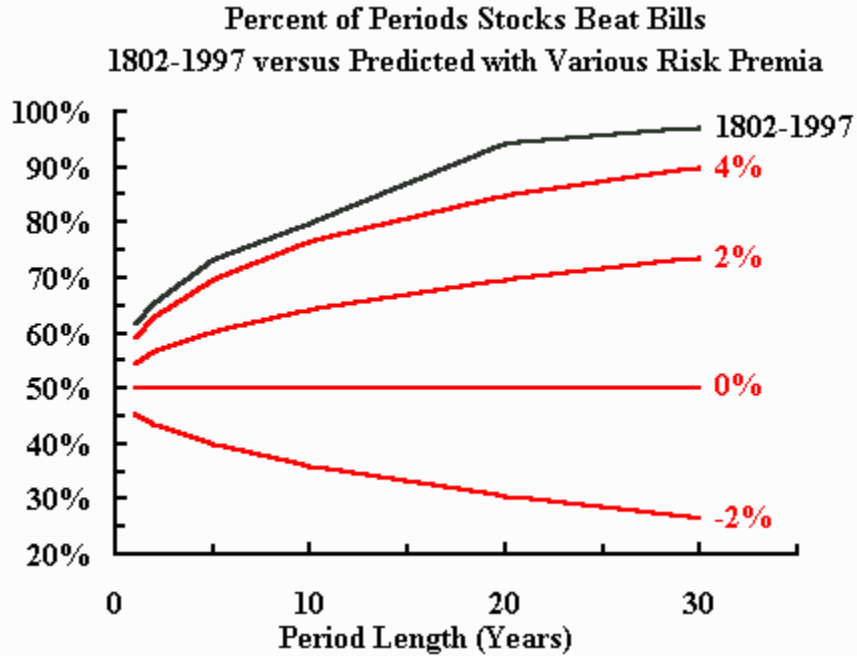
For those of you who are interested, I've made available an Excel spreadsheet that uses this method to calculate the theoretical probability that stocks will underperform T-bills. It requires four inputs: stock and T-bill returns, the stock-return SD, and time horizon. I've included the 1802-1997 Siegel summary data for reference. Using the historical data, the "theoretical" versus actual percentages that stocks have outperformed T-bills are plotted below:



Care is needed in interpreting these data since at the long end there have been only six non-overlapping 30-year periods. Siegel uses overlapping time periods—not kosher, but necessary—to produce the required data density. Still, the agreement is quite good. Incidentally, the vaunted mean-reversion tendency of the stock market, which shows up as the black-over-red gap at the right side of the curve, is shown to be a minor player in this act; the closeness of the fit confirms the random-walk behavior of

market returns.

I strongly doubt that future stock returns are going to be 5.5% higher than T-bills, as they were from 1802 through 1997, or 7% higher than T-bills, as they were in this century. A reasonable case can be made that the equity risk premium going forward may be very small. If stock returns are approximated as the sum of earnings (or dividend) growth plus the dividend yield, then the gap between stock and bond returns may be only a few percent. What if it's only 2%? Maybe a little higher or lower? I've plotted a range of possible equity risk premia below… no matter how you slice it, things look ugly:

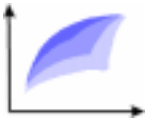


Suddenly, stocks aren't so safe; even at a 30-year time horizon, in addition to their breathtaking short-term volatility, stocks run a significant risk of underperforming T-bills once the risk premium falls below 4%.

This exercise neatly outlines the gross internal inconsistency of the Glassman and Hassett argument in *Dow 36,000.* The authors' hypothesis is that stocks, because they are less risky than bonds, should have higher prices and lower returns. But, as we've just shown, if they have lower returns, then their long-run risks will be much higher.

Yes, the long-term risks of equities *were* lower than that of T-bills and bonds. But the good news is already out about the stock market and totally discounted into its present price. Going forward, stocks will be riskier than bonds and T-bills, no matter how you measure it. And the rewards for bearing that risk will be lower.

Efficient Frontier



William J. Bernstein

Efficiency, Rationality, and Arbitrage

I spent most of the Internet Boom in a disoriented fog. For example, I could never decide which part of speech the corporate moniker Yahoo! was supposed to represent. Was it an interjection, reflecting the technologic and economic ebullience of the time, or was it simply a noun, meant to describe the company's shareholders?

The definitive history of the Great Internet Bubble has yet to be written, but there are a few observations that can already be made, as we've all had bestowed upon us a morbid historical privilege, not unlike witnessing the 1906 San Francisco earthquake. I still remember the sheer wonder of my first reading of Mackay's *Extraordinary Popular Delusions and the Madness of Crowds*, which described the Dutch Tulip, South Sea, and Mississippi Company episodes—what must it have been like to live in such a time! Now you and I know. Not since the diving and bubble companies of the 17th and 18th centuries have entities with so little substance commanded such high prices. If we were not personally touched by these Internet shooting stars, we all knew folks who were.

The Morningstar April 2000 stock module occupies an honored place on my hard drive, and from time to time I sift through the names with awe: Terra Networks, selling at 1200 times *sales*; Akamai Technologies, 3700 times *sales*; Telocity, 5200 times *sales*. Not a one with *earnings*. What were we thinking?

But my all-time favorite is Internet Capital Group. On August 5, 1999, it went public at $6 per share, rose to $212, then fell back to under a buck. Nothing unusual, really. What made it such an enchanted soul was that it was the direct descendant of the 1920s leveraged investment trust—its holdings were small private companies operating in the wildest, woolliest part of the Internet scene, business-to-business (B2B) enterprises. This company actually issued *bonds* (of about the same quality as those my butcher at Safeway might issue, if only the SEC would allow him to do so). The frosting on the cake was that Internet Capital Group common stock sold at an estimated 10 times the value of the companies it held. So not only did it own pure fluff, but was valued at 10 times this fluff.

Surely, you say, such a market is not *efficient*. From time to time, markets *do* go stark raving mad or, on the other more subtle extreme, become toxically depressed.

Shouldn’t the intelligent investor find it easy to garner excess long-term returns by keeping his head when all about him have lost theirs? Such doubts about market efficiency get to the heart of how we define it.

Two papers shine like lighthouses on a foggy night for the thoughtful investor trying to navigate these treacherous shoals. The first is an editorial by Mark Rubinstein in *Financial Analysts Journal* (May/June 2001) entitled, "Rational Markets: Yes or No? The Affirmative Case." (If the author’s name rings a bell, it should: Rubinstein and his Berkeley sidekick Hayne Leyland, in response to their deteriorating lifestyles, gave us portfolio insurance 15 years ago, just in time for the 1987 crash. So much for Adam Smith’s "invisible hand.") The second, which I’ll get to further below, is a piece by Andrei Shleifer and Robert Vishny, "The Limits of Arbitrage," in *Journal of Finance* (1997).

Rubinstein’s editorial defines three types of rational markets (which correlate only loosely with the strong, semi-strong, and weak forms of the Efficient Market Hypothesis):

- Maximally Rational: All market participants are maximally rational. This means that there is no trading. Rubinstein points out that no one takes this seriously—just look at market volumes.

- Plain-Vanilla Rational: The markets behave *as if* all participants are rational. One group of investors may be inappropriately optimistic about a security; another, inappropriately pessimistic. But the net effect is rational pricing. Most investors may be grossly under-diversified, but the overall market portfolio is efficient.

- Minimally Efficient: The markets themselves are not rational, but still do not provide opportunities for excess returns. Yes, Rubinstein says, closed-end funds trade with irrational discounts, prices are too volatile relative to information (Quickly now: do you recall the news that triggered the 1987 crash?) or certain stocks are grossly overpriced. *But there is no way to reliably profit from this information*.

Rubinstein surveys an impressive litany of market irrationality. He presents the case of the behavioral finance proponents (Richard Thaler and his many disciples) who are fond of pointing out common investor errors as evidence against market efficiency, listing no less than 35 examples of investor irrationality. He then goes on to detail six major market anomalies (excess volatility, the risk-premium puzzle, the value and size effects, closed-end discounts, calendar effects, and the 1987 crash).

Finally, Rubinstein discusses exactly one real argument in favor of market rationality: the sorry story of mutual fund *non*-performance and *non*-persistence, citing the

literature from Jensen to Carhart. True, only one area of hard data versus a whole panoply of anomalies and behavioral deficits; but, he argues,

> *It [mutual-fund nonperformance] should not simply be put on one side of the ledger and given equal weight with any market anomaly on the other side. In fact, just to pile on the metaphors, the behavioralists have nothing in their arsenal to match it; it is a nuclear bomb against their puny sticks.*

The gauntlet is thrown down: Where are the behavioralists' yachts?

Rubinstein concludes that the markets are at least minimally rational; he rejects maximal rationality and is mute on the possibility of plain-vanilla rationality.

For my money, the classic in the behavioral finance field on the topic of market efficiency is Andrei Shleifer and Robert Vishny's paper, "The Limits of Arbitrage," published in *Journal of Finance* in 1997. (Hey, what is it about these academics? Shleifer recently found himself the unhappy target of a federal probe surrounding Russian investments made by his wife while he was directing the Harvard Institute for International Development.)

"Arbitrage" refers to operations which produce riskless profit. The example used by generations of economics professors is that of a newspaper simultaneously selling on one street corner for a nickel and on another for a dime. This is a riskless venture: one simply buys the papers for five cents and sells them on the next corner for double the price.

The only problem, of course, is that since no operation is truly riskless, arbitrage doesn't really exist (until someone coined the oxymoron "risk arbitrage," which most often refers to trading in the securities of takeover participants). Our mythical newspaper trader has a number of problems. First, it's possible that in the interval between buying for a nickel and selling for a dime, the price differential may collapse. Second, and of greater relevance to the capital markets, a nickel profit is just not very much money. To make the venture worthwhile, he must turn the trick with hundreds of thousands of newspapers; he'll likely have to borrow money to buy all those nickel papers. Creditors may not be as patient as he is and may decide to pull the plug if things go slowly, leaving our "arbitrageur" bankrupt. Last, but not least, he will run straight into market impact costs; he'll rapidly run out of pigeons willing to pay ten cents for a paper and will have to lower prices to unload the rest.

Shleifer and Vishny point out that in the real world of finance,

> *. . . arbitrage is conducted by relatively few professionals, highly specialized investors who combine their knowledge with resources of outside investors to take large positions. The fundamental feature of such*

arbitrage is that brains and resources are separated by an agency relationship.

The problem then is, although the arbitrage professionals (which I broadly define to include active mutual-fund and pension managers) allocate resources rationally according to future expected returns, *their investors allocate among professionals according to past results.*

This is the key point. Imagine that a fund manager believes value stocks have a higher return than growth stocks in the long run and, further, that over very long time horizons (say, greater than 20 years), the manager is always right. But value does not beat growth all the time; it is quite common for the opposite to occur for a few years. As growth stocks temporarily appreciate in price relative to value stocks, two things happen: First, the expected return of the value-versus-growth bet increases. And second, uninformed investors start pulling money out of this manager's fund. *So, the typical money manager finds that the greater the opportunity, the less assets he has to manage.* The reverse happens when things are going his way; he will be awash with assets just when expected excess returns disappear or, worse, when they become negative.

Now just imagine that this money manager runs into a bad stretch, say, *15 years*, which is just what we're hopefully emerging from, with value-versus-growth stocks. Shleifer and Vishny refer to this situation with a sneer as "performance-based arbitrage." And it can get even worse: What if you are leveraged? Your creditors are almost certainly "uninformed" and will want their money back, forcing you to sell your positions, adversely impacting prices in the bargain.

But worst of all, a bad stretch can make even the most disciplined players lose heart. The authors assign the lowest circle of hell to "Bayesians": managers whose return expectations move with the market, not counter to it, as any rational manager's would. (In unlovely econ-jargon, "a sequence of poor returns may cause an arbitrageur to update his posterior and abandon his original strategy." Well, not quite; when you abandon your strategy, you are not so much updating your posterior as *kissing it goodbye.*) At the end of a bubble, almost all investors are Bayesians; this was certainly true of tech-fund managers.

The authors make a few other salient points:

- Quoting them, "the long-run ratio of expected alpha to volatility may be high, but the ratio over the horizon of one year may be low." We covered this ground in the last issue—it is not a peculiarity of some asset classes, as the authors imply, but a general quality of *all* financial assets. In plain English, in the long run, return compounds faster than risk. Unfortunately, for arbitrageurs there is no long run, only a ferocious series of short runs in

which volatility eventually overwhelms return and, with it, their employment.

- The overwhelming majority of arbitrageurs hold highly undiversified portfolios; therefore they are very concerned about the unsystematic risk of assets and "price" this risk, i.e., lower valuations so that returns will increase to compensate for the additional risk. Thus, a pricing model (read as, the Capital Asset Pricing Model) that prices only unsystematic risk is inappropriate. As an amusing aside, the folks at Dimensional Fund Advisors, who constitute the Efficient Market Hypothesis's best and brightest, freely admit that one of the risks of value investing, where one is rewarded with higher expected return, is that it is not as diversified as the market portfolio and will often temporarily underperform. They cannot quite bring themselves to utter the words "tracking error."

- Finally, Shleifer and Vishny attack the value-premium controversy: is it risk or behavior? To wit, "arbitrageurs trying to eliminate the glamour/value mispricing might lose enough money that they have to liquidate their positions. In this case, arbitrageurs may become the least effective in reducing the mispricing precisely when it is the greatest. Something along these lines occurred with the stocks of commercial banks in 1990-1991."

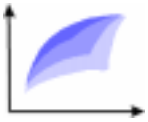
Their paper, published in 1997, gets my Nostradamus Award for the decade, foreshadowing the slaughter of those who, correctly perceiving the massive overpricing of tech stocks in the late 1990s, shorted them and ran out of margin long before the cavalry arrived in March 2000. In other words, just when the returns from shorting tech stocks were the greatest, the ammunition necessary to maintain their position was thinnest on the ground.

The occasional prolonged, massive failure of even the most coldly calculated strategies gets to the heart of the rationality/efficiency conundrum: The markets are at best "minimally rational," as defined by Rubinstein. The market frequently misprices securities and, every once in a while, entire asset classes. But the market is *highly* efficient—because of the limits of arbitrage, it is very difficult to make much money from the irrationality. First and foremost, to make it worth your while, you have to deviate from the market portfolio—that is, place bets—with a significant chunk of assets, perhaps not all your own. And therein you sow the seeds of your own destruction. In the case of the money manager, his vocational time horizon is usually much shorter than that of the pricing anomaly he identifies. And in the case of the small investor, this happens because he is prone to "reevaluating his posterior." When the cheap asset class or stock that you originally allocated 5% of your portfolio to, becomes 2% over the course of a decade, do you really have the fortitude and conviction to repeatedly rebalance back to 5%, let alone increase the bet? There are

few things more discouraging than a bad asset class gnawing at your posterior for years at a time.

I do believe that it's possible to earn excess returns from market irrationality. But because the above considerations mandate very small bets, the rewards are tiny, highly uncertain, and quite probably not worth the trouble. The rational investor treats concentrated positions and substantial deviations from market sector weighting in the same way that Burton Malkiel treats the "mad money" portion of his portfolio—a very small corner of the show, mostly for entertainment. One occasionally *does* find $10 bills lying on the ground, but the intelligent investor does not attempt to make a living doing so.

Efficient Frontier



William J. Bernstein

Of Markets, Economies, and Populations

In the winter issue, "How Much Pie Can You Buy," we followed the bread crumbs from economic growth to rises in stock price. We found that from 1929 to 2000, domestic GDP grew by 6.63% per year. It would have been nice if all this growth had filtered directly through to share prices. Alas, it did not. During the same period, aggregate corporate profits grew by slightly less (about 6.42%), but the real damage came from the investment bankers, who issued so many new shares that per-share corporate earnings grew by an even lower 4.98%. Fortunately, the gods smiled on shareholders in this period—multiples expanded and stock prices rose by 5.87% per year.

Some suggest that per-capita GDP is a more useful indicator of stock prices than gross GDP and, in fact, this may be the case: from 1929 to 2000, per-capita GDP rose by 5.38%. It was a better guide of per-share earnings growth than raw GDP growth. Unfortunately, we're looking at only one data point here, the U.S. market. We'd be more informed on the issue if we could examine the impact of GDP and population growth on share prices across a number of nations. Thanks to a happy coincidence, we are now in a position to do so.

In 1999, William Goetzmann and Philippe Jorion published in the *Journal of Finance* a seminal study of stock returns around the planet, entitled "Global Stock Returns in the Twentieth Century." Their key parameter was annualized real price rise (that is, dividends not included, inflation factored in) of many national markets in U.S. dollars.

Almost two years later, Angus Maddison published his landmark *The World Economy: A Millennial Perspective*. This tome, together with his earlier work, *Monitoring the World Economy*, provided real gross and per-capita GDP (again, expressed in real U.S. dollars) as well as population figures for virtually the entire globe, over the same period studied by Goetzmann and Jorion. In the table below, I've summarized the relevant data from both sources, including only those nations with more than a 35-year history of stock returns:

	Price				Annualized	Growth of	
Country	**Return**	**Years**	**Begin**	**End**	**GDP**	**Population**	**Per Cap. GDP**
U.S.	4.32%	76	1920	1996	3.26%	1.20%	2.27%
Canada	3.19%	76	1920	1996	3.81%	1.61%	2.16%
Belgium	-0.26%	76	1920	1996	2.44%	0.39%	2.04%
France	0.75%	76	1920	1996	2.88%	0.53%	2.34%
Germany	1.91%	76	1920	1996	3.07%	0.48%	2.57%
Netherlands	1.55%	76	1920	1996	3.10%	1.08%	2.00%
Spain	-1.82%	76	1920	1996	3.29%	0.81%	2.32%
Sweden	4.29%	76	1920	1996	3.02%	0.54%	2.46%
U.K.	2.35%	76	1920	1996	2.17%	0.39%	1.81%
Japan	-0.81%	76	1920	1996	4.50%	1.08%	3.38%
Austria	1.62%	72	1924	1996	2.75%	0.29%	2.46%
Denmark	1.87%	72	1924	1996	2.78%	0.61%	2.34%
Switzerland	3.24%	71	1925	1996	2.77%	0.84%	1.91%
Chile	2.99%	70	1926	1996	3.54%	1.80%	1.71%
Norway	2.91%	69	1927	1996	3.60%	0.66%	2.91%
Italy	0.15%	68	1928	1996	3.14%	0.53%	2.60%
Finland	2.07%	66	1930	1996	3.42%	0.60%	2.80%
Australia	1.58%	66	1930	1996	3.68%	1.59%	2.06%
New Zealand	-0.34%	66	1930	1996	3.09%	1.40%	1.70%
Portugal	-0.63%	65	1931	1996	3.78%	0.56%	3.31%
Ireland	1.46%	63	1933	1996	3.11%	0.32%	2.74%
Mexico	2.30%	62	1934	1996	4.97%	2.68%	2.21%
Colombia	-4.29%	60	1936	1996	4.44%	2.49%	1.85%
India	-2.33%	57	1939	1996	3.75%	1.95%	1.64%
Peru	-4.85%	56	1940	1996	3.70%	2.50%	1.18%
South Africa	-1.76%	50	1946	1996	3.42%	2.46%	1.08%
Philippines	3.65%	42	1953	1996	4.18%	2.92%	1.47%

Israel	3.03%	40	1956	1996	6.28%	2.72%	4.28%
Argentina	-4.80%	39	1957	1996	2.63%	1.52%	1.10%
Pakistan	-1.77%	36	1960	1996	5.73%	2.62%	2.87%
Brazil	-0.17%	36	1960	1996	4.78%	2.44%	2.36%

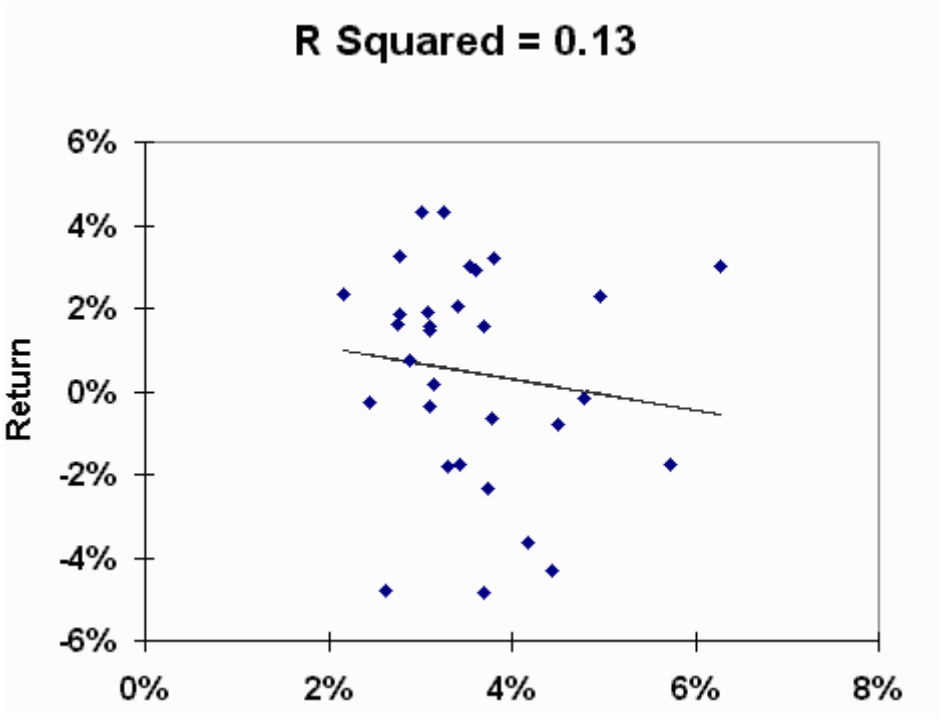
By combining the data from both Maddison and Goetzmann/Jorion, we can study the effect of these three factors on global stock prices. The story is fascinating, if complex, and the trail well worth following. But keep in mind, we are in fact looking at only two variables, since the three variables (gross GDP, per-capita GDP, and population) are mathematically related:

Per-Capita GDP = GDP/Population

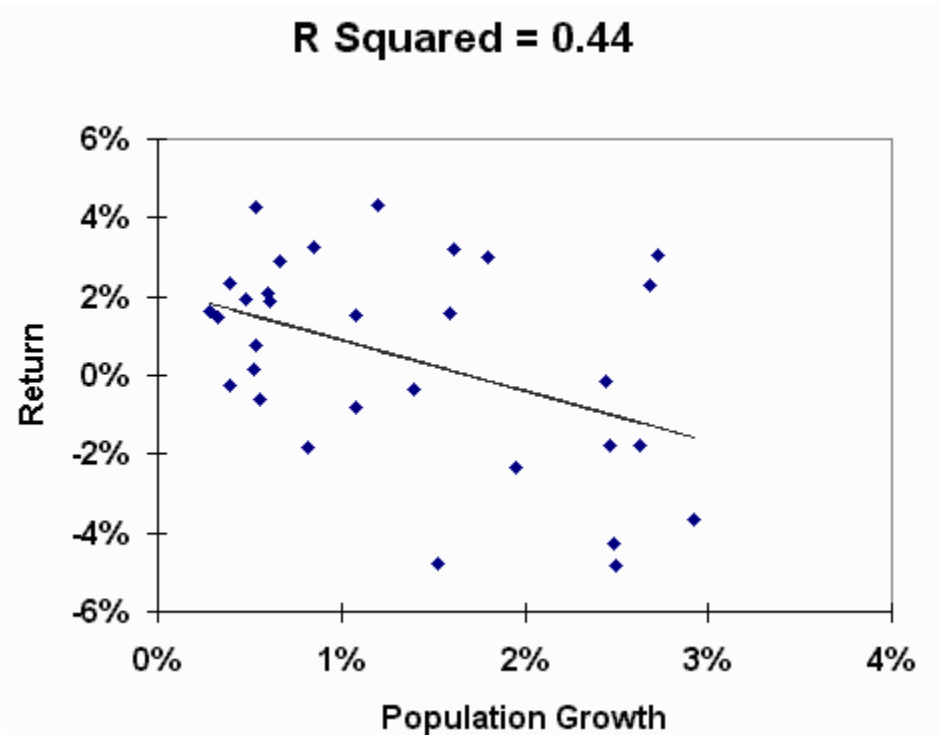
Further, the *growth* of these three parameters are roughly arithmetically related:

Per-Capita GDP Growth ~ GDP Growth – Population Growth

Therefore, if you know two variables, you automatically know the third. For simplicity's sake, we'll initially consider only population and gross GDP. It's obvious that as GDP grows, so should stock price; there ought to be a direct positive relationship between a nation's GDP and stock-price rise. Unfortunately, there is not. Below, I've plotted stock-price growth versus GDP growth for the 31 nations in the Goetzmann/Jorion database with a greater than 35-year track record:

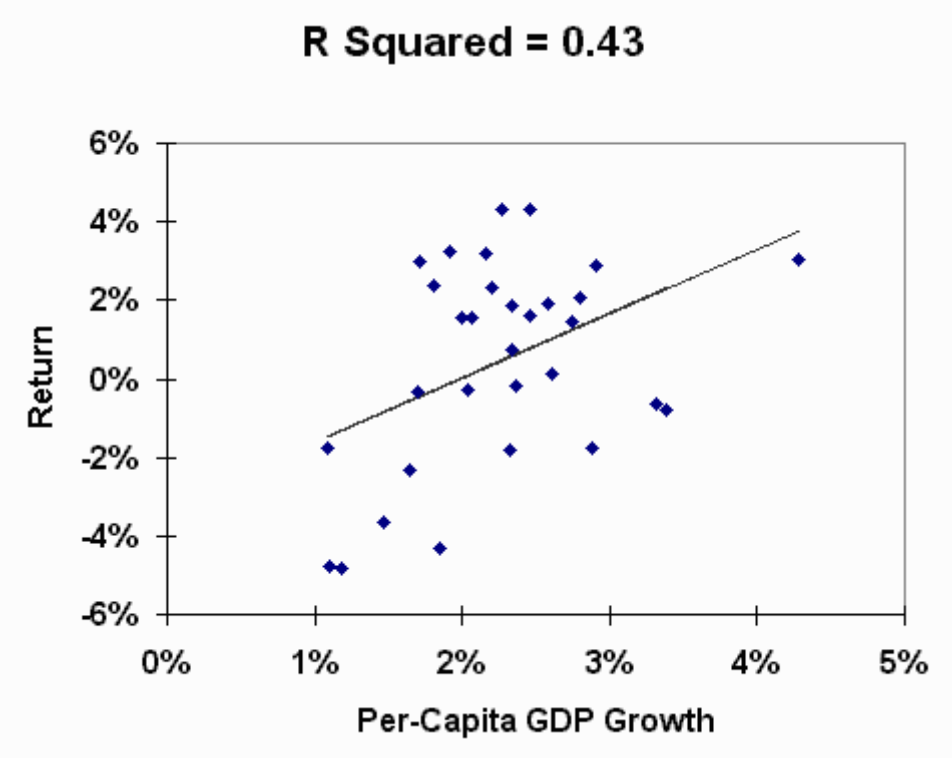


As you can see, there is a weak *negative* relationship between the two, albeit statistically insignificant. What's going on here? The next step is to plot stock-price growth versus population growth:

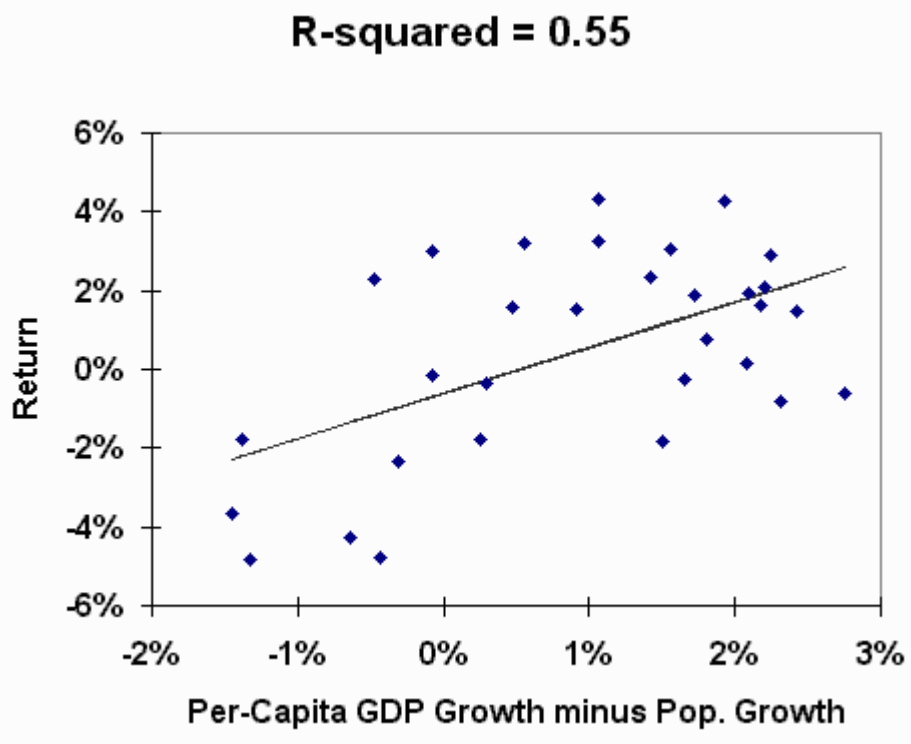


Here we see a negative correlation that is highly statistically significant. In other words, population growth appears to be bad for stock prices.

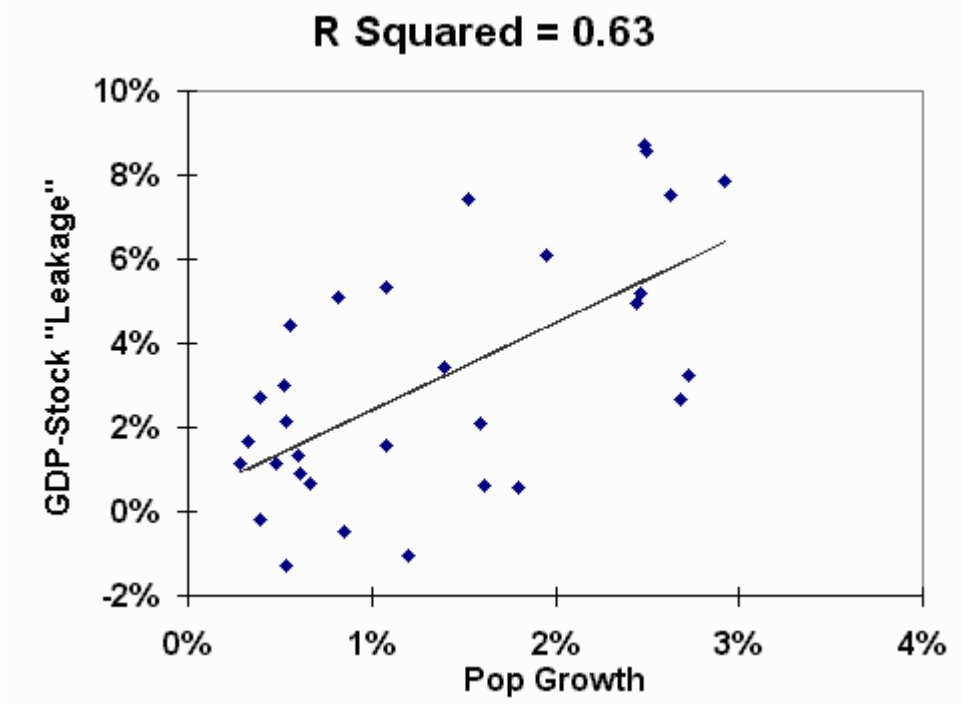
The mystery of the above apparent irrelevancy of GDP is solved when one simultaneously regresses stock-price growth against both population *and* GDP growth. When the two are looked at together, GDP is seen to exert a positive effect on share prices after all. This is corroborated by plotting per-capita GDP growth versus stock-price growth:



Per-capita GDP very nicely captures both of these factors, with a rise in gross GDP helping the numerator and tiny rises in population helping the denominator. In fact, the bivariate regression shows that population growth is about twice as important as GDP growth. This suggests a trick that should capture even more of the price return: per-capita GDP growth minus population growth. Indeed, it turns out that this simple metric explains fully 55% of national equity returns:



Finally, one can specifically examine the "leakage" between the growth of GDP and the growth of stock prices. For many nations, the amount of GDP growth that escapes before arriving in the hands of shareholders is huge. For example, in Pakistan, GDP rose at an annualized rate of 5.73% while stock prices *fell* at an annualized rate of 1.77%; there was thus 7.50% of leakage between GDP growth and stock prices. In a few countries, notably the U.S. and Sweden, the discrepancy was actually negative due to rising valuations. Again, "leakage" is a good measure of property and shareholder rights. Its relationship to population growth is nothing short of phenomenal, with an R squared of 0.63:



These results shed a small amount of light on the sources of equity returns. GDP rises are good for stock prices *only* when they come from increases in individual productivity, as measured by per-capita GDP; they are bad when caused predominantly by population growth. The classic case of the latter is Pakistan, which, believe it or not, had the second highest gross GDP growth rate in our sample, but also one of the highest population growth rates. Needless to say, the Karachi Stock Exchange has not been a happy place the past four decades.

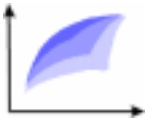
It seems unlikely that population growth itself is the cause of poor stock returns, but rather a marker for the underlying social and cultural conditions that attend high birth rates and disrupt corporate profits: a dirigiste government, with its concomitant disrespect for private property, lack of functioning capital markets, and intrusion of religious thinking into areas better served by Western rationalism. For example, Israel had the second highest population growth in the sample, but since this was largely due to immigration and not a high birth rate, it offered reasonable stock returns.

Is the above paradigm useful for predicting future returns? The key question here is, can we divine the demographic transition that accompanies successful industrialization? At one end of the spectrum, the traditional developed nations should continue to experience agreeable real returns, as should emerging Western countries like Hungary, Poland, Taiwan, and Singapore. At the other end of the spectrum are nations like Pakistan and Peru, where a demographic transition seems remote. And in between are nations like Indonesia, Thailand, and Mexico, which may or may not be in the early stages of demographic transition.

At the end of the day, though, a central paradox remains: Raw economics explains

only a small part of equity returns. Factors well outside the ken of the financial economist are far more important and likely less predictable.

Efficient Frontier



William J. Bernstein

Links of the Month

Current Working Papers in Finance

The best way to keep up with academic finance literature is to stay abreast of working papers circulated by the nation's leading financial economists. Unfortunately, unless you are well situated in finance's grapevine, you're not likely to see all or even many of these. No more: John P. Scordo, Esq. is now posting the most important works-in-progress on his Web site and promises to keep it updated. A list of recent articles (with their links) appears in the left-hand column of the page.

Reinventing Retirement Income in America

American workers are beginning to notice an unpleasant odor wafting from their mailboxes. Each quarter, with the arrival of their 401(k) statements, it is slowly dawning on them that there's more to retirement investing than throwing money at the most popular growth fund around the water cooler. A few may even be starting to realize that *costs matter*.

Unfortunately, the real message of the Enron debacle—that a retirement system which forces every employee to be a portfolio manager and where costs are largely ignored is a disaster waiting to happen—has been lost in a far more entertaining morality play. The Lay family makes for great Doonesbury, but unfortunately obscures the larger public policy issues.

After my editorial appeared in *Barron's* last fall, multiple members of the fourth estate mistook me for a pension-fund expert and asked what remedies I had to offer. I quickly learned to mumble the words "portability" and "federal pension board," then change the subject. Luckily for me, financial columnist Scott Burns and pension consultant Brooks Hamilton were in the process of doing the heavy lifting for the National Center for Policy Analysis, now detailed in an extensive report. For starters,

they beautifully lay out the problem, including a shocker I had been unaware of: Because of differences in investment knowledge, highly compensated employees earned far higher returns than lower-paid ones. While this may please the Hayek-Rand crowd, it is social and political dynamite—a system that results in high returns for the top brass and low returns for the rank and file does not pass the smell test.

The study's centerpiece is a neat exchange of commonsense features for legal safe harbor: a default professionally managed 60/40 portfolio mix for employees who do not manage their own accounts, immediate vesting, full portability, and most important of all, employer responsibility for fees. Engaging employers in the fund cost issue is essential in an arena where 3% to 4% annual expenses are not unusual.

Take a look. It's not perfect, but it's darned close. My two cents is, one option should be universally available—an age-determined, indexed, sliding mix of stocks and bonds managed by an independent, *federally run* pension board with rock-bottom expenses. I figure Gus Sauter could do it for less than 10 basis points out of a few cubicles.