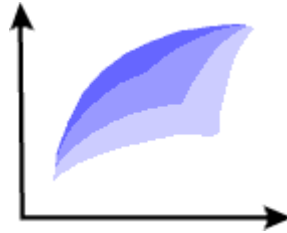


# Efficient Frontier



**An Online Journal of Practical Asset Allocation**

Edited by William J. Bernstein

**September 1999**

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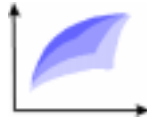
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# Efficient Frontier



William J. Bernstein

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## Value Stocks—Hidden Risk or Free Lunch?

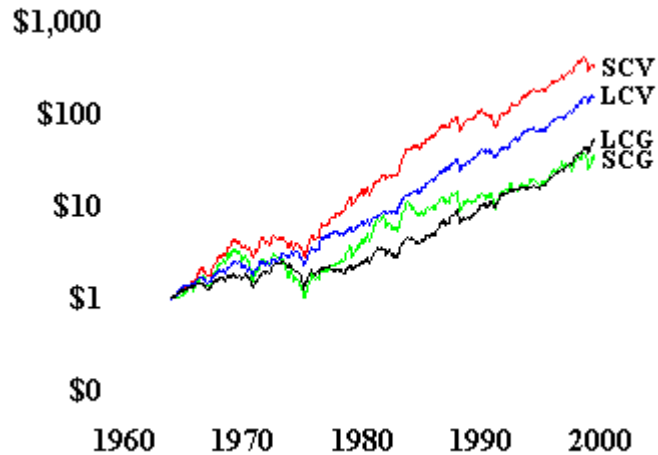
Few notions are as well embedded in financial thought as the relationship between return and risk. At ground zero are treasury bills. Historically not returning much more than inflation, they are considered to be a "riskless asset." Perhaps not *absolutely* riskless, but dire indeed would be the circumstances under which the Treasury of the United States defaults on its short term debt.

Stocks have a much higher return than t bills, but also expose the owner to the possibility of severe capital loss. Consider for a moment what would happen if tomorrow the US Treasury offered a 1 year security with a yield of 11.22%—the annualized return of stocks for the past 73 years. The price of that security would immediately be bid up high enough to reduce the yield to its current 4.6% return. The free lunch would not last a nanosecond.

However, once we start looking at different categories of stocks things get a bit sticky. It turns out that certain kinds of stocks have higher returns than others, namely *value* stocks. Fama and French sort stock returns by size and price and book-to-market (BtM) ratios, and obtain the following returns and risk metrics:

	Ann'd Return 7/63-3/99	Ann'd SD	Return 1973-4	Worst 12 Month Loss
Small Value	17.47%	18.63%	-53.78%	-30.74%
Small Growth	10.18%	23.04%	-61.23%	-50.71%
Large Value	15.16%	14.86%	-22.97%	-28.07%
Large Growth	11.75%	16.35%	-44.19%	-45.20%

I've also graphed out the cumulative return of \$1.00 invested in each style category on July 1, 1963:



Note the large differences between the returns of value and growth stocks. Classic theory predicts that the risks of value companies should also be higher. Yet the data in the above table suggests otherwise; by any measure (standard deviation, 1973-4 bear market return, worst 12 month rolling return) value stocks actually look less risky.

For a while, this flummoxed even Fama and French. They wrote vaguely of "hidden risk"—it was there, you just couldn't measure it with crude statistics like standard deviation or raw calendar losses. Others pointed out a simple bond market analogy. It's a well known fact that the standard deviation and raw losses sustained by treasuries are a bit larger than those of high grade corporate debt of similar duration. By that measure, at least, the corporate paper is less risky than the treasury securities. And yet, "everybody knows" that treasuries are safer than corporates. In other words, there are other dimensions to risk besides simple numerical concepts.

Fama and French finally settled on the "sick company" theory of risk. Value companies are "sick" and because they are less likely to survive, must offer higher returns to offset this risk. (Some spoke in hushed tones of a massive financial intensive care unit, presumably somewhere in lower Manhattan, containing vast numbers of companies maintained on the fiscal equivalent of ventilators and potent antibiotic and heart medicines.)

I highly recommend a lucid and entertaining piece by Fama's son (think Paul Samuelson meets Jerry Seinfeld) on this conundrum. A few passages express the risk/return equation beautifully:

. . . there is nothing special about book-to-market. It does not describe risk. However, sorting stocks by BtM also seems to sort them by their true underlying source of risk—the level of their distress. The key to book/market lies in the denominator, market price. High BtM stocks are lower-priced stocks. This is usually because the stock is a poor earner, because it is riskier.

Riskier means higher returns.

Suppose Microsoft and Apple Computer each go to the bank for a loan. Which company will have to pay the higher interest rate? Apple will—its future is uncertain and the bank will need to be paid to take the extra risk. Apple therefore pays a higher cost for its capital. The stock market works the same way. The market expects a higher return for Apple stock than for Microsoft stock. This induces investors to purchase Apple even though Microsoft seems to have better earnings prospects (it seems safer). Put differently, if the two companies had the same expected return, no one would buy Apple.

Fama *files* then goes on to attack standard deviation as a measure of risk, applying the label *mean variance preferred* to investors who are concerned mainly about SD. (This gets my vote for finance buzzword-of-the-year). He goes on:

If the only risk you fear is fluctuation of returns, you should use a mean-variance optimizer, and the optimizer will tell you to overweight value heavily. This is a perfectly legitimate approach. However very few investors care only about standard deviation. If you care only about SD, you don't care about tracking drift. You don't mind if the market is going strong for several months and your portfolio is flat, or negative. You don't care if your portfolio is dominated by bank stocks and has no technology stocks.

I'm not entirely convinced. Of course most investors don't care about mere "fluctuation of returns;" they care about loss of capital. And, as the above table shows, SD is a superb proxy for this. Most mutual fund shareholders (and particularly index fund shareholders) could care less if several percent of the companies their fund owns wind up on the wrong side of the daisies each year as long as the whole portfolio does well. The key point being that the risk of owning sick value companies is for the most part *nonsystematic*—it is easily eliminated by owning a diversified portfolio of sick companies. And, as any efficient market student knows, you are not rewarded for bearing nonsystematic risk. (Or, in the words of Paul Samuelson, you are not rewarded merely for going to Las Vegas.)

Well, perhaps not entirely. Maybe 1973-4 just wasn't bad enough to push enough sick companies over the brink. Fama and French also have data going back to 1927, and it shows that during the Great Depression value investing was indeed riskier than growth investing. From January 1929 to July 1932 large value stocks lost 85.6% versus "only" 80.0% for large growth stocks. For small stocks, though, the situation was reversed, with small growth losing 98.1% and small value stocks losing "only" 90.0%.

The tracking error issue is also not entirely convincing. Eugene Fama Jr.

works in the world of big-money pension plans. These large funds, together with the mutual fund industry, are indeed exquisitely sensitive to tracking error. Underperform your benchmark by more than a year or two and you're toast. In fact, Robert Haugen, in *The New Finance*, identifies this as the source of the value premium. Since growth stocks track the S&P more closely than value stocks, they are overowned, and have lower returns. There is only one thing wrong with this argument. As Fama *pere* points out, the portion of institutionally managed money has increased by an order of magnitude over the past several decades, and yet the value premium seems not to have changed.

Further, I doubt that tracking error is that big of an issue with small investors. Nobody is going to fire you or me if our portfolios underperform the S&P for a few years. And frankly, having seen the long-term returns of technology stocks and IPOs, I don't want to be near the things.

But perhaps the most persuasive argument against the risk premium story for value stocks comes from the current internet stock mania. These stocks trade at astronomical multiples of book value, and most will disappear without a trace of earnings. Yet the risk premium theory predicts that the low expected returns of these stocks (and boy, have they ever got that one right) is due to their *safety*. Sure.

Perhaps in an era when individual investors held undiversified portfolios consisting of a few issues the "sick company" theory made sense. But the shareholders of the Vanguard and DFA value funds do not seem overly troubled by the fact that they own the equivalent of a financial hospital.

What I find most worrisome is the possibility that investors are now much more willing to own sick value companies than they have been in the past. For if they are, then the value premium may be lower than it has been, or even disappear entirely. I don't pretend to have the answer to that one. I was somewhat shocked to find that as of 3/31/99 over 3 times as much was invested in Vanguard's growth as in their value index funds, so perhaps not all of the value premium has been arbitrated from the financial landscape yet.

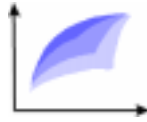
Perhaps the real risk of value investing is not that many of these companies will die, but that the value premium itself has disappeared, and that one will be rewarded just as well for owning big, safe companies as small or sick companies. And that alone may be a risk worthy of a premium.

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# Efficient Frontier



William J. Bernstein

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## Bill Sharpe's Brave New World

If you're of a certain age, you'll remember a TV series called *The Millionaire*, about ordinary citizens upon whom large wealth is suddenly bestowed. And each week, like clockwork, another hapless average Joe or Josephine wound up having their money managing them instead of the other way around. Today a similar, if smaller, drama is taking place in millions of households, as companies switch from traditional paternalistic defined benefit pension plans to employee directed 401(k) structures.

How competently will these nest eggs be invested? (Let's define competently, say, as the ability to obtain risk-adjusted returns within 100 basis points of the market portfolio, annualized over 30 years.)

Since most investment professionals fall far short of this, the odds that the average retiree will be able to do so must be small indeed. If he is intelligent, industrious, and not a little lucky, he just may come across *A Random Walk Down Wall Street*, or *Common Sense on Mutual Funds*, passively manage his assets at low cost, and achieve his goal. Again, not likely, particularly considering the notoriously high expenses of 401(k) plan funds. Odds are his advice will come from a friend, stockbroker, or TheStreet.com. Not large enough to attract professional management, one can only imagine the asset allocation process involved in these accounts.

Pollsters are fond of asking folks to rank the seriousness of various foreign and domestic problems facing the nation. Myself, the number one wake-up-in-the-night-staring-at-the-ceiling worry is the tidal wave of boomers surging towards retirement with no visible means of support besides Social Security. From rebels without a clue to rebels without a plan in just 40 short years.

Enter Bill Sharpe. Nobel Prize recipient, inventor of the Capital Asset Pricing Model (CAPM), and midwife of Modern Portfolio Theory, he rides to the rescue of these forgotten millions with his [Financial Engines](#) ("FE") advisory service. Originally set up to provide advice to the beneficiaries of large corporate defined contribution plans, it is now open to the general public. And make no mistake about it—asset allocation advice from Professor Sharpe is like volley instruction from Pete Sampras. Of course, Bill doesn't actually look over your shoulder in person and pencil out an

efficient allocation for you, but he has done the next best thing. For \$14.95 per quarter you can log on, describe your personal situation, assets, and available investments to the Java-based expert system, and obtain a roadmap for your finances.

Just how good is this advice? To answer this question *Efficient Frontier* strapped on [Financial Engines](#) and roared off into the future of asset allocation. (And also a bit of disclosure. The author is a principal in a financial advisory firm. If widely successful, FE is not expected to do good things for the average investment advisor.)

### Retirement Calculator: A+

The good news is that a substantial part of the service is available for free. Even better, the free part of the site is superb. For starters, you'll need a Windows 95-based system with a Java-capable browser. It will take you about 15 to 30 minutes to fill out your personal information, including current income and retirement savings, retirement income requirements, etc. Next you will have to enter your current retirement assets. This takes a while, as you'll have to enter individual fund names or tickers and share/dollar amounts.

After this is accomplished, the program will produce a forecast of how likely it is that your retirement goals will be met, the median, upper and lower 95% confidence limits for your retirement income and nest egg, and the amount of risk (expressed as the worst annual loss) you might expect. This service is light years ahead of any retirement calculator I've seen, and if you're shaky about these sort of calculations, it alone is worth the time spent climbing the program's substantial learning curve.

### Advice Quality: B+

The next step is to ask the program how your allocation might be improved. This is what you're paying your \$14.95 for. In order to evaluate a passively managed approach, I first examined the following asset classes, each represented by a discrete mutual fund. For all but 2 classes (international bonds and precious metals equity) index funds were used. Over a 30 year horizon, Financial Engines predicted the following inflation-adjusted returns, expressed as median, and best case/worst case scenarios (upper/lower 95% confidence limits):

Fund Ticker	Asset Class	Median Return	Best Case	Worst Case
VBISX	Short Bonds	1.78%	2.50%	0.60%
VBIIX	Intermed. Bonds	1.98%	2.98%	0.18%
VBLTX	Long Bonds	2.61%	4.50%	-0.66%
VGSIX	REITs	3.54%	7.99%	-1.12%
VFINX	S&P 500	5.79%	10.99%	1.37%
VEXMX	Wilshire 4500	5.84%	11.53%	0.11%

NAESX	Russell 2000	5.66%	11.76%	-0.75%
DFSCX	CRSP 9-10	5.38%	11.42%	-1.01%
VIGRX	Big Growth	5.65%	11.25%	-0.17%
VIVAX	Big Value	5.36%	10.31%	0.21%
DFSVX	Small Value	5.34%	10.96%	-0.43%
VEURX	MSCI Europe	4.37%	9.76%	-1.21%
VPACX	MSCI Pacific	2.92%	10.11%	-4.47%
VEIEX	Emerging Mkts.	2.87%	9.95%	-4.27%
DFCSX	Cont. Small	3.56%	8.36%	-1.34%
DFUKX	UK Small	2.84%	8.56%	-3.03%
DFJSX	Japan Small	0.62%	10.26%	-9.82%
VGPMX	Prec. Metals	-0.43%	9.79%	-11.06%
BEGBX	Int'l Bonds	1.26%	4.59%	-2.12%

Too reiterate, these are *inflation-adjusted* returns.

I do have a few quibbles. First, the bond returns are a bit low. After all, 30-year inflation-adjusted treasuries now offer almost 4%. Even taking into account reinvestment risk, a 3.5% real bond return seems reasonably certain. Second, there seems to be no value premium. Decades of research show that value stocks produce above market returns. Perhaps the good professor is just being cautious. Finally, foreign stock, and particularly small foreign stock returns, seem way too low. Consider that UK small stocks currently yield in excess of 3% in dividends. The model seems to be expecting zero real capital appreciation in this area over the next 30 years. Hmm.

But on the whole, the returns assumptions are not too far off, and it is certainly better to err on the side of caution.

I next set up a hypothetical 50 year old investor with a \$1,000,000 nest egg to which no further contributions will be made, and a required annual retirement income of \$100,000 starting age 65. FE assumes that he and his wife will receive \$40,000 annually from Social Security, so they will require \$60,000 additional income. Using the above assets, FE spits out the following allocations:

Asset Class	"Risk Level"														
	0.34	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.6
Short Bonds	100%	76%	53%	33%	25%	25%	25%	23%	8%						
Intermed. Bonds		9%	21%	31%	25%	21%	12%								
Long Bonds					3%			5%	12%	11%	1%				
REITs		5%	4%	4%	4%	1%									
S&P 500		3%	12%	19%	25%	25%	25%	25%	25%	25%	25%	25%	4%		
Wilshire 4500			2%	3%	5%	14%	22%	25%	25%	25%	25%	25%	25%	21%	
Russell 2000												8%	25%	79%	100%
CRSP 9-10								1%	2%	3%	4%	8%	21%		
Big Growth								2%	4%	7%	11%	25%	25%		
Big Value								1%	4%	7%	11%				



MSCI Europe				1%	3%	6%	8%	10%	11%	12%	13%	3%			
MSCI Pacific		1%	3%	4%	5%	5%	6%	6%	7%	8%	9%	6%			
Emerging Mkts.		3%	3%	3%	3%	3%	2%	2%	2%	2%	1%				
Cont. Small		1%	1%	1%	1%										
UK Small		2%	1%	1%	1%										
% Success Rate	<5%	11%	33%	46%	54%	59%	63%	65%	67%	68%	69%	69%	67%	65%	65
Worst Annual Loss	0%	0%	0%	2%	3%	5%	7%	8%	10%	11%	13%	15%	17%	19%	20

Pay particular attention to the next to last row, which indicates the chance of successfully meeting his needs. One rational response would be to decrease retirement requirements to \$90,000, which would substantially increase your odds of success, or to \$80,000, which would make them certain. And in any case, since no benefit accrues from increasing risk level above 1.2, it makes no sense to use a more daring portfolio than this.

Several comments are in order. First and foremost, once you reach a portfolio risk level that is 100% in equities (at about 1.3 in the above example), further increases in risk dramatically change the relative proportions of the asset classes within the equities portfolio, resulting in portfolios that no one could reasonably describe as "optimal." By the time you reach the highest portfolio risk column on the right, FE puts the entire portfolio into just one asset, the Vanguard Small Cap Index Fund. Ironically, the CAPM, which Mr. Sharpe invented, would instruct us to utilize margin to increase portfolio risk once the allocation has reached 100% stock, rather than concentrate the portfolio in just the highest risk equity asset classes. FE does not incorporate this option, however, presumably because the use of margin is not allowed in 401(k) plans. In fact, within the stock portion of the portfolio, the CAPM would dictate identical equity asset class allocations over the entire range of risk. I spoke to Chris Jones of FE about this, and he explained that the equity asset class percentages move around a bit because there really is no "riskless" asset in real portfolios. However, I'm not entirely satisfied with such wide swings in relative equity class recommendations. What is clear is that FE's recommendations cannot be relied upon at very high levels of risk.

Next, there is no allocation to US small value stocks, and almost none to small foreign stocks. This is of course an artifact of the low returns projections for these assets. One wonders if this is intentional, so as not to unduly upset clients with unconventional portfolios. Lastly, look at the long row of 25% allocations to the S&P 500 and Wilshire 4500. Mr. Jones tells me that the outputs are not cooked, or "constrained" in any way, but this output certainly walks, looks, and quacks like a seriously constrained duck.

Since FE penalizes funds with high expenses and cash positions, it tends to favor index funds. This is not necessarily a bad thing; most retirement investors would be well served by selling their actively managed funds and indexing. However, this is an optimizer, and it is pretty easy to trick it into doing stupid things when you mix active and index funds.

To demonstrate this, I fed 3 assets into the model: a domestic stock fund, an emerging markets stock fund, and the Vanguard Short Term Corporate Fund as the diluting bond asset. First, I used a domestic index fund (Vanguard 500 Index Trust) and an emerging market actively managed fund (Templeton Developing Markets A). Not surprisingly, it returned only a few percent contribution to the Templeton fund over most of the range of risk. This is to be expected—the Templeton Fund, already starting with the low emerging markets expected return, is further penalized by its 2% expense ratio.

But switch things around and use an active domestic fund (Tweedy Browne American Value) and the Vanguard Emerging Markets Index Fund, and you get a really bizarre set of portfolios, starting with 100% Vanguard Emerging Markets at the high risk end. This is because the Vanguard Emerging Markets Fund has a higher expected return than the Tweedy Fund. Even the 1.25 risk portfolio is 50/50, and the low .75 risk portfolio still has 11% emerging markets, plus 45% domestic stock, and 44% short bond. These are definitely not your father's portfolios.

At the end of the day FE is an optimizer. And optimizers are like chainsaws; useful for circumscribed tasks, but dangerous in untrained hands. Even Bill Sharpe can't render the technique completely idiot proof—I have no doubt that some folks will do themselves serious harm with this tool. So be careful; set up FE with only index funds in each asset class, as was done above. Where index funds are not available, use the best actively managed fund you can buy for that asset class. But *do not mix actively managed and index funds from different asset classes in your analyses*. If you do, you will likely get some very strange allocations.

If you fuel the engine exclusively with index funds, you will get allocations which are both reasonable and efficient. It's a fact of life that nobody much likes anyone else's allocations, and I'm not wild about many aspects of the engine's outputs. Still, the above portfolios represent a vast improvement over most folks' 401(k) strategies. FE's most attractive feature is that if you're unhappy with your retirement forecast (accompanied by cute little cloudy/sunny weather icons), you can easily adjust your risk tolerance, savings amount, or retirement income up or down. This feature is a facile and effective way of learning the interplay between savings, liabilities, risk, and return. FE gets a well done here as well.

### FE Meets the Real World: C+

Just as there is a difference between experiencing an airplane crash in a simulator versus in a real airplane, so too there is a large difference between simulating losing 15% of your money in an applet and living through the real thing. Only time will tell what will happen when millions of investors simultaneously sustain significant losses in their FE-designed portfolios. How many will stay the course? (And how many will join in a class action

which might make the tobacco settlement look like lunch at Burger King?) I don't have the answer to this one, and I don't think that that FE does either.

The folks from Palo Alto are both intellectual and social pioneers, and I wish them every success in doing well by doing good. If they fail, we will at least have learned something about the nature of the retirement planning crisis which looms ever larger over our aging population. And if they succeed, then they will not be alone for long, and this too will be a good thing for the millions of small investors saving for their futures.

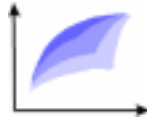
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# Efficient Frontier



William J. Bernstein

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## Historical Returns—Signal or Noise?

Look at enough financial data and you slowly come to the realization that there is much chaos, and little order. Too many times logically appealing patterns appear, only to vanish as the future too soon becomes the recent past.

How to separate the wheat from the chaff, the signal from the noise? There are no easy answers, but at a bare minimum some guidelines are helpful.

The experience of James O' Shaughnessy provides a cautionary tale, as well as some helpful hints. In 1997 Mr. O'Shaughnessy published *What Works on Wall Street*, which rapidly became an investment bestseller and classic. Let me say at the outset that this book is a well-written and researched effort which belongs on the shelves of most investors, particularly those unfamiliar with the perils of growth stock investing.

The author ran Standard and Poor's Compustat tapes, containing decades of company specific financial and returns data. He examined many different investing strategies, and found 6 particularly interesting: investing in companies with low price to earnings (PE), price to book (PB), price to cash flow (PC), and price sales (PS) ratios, as well as stocks with high dividends (Div) and price momentum (or relative price strength—RPS).

He further looked at two different size-related strategies—the whole stock market (or "all market") consisting of large- and medium-sized companies, and the biggest companies ("large stocks"). For the 1952- 94 period (43 years) here's how they stacked up:

	Large Stocks		All Stocks	
	Return (%)	p value	Return (%)	p value
Market	11.41	--	12.81	--
Low PB	14.54	0.25	14.66	0.13
Low PE	12.47	0.07	11.84	0.98
Low PC	14.68	0.02	14.14	0.14
Low PS	13.75	0.05	16.01	0.025

High Div.	13.13	0.12	11.58	0.5
High RS	14.17	0.05	14.44	0.14

First, notice how the value strategies and high relative strength portfolios in general seem to do better than the market. The take home message here is that "value and momentum work well" as investment strategies. (Readers of WWOWS will notice that my return figures are different from the book's. Mr O'Shaughnessy reports average annual returns, whereas the above figures are annualized returns.)

At this point it's worthwhile to interject an abstruse but very important statistical concept. Let's say that we have two series of monthly returns for different market strategies or mutual funds, or even annual batting averages for two different hitters. What are the chances that the difference (if any) between the two strategies, funds, or batters could have occurred by chance? To do this one performs a "t test," which can be found in the statistical package of most spreadsheets.

The t test, somewhat confusingly, yields a "p value," or the probability that the difference between the two means could have been due to chance. The lower the p value, the more likely it is that the difference was due to something else besides chance. Most statisticians draw the line at 0.05. Above this value, suspect chance. Below this value, suspect something else besides chance.

Already we find the author on shaky ground. Yes, the value and RPS strategies produce higher returns, but notice the p values. For example, consider the "large stock" columns. Notice how the low PB strategy produces over 3% more annualized return than the market portfolio. Hooray! Unfortunately the p value in the next column tells us that there is a 25% possibility that this could have occurred by chance.

Judged by this standard, only the large-stock/PC and all-stock/PS strategies seem to beat the market with any degree of assurance.

Things go rapidly downhill from here, unfortunately. Looking at the above table, one might conclude that the large stock/low PB and all market/low PS strategies work the best. And you'd be wrong, at least in a statistical sense. Consider the p values comparing each pair of large stock strategies:

	PB	PE	PC	PS	Div	RPS
PB	--					
PE	0.45	--				
PC	0.78	0.28	--			
PS	0.51	0.86	0.44	--		

Div	0.054	0.36	0.063	0.27	--	
RPS	0.97	0.72	0.96	0.78	0.40	--

Going down the first column, we see that even though the PB strategy returned 2.07% more than the PE strategy (first table) there is a 45% possibility that this could have occurred by chance. In fact, there is not one statistically significant pairwise comparison in the above chart. In other words, *we cannot say with any degree of assurance that any of the 6 large cap strategies is really any better than any of the others.*

Things are not much better for the all stock analysis:

	PB	PE	PC	PS	Div	RPS
PB	--					
PE	0.08	--				
PC	0.76	0.07	--			
PS	0.38	0.016	0.27	--		
Div	0.04	0.55	0.07	0.013	--	
RPS	0.82	0.23	0.7	0.87	0.10	--

Here, at least, it appears reasonably certain that low PS beats both low PE and high dividends, while low PB also beats high dividends. But is low PS the "king of value strategies," as suggested by the author? No—its returns are not statistically distinguishable from the returns of low PB and low PC.

The above vignette highlights the perils of blindly accepting backtested market strategy results. Say you examine 10 different strategies over a 50-year period (as the author did). Naturally you are going to settle on the one with the highest return. How predictive is that of the strategy's success going forward? In other words, was the historical success of the strategy due to chance or to a real, inherent advantage? There is of course no way of telling for sure, but a slew of p values greater than 0.05 should be a red flag.

This also has great import for the mutual fund investor. Hardly a month passes without someone starting a new investment company based on an historically tested strategy. (Mr. O'Shaughnessy has done so, as have LSV Asset Management, to say nothing of Long Term Capital Management. But that one's a whole 'nother article.) Further, let's say that the strategy has been shown to beat the market by 4% per year over the past 20, 30, or 50 years.

It's a good bet that even in the best of circumstances half, or 2%, of that advantage is due to chance, or "data snooping." You can never know for certain how much a difference in return series is signal (that is, reproducible) and how much is noise, but remember that it's no accident that your eye

settles on the most successful strategies only after the fact. Further, the fund's expenses and market costs are very likely to total 2% or more. So in the blink of an eye you're back to the market return, if you're lucky. And if *all* of the strategy's excess return is due to data snooping (a not uncommon occurrence) you are now 200 bp in the hole each year.

The problems detailed above lie at the heart of the behavioralist/efficient market controversy that rages in financial circles today. It's not that I don't trust the behavioralists to manage my money. Look at it this way. Imagine that the behavioralists are represented by your theater producer cousin, and the efficient marketeers by your accountant cousin. You sure know which one whose table you'll want to share at the next family wedding. And you also know who you'll want to execute grandma's estate.

We are all swimming on an investment beach roiled by waves of noise. Be very careful you don't mistake a line of rogue waves for the turning of the tide.

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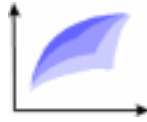


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# Efficient Frontier



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## The Duration of Stocks

*Location: Pearly Gates*

*Cast of Characters: 1) Hy Defees, fund manager, late of the Churnum, Burnum, & Spurnum Group, and 2) Saint Peter*

*Apologies: to Charles Ellis (**Investment Policy**)*

SP: Clue me in, Hy. No one ever told you that snowboarding and Margaritas don't mix? Too bad, such a promising young man.

Defees: You're telling me. The buzz is my American Hubris Capital Depreciation Fund was in line for its fifth star. Life's cruel.

SP: The news at this end ain't good either. The tally looks pretty even, can't tell you if it's yea or nay. (Scratches his beard thoughtfully.) OK, here's the deal. You either go to the place where prices are permanently high, or to the other place where there will soon be an 80% fall in the market, with prices staying permanently depressed.

Defees: Pretty easy choice, I'm going to the realm of everlasting high valuations.

SP: You got it. That's the first set of stairs to the left, then *down*. (chuckles to self) I lose more money managers that way . . . . .

Sad but true. You see, Mr. Deffes is indeed condemned to an Eternity of low returns—he forgot that he was managing his assets for the Hereafter, and not just the next quarter. Had he thought about it a little, he'd have realized that high prices mean low dividends, and vice versa. Since over very long periods most equity return is due to generations of reinvested dividends, he'd have been much better off with lower prices and higher yields.

If you're having trouble following this, let's start with something more basic.



Like a one-year Treasury Bill. A bill is in reality a zero coupon bond, bought at a discount. For example, a 5% bill will sell for \$0.9524 and be redeemed at par. If someone purchases this 5% bill, and a few seconds after it is issued yields suddenly rise to 10%, it falls in price to \$0.9091, with an immediate loss of 4.55%.

But, if our investor holds the bill to maturity he will receive the full 5% return, the same as if there had been no yield rise/price fall. And beyond one year, it's all gravy—our investor can now reinvest the entire proceeds at double the yield. His "point of indifference" is thus the one-year maturity of the bill; before one year he is worse off because of the yield rise/price fall, after one year he is better off.

Now consider a holder of a 30-year 5% treasury *bond*. If soon after purchase at par we see the same rise in yield to 10%, our hapless investor has received a financial kick in the solar plexus—the bond is now worth less than 53 cents on the dollar. (And, in fact, this is precisely what happened to bondholders between 1967 and 1979.) . However, a bond is a very different beast, as it throws off coupons that can be reinvested at the higher yield. Because of this the recovery from disaster takes considerably less than 30 years. In fact, it only takes our hapless bondholder 10.96 years to break even. This 10.96 year period is known in financial circles as the *duration* of the security, and for a coupon-bearing bond is always less than the *maturity*, sometimes considerably so. (For a zero-coupon bond, maturity and duration are the same.)

There are lots of other definitions of duration, some dizzyingly complex, but "point of indifference" is the simplest and most intuitive. (The other useful definition is the ratio of price to yield change. That is, our 30-year bond will decrease 10.96% in price with each 1% increase in yield.)

To reiterate, *after 10.96 years, our unlucky bondholder is better off for the fall in price because of the rise in yield.*

Duration is almost always used to describe bonds, but there is no reason why you can't apply the same concept to stocks, as well. It's a simple matter to model the "duration" of the stock market. For example, stocks are currently yielding 1.4%. If they decline 75%, the absolute amount of the dividend remains the same, but you are now investing those dividends at a yield that is four times higher—5.6%. Eventually this will redound to your benefit, and you will wind up better off than at the lower yield/higher price. How long does it take to catch up? It depends on the beginning yield and the magnitude of the decline. My model shows that with today's 1.4% stock yield, a 25% decline would have a duration of 62 years, a 50% decline 50 years, a 75% decline 33 years, and a 90% decline only 19 years.

Skeptics will point out that a 90% stock decline would likely be associated with a decrease in the absolute dividend amount, but even during the Great Depression the real dividend stream of the Dow decreased by only 25%. In

fact, the 1929-33 bear market provides a superb reality check of the above paradigm. One dollar invested in stocks on Labor Day 1929 declined in value to 16.6 cents by July 1, 1932 and increased back to par by the end of January 1945—less than 13 years after the bottom.

The dividend yield was 2.6% in September 1929, and for the 30 years after that earnings growth was only 1.8%. Thus, had the crash not occurred then stocks would have returned 4.4% per year, resulting in a "break-even" point with what actually occurred of January 1952, or 22 years, almost exactly the same period predicted by the duration model. Viewed from this perspective, today's market is a good deal more frightening than that of 1929, since a 75% stock decline produces a duration of 19 years at the 2.6% 1929 yield, versus 33 years at the current 1.4% yield.

Certainly, such a wrenching market decline today would wreak havoc on the financial and social structure of the republic, as it did 70 years ago. But at the same time, today's high prices and resultant low yields are no great blessing either.

Is there a way that an individual can shorten the duration of her stock portfolio? Yes. Since the size of the yield influences duration (the greater the yield, the shorter the duration), you can effectively increase the "yield" of your portfolio by adding to it every month. Let's start with the 75% price fall/1.4% yield/33 year duration scenario referred to above. If you start with \$10,000 and neither add nor withdraw from your account, you will break even at the 33 year duration. But add in \$200 per month and you break even at just over 11 years.

For the truly long-term investor, the results of a prolonged bear or bull market may very well prove of little consequence, or even produce surprisingly paradoxical results. But in reality, equanimity to market declines depends on time horizon. If you're retired and living off savings, you will neither have enough time to get over the duration hump nor be able to make the contributions to shorten it. If you're a boomer who is still adding to a decent-sized nest egg, then you will likely have plenty of time. And if you're a twenty-something just beginning to save, then get down on your knees and pray for the Crash of 1999.

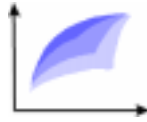
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## Conspiracy Theory

*Efficient Frontier's* notariety has brought me into increasing contact with members of the fourth estate, and I find myself occasionally sharing with these folks my Mittyesque fantasy of becoming a financial journalist. This usually gets a good chortle; "Hah, Bernstein, you sure screwed the pooch on that one. Don't you realize that if you won't write about active management you've lost 90% of your stories?"

Which gets me to the price-finding apocalypse. An entire generation of finance academics has learned that the fastest way to identify the pick of the litter is to explain the efficient market hypothesis to a Finance 101 class. At the end of the lecture, one hand usually goes up slowly, and a voice quavers, "But ma'am, if everybody invests passively, then who is left to analyze securities and determine their correct price?"

This is in fact just starting to be a real worry. Within a few years over half of the country's biggest investment pool—pension money—will be indexed. And small investors will not be too far behind. The rear will be brought up by non-US investors. Who then finds prices for the market?

Now I know the answer. Like the poor, active managers and their shareholders will always be with us. It's a stretch to call the relationship between money managers and the financial press a "conspiracy," but it is clear that each party desperately needs the other. Without active managers there are no stories, and without glowing manager interviews there are no pigeons. (Or, in Keynes' aviary, "gulls.") The symbiosis between money managers and the press is hardly unique—one only has to think about fashion, automobiles, and travel, to name but a few. But it is hard to come up with one with such a large economic impact. Very few automobile purchasers are silly enough to buy on the basis of a favorable review in *Car and Driver*, but a glowing manager story can move vast amounts of capital.

So our capital markets will be safe as long as financial journalists need to eat. The irony is that if the day ever arrives that almost everybody indexes the few active managers left shall indeed produce excess returns. Fortunately for the rest of us, this eventuality will be prevented by the large residua of press-related actively managed money.

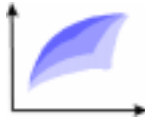
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## Historical Returns and Valuation Data for US and Foreign Stocks

I'm frequently asked for historical returns and valuation data for US stocks. Robert Shiller, Professor of Finance at Yale, has made available [annual returns, earnings, and dividend data back to 1871](#). His excellent [home page](#) is also worth a visit.

Another frequent request is for returns data on foreign stocks. Morgan Stanley has finally gotten with it and placed the various MSCI national and aggregate indexes online [here](#).

Both of the above sites are a boon to amateur portfolio modelers, or to small investors who simply want an idea of the returns and risks of investing here and abroad.

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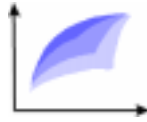
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## An Apology for a Promise Delayed

In [the piece on fund expenses and turnover](#) in July's *EF* I noted that high fund turnover had an unexpectedly positive influence on the returns of growth funds. I promised a fuller analysis of the interplay between return, turnover, and style in this issue.

Unfortunately (or fortunately, depending on your frame of reference) the September issue is usually written on a laptop far, far from home, and I've decided that before writing the piece I'd like to confirm the results with an out-of-sample look at the 1989-93 data. (The original piece having examined the 1994- 98 data.) Since the relevant database resides in *EF*'s Computational Sciences Museum (my spouse's basement PC) this piece will have to await my return home, and will unavoidably be delayed until the January issue.

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