



UNDERSTANDING CORRELATION & DIVERSIFICATION

In this paper, we address correlation and diversification and their critical role in the success of any portfolio. We also describe how “alternative assets,” including tactical investment strategies, can provide low-correlated returns and, hence, diversification for an investor’s holdings in stocks and bonds.

Diversification is an often-used buzzword in the investment world. But what does it really mean?

What Is Diversification?

Imagine a basketball team with five point guards. It would be a great lineup for freezing the ball to run out the clock at the end of a game but it wouldn’t work for a whole game, much less a whole season. Who would defend under the basket? Who would get rebounds?

Or picture a baseball team with nine pitchers. There’d be plenty of relief to face different kinds of batters yet no manager would put nine pitchers on the field. With such notoriously poor hitters, the team would probably never score a run, so all that great pitching would still be a losing strategy. Every sports fan knows that you need a diversity of skills to win.

What does diversification mean for investors? The sports analogy really isn’t so silly. Many people think that they are diversified simply if they own a lot of different stocks or different mutual funds. However, if all the stocks are technology companies, you aren’t really diversified just because you own a bunch of them. Even owning shares of a dozen mutual funds doesn’t necessarily mean diversification – not if they are all large-cap growth funds.

What Is Diversification?

Diversification means strength through variety. If each component of a portfolio does the same thing, then the portfolio is no stronger than any one component, much like the basketball team comprised of just point guards. If each piece does something different, then the whole can be greater than the sum of its parts.

What do we mean by a stronger or better portfolio? We measure investment results in terms of returns and risk. Let's say that the long-term average annual return of the U.S. stock market has been 11% and that of the broad U.S. bond market has been 7%. Does this mean that stocks have been better investments than bonds? Obviously not, because these return statistics don't tell the whole story. By themselves, the returns do not say anything about risk.

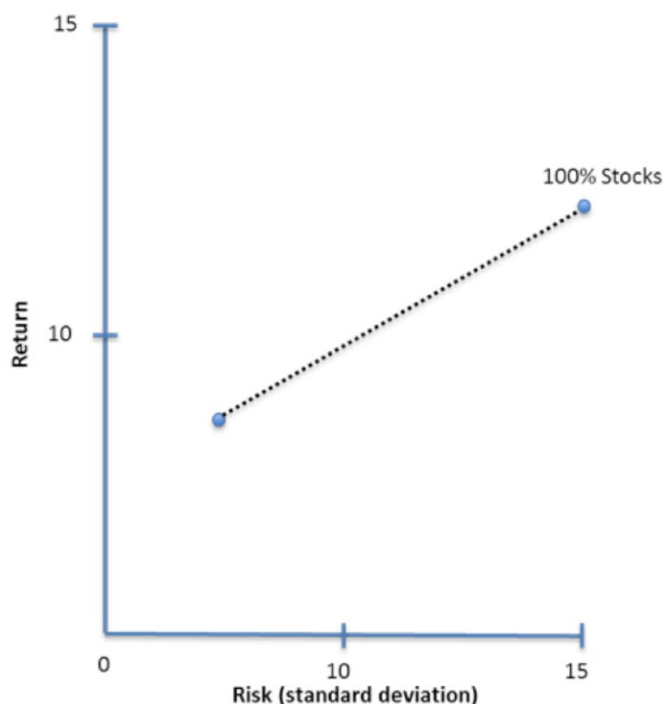
Risk can mean different things to different people, but one useful way to think about it is this: How reliable, or steady, are the long-term averages? Does a 10% average mean 10% each and every year, or does it mean a more volatile ride of up 30% one year and down 10% the next? In other words, how tightly does the history conform to these averages?

The statistical term for the spread of data around an average is "standard deviation." With an annual average return of 10%, a standard deviation of zero would mean that returns were exactly 10% every year.

A more accurate standard deviation of 20% (for stocks) would mean that, with an average of 10%, returns would be between 30% and -10% about 70% of the time. If that spread isn't concerning enough, fully 30% of the time, the returns would be even more extreme: greater than a 30% gain or less than a 10% loss.

In the chart below, we graph risk and return using actual data from January 1, 1976 through February 28, 2015. This is the longest period for which we have data on both indexes. Over this 39-year (plus two months) period, the S&P 500 returned an average annualized return of 11.64%, with a standard deviation of 15.01%. The Barclays Aggregate Bond Index averaged a 7.86% return, with a standard deviation of 5.46%¹. On average, bonds have delivered lower returns than stocks, but they have been less volatile.

As the chart shows, stocks outperformed bonds (vertical axis), but at the price of greater volatility (horizontal axis).



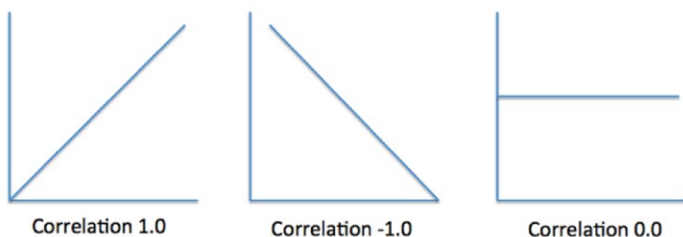
Source: Morningstar Direct, January 1, 1976 through February 28, 2015

¹ Assumes annual rebalancing to S&P 500 and Barclays Aggregate (January 1, 1976 through February 28, 2015).
Data source: Morningstar Direct

Low Correlation Brings Diversification

In the chart above, we draw a straight line between the two risk/return coordinates to make a point. You might expect that you could build a portfolio of stocks and bonds that would have put you at any point on this dotted line. However, this is where diversification comes into play. You would be on this line only if stocks and bonds were perfectly correlated, but they are not.

Correlation refers to how two variables (or investments) behave in the same setting. If one investment goes up every time another goes up, and the two go down together as well, then they have a correlation of 1.0, a perfect positive correlation. If the two investments move in opposite directions all the time, they would have a correlation of -1.0, a perfect negative correlation. If the movements of the two investments show no relationship at all, they have zero correlation.

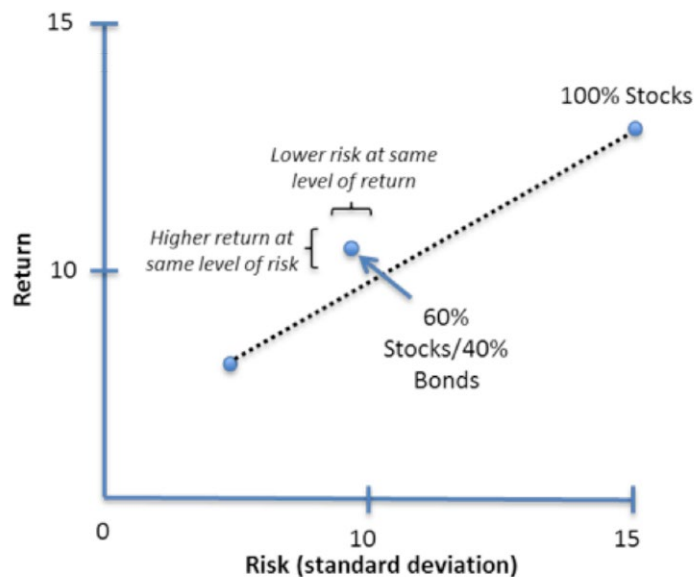


Investing occurs in the real world, so we will rarely see perfect correlations of 1.0 or -1.0. The surprising fact is that any correlation below 1.0 provides some diversification. To illustrate this, let's look at the prototypical U.S. investor holding 60% in stocks and 40% in bonds. The S&P 500 had a correlation of -0.07 with the Barclays Aggregate Bond Index from 1999 through 2014.

This means that stocks and bonds had a low negative correlation across the entire period, though it is important to note that the correlation was higher and lower for shorter phases within the period. (In fact, the long-term correlation between these indexes is +0.22, indicating a low but positive correlation, from January 1, 1976 through February 28, 2015.)

Because stocks and bonds have such a weak correlation, the hypothetical 60/40 investor would have experienced a combination of return and risk located above the straight line, achieving an annualized return of 10.47%, with a standard deviation of 9.72%.

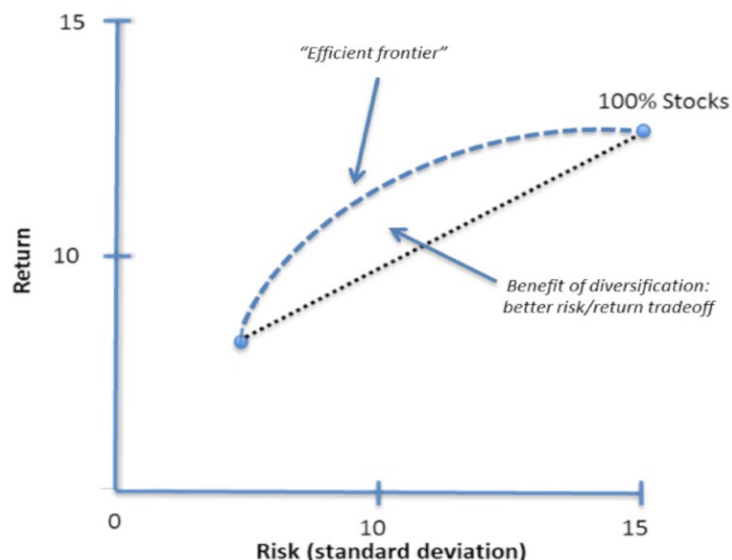
The point above the dotted straight line is a good place to be. Hypothetically, the investor could move straight up from the dotted line, achieving a higher return at the same level of risk. Alternatively, the investor could move straight left from the line, which would reduce risk but achieve the same level of return. Points on the line are "inefficient" in the sense that you could find a better combination of return and risk by moving up (more return) or to the left (less risk).



Source: Morningstar Direct, January 1, 1976 through February 28, 2015

In fact, the lower the correlation is between the two asset classes, the greater the benefit of diversification will be – other things being equal. If you could find another asset class with the same return and standard deviation as the bond market but with an even lower correlation with stocks, you could achieve even greater diversification benefits.

As illustrated below, when combined with stocks, a non-correlated asset would open up an "efficient frontier" of various portfolio combinations that dominate points on the straight line.



Source: Morningstar Direct, January 1, 1976 through February 28, 2015

The Search for Low Correlation: “Alternative Assets and Alternative Investment Strategies”

So far, we have discussed stocks and bonds, which are, along with cash, generally considered the “traditional” asset classes that people and institutions have invested in. A buy-and-hold approach is also traditional. In the last few years, investors have gained access to many new asset classes and strategies, including the following:

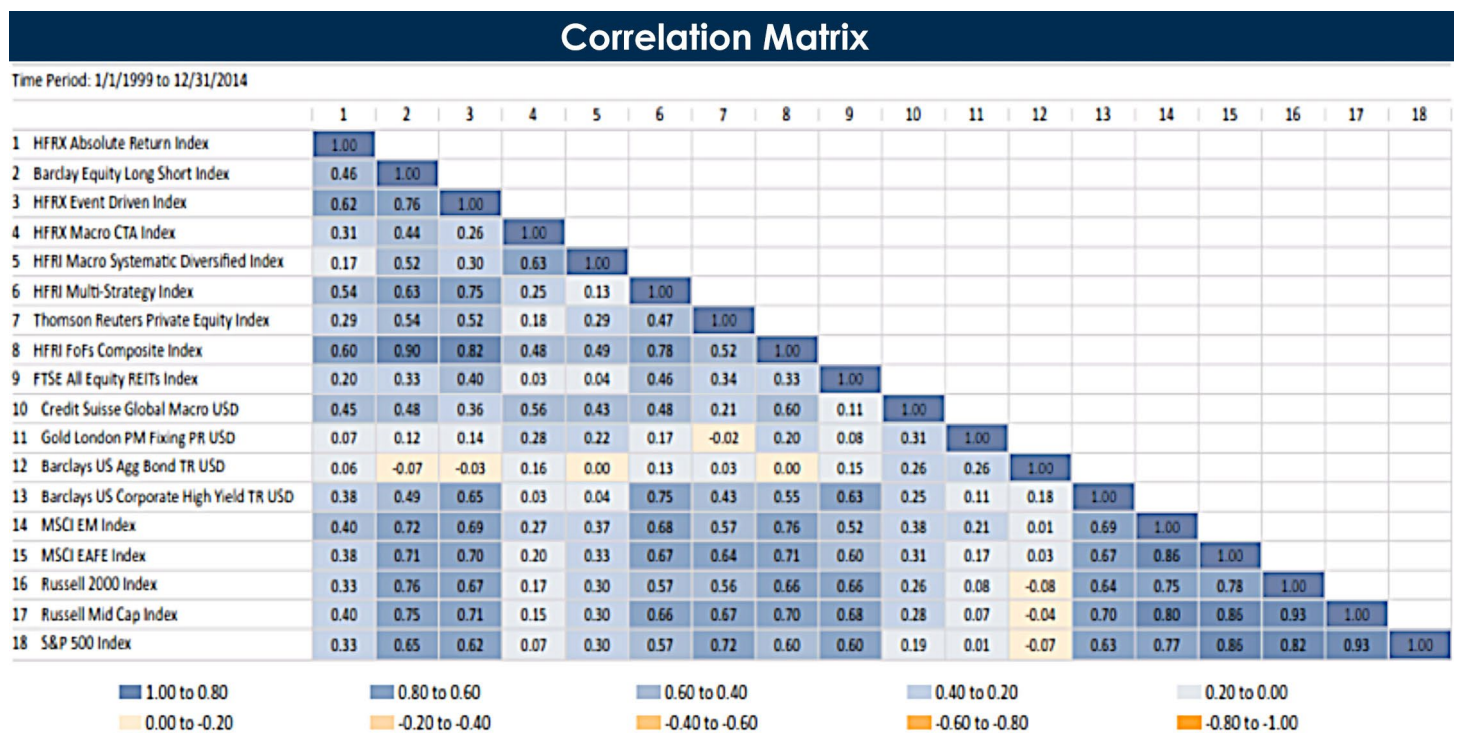
- **Real (non-financial) assets such as commodities & real estate**
- **Hedge funds**
- **Private equity**
- **Tactical investment strategies**

These asset classes are generally called “alternative investments” simply to distinguish them from traditional holdings in stocks, bonds, and cash and from a more passive buy-and-hold strategy. Just as there are many categories of stocks (such as

industrials, technology, financials, health care, etc., which range in size from large-cap to small-cap and value to growth) and bonds (such as corporate, government, mortgage, and municipal), there is a broad and diverse array of alternative assets and investment strategies.

What is really important about these alternatives is that they can provide investors with exposure to fundamentally different return patterns: different return expectations, different risk levels, and different correlations with other asset classes.

A key indicator of diversification potential is the correlation statistic. The chart below shows correlations for a sampling of asset classes, both traditional and alternatives, based on returns from 1999 through 2014.



Source: Morningstar Direct



It is crucial for investors to understand these correlations to gauge how well diversified they are. All of these asset classes presented above achieved positive returns from January 1, 1999 through 2014, ranging from an over 12.06% annualized return for private equity, 9.58% for global macro, 8.40% for long/short equity, 7.91% for systematic diversified, and 5.22% for the S&P 500 index to the lowest return of 2.79% for absolute return strategies. But during that 15-year period, their gains and losses occurred at different times, which is why there are different correlation coefficients for each pair of asset classes (see Appendix A).

Here is how you read the correlation matrix. Each asset class is a row in the matrix and each asset class is repeated in the columns. Therefore, the correlation of each asset class to itself is 1.0 (note the diagonal line of dark purple squares).

Now compare the various assets to the S&P 500, the last line (#18) of the matrix. First, let's see how bond returns correlated with stocks. The Barclays Aggregate Bond Index is line #12. Looking across the S&P 500 Index, line #18 to column #12, you find the -0.07 correlation that we mentioned earlier. This low correlation is one reason that the addition of bonds to a stock portfolio helps create a more efficient return.

The lowest correlations on the matrix are highlighted in yellow. Among these, note that the Barclays Aggregate Index has a zero or slightly negative correlation with three other asset classes in addition to the S&P 500: 1) the Barclay Equity Long Short Index, 2) the HRFX Event Driven Index, and 3) the HFRI Macro Systematic Diversified Index. Boxes shaded in darker shades of blue indicate progressively higher correlation coefficients.

Which of these asset classes provides the best diversification potential when added to a portfolio of stocks and bonds? A good starting point would be asset classes with low correlations to both the S&P 500 (stocks) and Barclays Aggregate (bonds). The following table highlights the five indices with these characteristics:

Asset class	Index Proxy	Correlation with S&P 500	Correlation with Barclays US Aggregate Bond
Absolute return funds	HRFX Absolute Return Index	0.33	0.06
Commodities	HFRX Macro CTA Index	0.07	0.16
Tactical strategies	HFRI Macro Systematic Diversified Index	0.30	0.00
Global macro strategies	Credit Suisse Global Macro USD	0.19	0.26
Gold	Gold London PM Fixing PR USD	0.01	0.26



Real-World Experience

We have argued that investors should seek low correlations to diversify. Some historical examples show how low correlation – and different volatilities – can bring dramatically different outcomes for different investments.

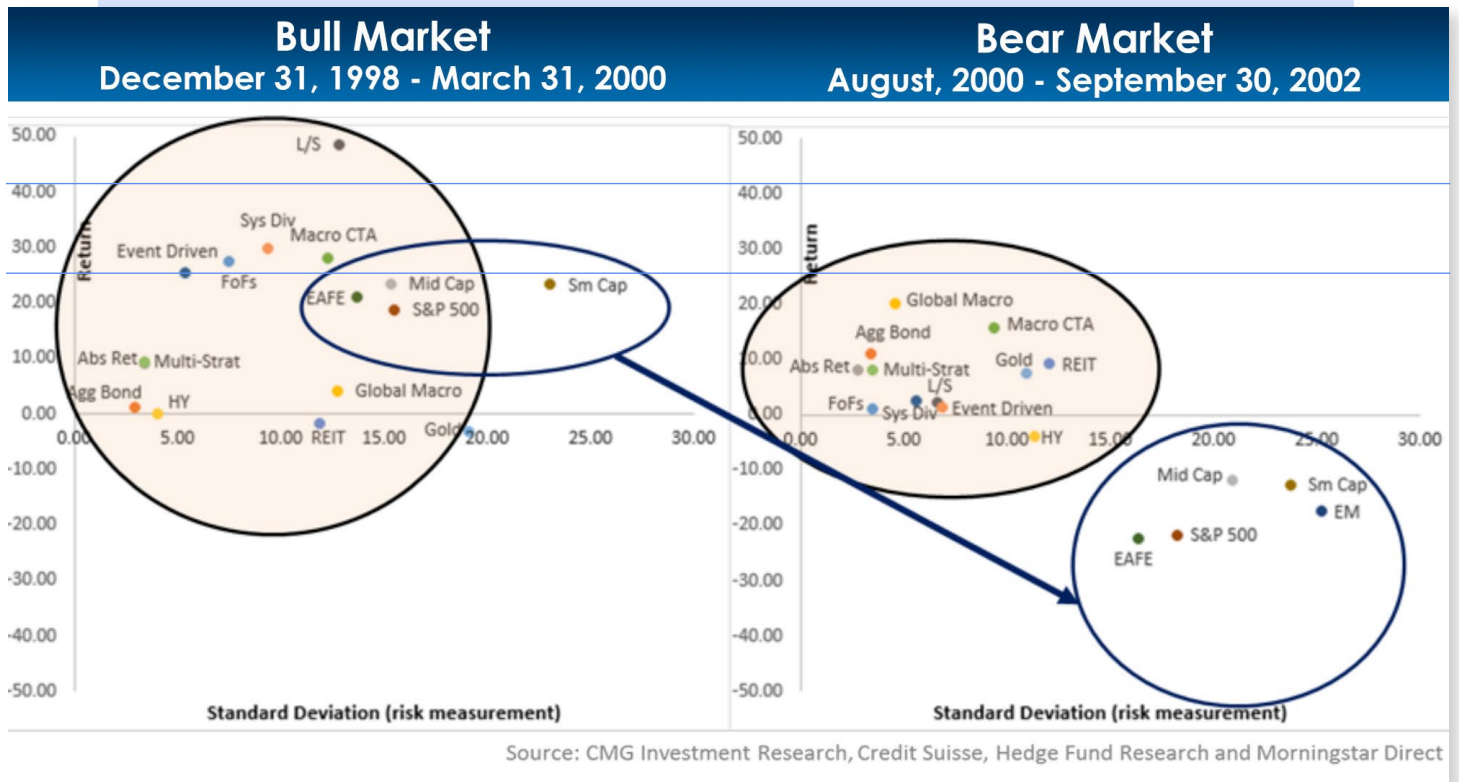
The next two charts display the return and risk (standard deviation) of various assets commonly owned by investors in two different bull market and bear market periods. The black circles (shaded in light orange) in the upper left part of both charts highlight the returns for alternative and tactical asset classes. The blue circles highlight the more traditional investments, including the S&P 500, mid-cap, small-cap, emerging market & developed market indexes.

The vertical axis on the left (measuring 0 to 50.00) in each period reflects percent returns and the horizontal axis (measuring 0.00 to 30.00) in each period reflects the degree of risk (as measured by the standard deviation). Risk increases from left to right. The return is highest at the top and lowest at the bottom. High returns with less risk – toward the upper left – are preferred.

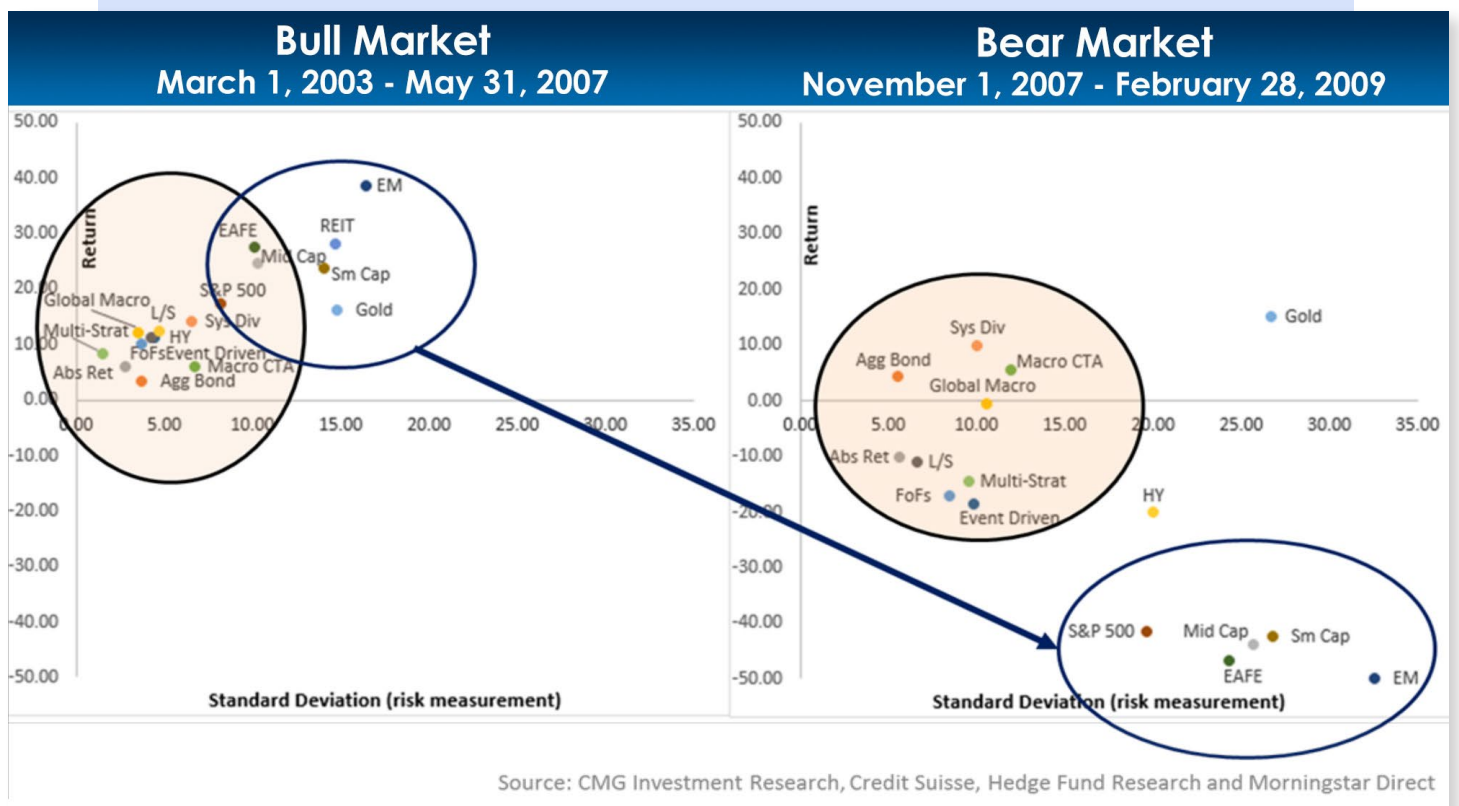
In the bull market periods, December 1998-March 2000 and March 2003-May 2007, the alternatives circle and the traditional circle had similar returns (same height on the Y-axis), though traditional asset classes were more volatile (farther right on X-axis).

However, in the two bear market periods, August 2000-September 2002 and November 2007-February 2009, traditional asset classes suffered large losses, while alternative asset classes did much better. By combining the traditional stock and bond investments with various alternatives, an investor can dampen the volatility of their overall portfolio.

The following chart shows the return and risk characteristics for the **1998-2000 Bull market period** and the **2000-2002 Bear market period**.



As illustrated in the next chart, even during **the great financial crisis**, investors were well served by diversifying to include low-correlating assets.



Why Volatility Matters

Earlier in this paper, we talked about risk in an abstract sense, equating it with how bumpy the ride is on the way to our financial goals. We said that risk can be measured by the standard deviation of returns – that is, how closely our actual experience, year in and year out, looks like the long-term averages. If an investment brings the same return every year, then it has little or no risk. The more returns jump around from year to year (or day to day), the greater the risk will be. If the spread of yearly returns is higher, the standard deviation will be higher.

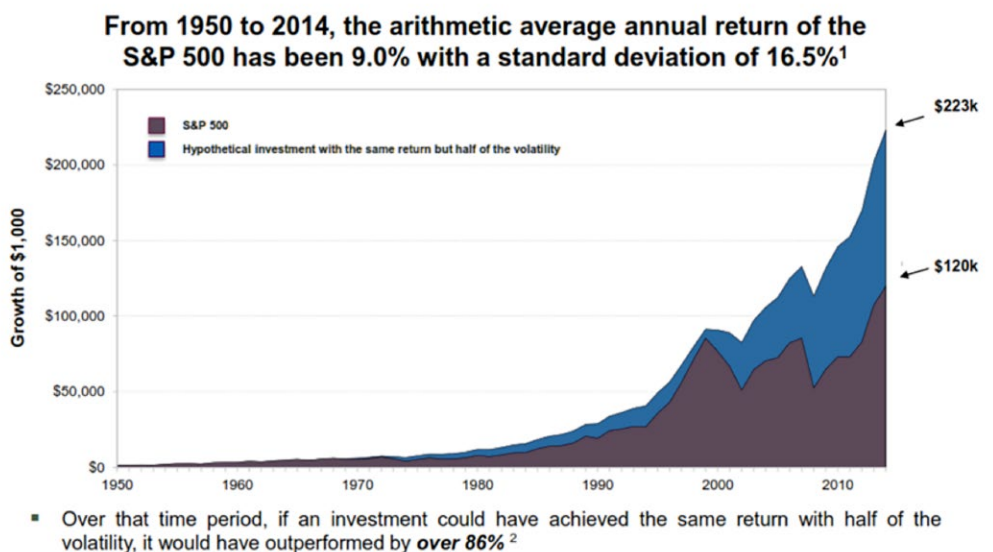
Smooth is always better than choppy because nobody likes to see their portfolio lose value – even if the drop is temporary and the portfolio eventually bounces back. In the moment, you never know whether the drop is temporary. Only in hindsight do you tend to smooth it over mentally and feel better about it.

In other words, steadier returns make you feel better, but, in the long term, does it really matter?

Higher volatility actually means lower returns in a mathematical sense as well. People tend to think about investment returns over long periods as the mathematical average of each year's returns. So an investment of \$100,000 that is up 10% each year for two years (average of 10% per year) is equivalent to an investment that is up 30% in the first year and down 10% in the next (average of 10% per year). But they aren't the same. After the two years, the first \$100,000 investment would be worth \$121,000. The second \$100,000 investment would be worth \$117,000. The difference of \$4,000 is the effect of compounding. Compounding is friendly to steady returns but doesn't like choppy returns, particularly negative ones.

On the path to a desired goal – whether it is retirement, a college education, or something else – an optimal portfolio is one that minimizes the size of declines and thus enables the mathematics of compound interest to work in your favor over time. The chart below illustrates how these different paths, smoother vs. choppy, are magnified over time. It shows how a 9% arithmetic average annual return achieved with a standard deviation of 8.25 outperformed a 9% return achieved with a standard deviation of 16.5 by 86% from 1950 to 2014 (“Top Endowments Focus on Reducing Portfolio Volatility”).

Top Endowments Focus on Reducing Portfolio Volatility



Note(s): The above information is hypothetical and is meant as an illustration only of consistent compounding of an original investment. Unmanaged indices are for illustrative purposes only. An investor cannot invest directly in an index. Past performance is not a guarantee of future results.

Source(s) 1. Standard & Poor's and Bloomberg 2. Morgan Creek Capital Management LLC.

Most investment professionals agree that diversification is the most important component in an investor's long-term financial success. Our goal, then, is to round off the sharp corners that the capital markets present to us.

Asset allocation to a broad and diverse set of market risks is the tool that you use to shape the risk and return characteristics of your portfolio. In the next paper, we will weave the concepts of correlation and diversification into a broader discussion on assembling a portfolio.

Conclusion

Carefully formulating a Strategic Asset Allocation investment plan is crucial to an investor's success in meeting his or her goals. Modern Portfolio Theory (MPT) underpins most approaches to Strategic Asset Allocation. MPT attempts to maximize portfolio expected return for a given amount of portfolio risk, or equivalently minimize risk for a given level of expected return, by carefully allocating the portfolio among various asset classes.

Price momentum has been rigorously tested by the academic community.² Tactical Investment Strategies are investment strategies that seek to identify and profit from price momentum. Broadening the universe of available investments to include Tactical Investment Strategies and other investment risks (such as REITs, gold, silver, currencies, timber and water) can enable the investor to construct a portfolio that has collectively lower risk than any individual asset. The key to an improved tradeoff between risk and return is the concept of low correlation.

In a subsequent paper, we will explore the total portfolio solution. We call this *Enhanced* Modern Portfolio Theory.



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Stephen Blumenthal founded CMG Capital Management Group in 1992 and serves today as Chairman, CEO and CIO. Steve authors two weekly newsletters – [Trade Signals](#), which focuses on investor sentiment and primary market trends, and [On My Radar](#), which looks deeper into the news and issues that impact portfolio decisions. Steve also writes for [Forbes](#), is a speaker at investment conferences across the country and is a sought-after contributor to numerous financial publications.

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² Chan, Lakonishok, and Jegadeesh (The Profitability of Momentum Strategies), Moskowitz & Grinblatt (Do Industries Explain Momentum?), Stivers and Sun (Market Cycles and the Performance of Relative Strength), Hurst, Ooi and Pedersen (A Century of Evidence on Trend-Following Investing), Daniel, Hirshleifer, and Subrahmanyam (1998) and Hong and Stein (1999), where overconfidence and momentum traders are featured, respectively. More recent papers, with alternate approaches, present evidence that risk may be importantly tied to momentum profits (Ahn, Conrad, and Dittmar, 2003; Liu and Zhang, 2008; Agarwal and Taffler, 2008), Griffin, Ji, and Martin (2003) and Dr. Christopher Geczy and Mikhail Samonov (212 Years of Price Momentum).

Appendix A

Performance

Time Period: 1/1/1999 to 12/31/2014 Calculation Benchmark: S&P 500 TR USD

	Return	Std Dev
HFRX Absolute Return Index	2.79	3.28
Barclay Equity Long Short Index	8.40	6.90
HFRX Event Driven Index	5.44	6.20
HFRX Macro CTA Index	4.87	8.28
HFRI Macro Systematic Diversified Index	7.91	7.87
HFRI Multi-Strategy Index	5.96	4.43
Thomson Reuters Private Equity Index	12.06	21.52
HFRI FoFs Composite Index	5.04	5.50
FTSE All Equity REITs Index	11.51	21.73
Credit Suisse Global Macro USD	9.58	6.17
Gold London PM Fixing PR USD	9.37	17.90
Barclays US Agg Bond TR USD	5.28	3.47
Barclays US Corporate High Yield TR USD	7.16	9.75
MSCI EM Index	10.04	23.10
MSCI EAFE Index	3.92	17.20
Russell 2000 Index	8.20	20.29
Russell Mid Cap Index	9.46	17.35
S&P 500 Index	5.22	15.14

Source: CMG Investment Research, Credit Suisse, Hedge Fund Research and Morningstar Direct



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