



## Low Volatility Investing is Just a Bet on Falling Interest Rates

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### Executive summary

- Low volatility equity strategies are a tilt towards defensive, bond-like sectors.
- Low volatility strategies and bond-like sectors have a bias to perform like bonds, outperforming during periods of falling interests.
- Low volatility strategies benefit from the diversification effect of the embedded interest rate exposure, which bond-like sectors extract more efficiently.
- The higher Sharpe ratio of low volatility strategies is explained by the diversification effect from bonds, not a return premium.
- Low volatility strategies should underperform in a period of rising interest rates

### Introduction to Low Volatility Strategies

Smart beta and especially low volatility investing, has become the latest fad in the investment management business. The last decade has seen a proliferation of products under the category of smart beta, which promise higher returns with lower volatility than traditional indices. We have heard this promise before. First from traditional active management and more recently from hedge funds. As with all attempts at beating markets, in aggregate, they will fail and earn the market return minus fees and costs. And as with any investment strategy that gains faddish popularity, common sense and experience tell us that low volatility investing has run its course but we look further in this paper to understand why.

Low volatility strategies have been sold using backtested data, academic studies dating back to 1972<sup>1</sup> and of course higher than index returns over the last decade. The earliest data series on low volatility factors go back to 1963, which means most of the data is during a period of falling interest rates. We want to understand whether these strategies have a bias to falling rates which would have provided a tailwind to their historical returns. We show the similarities of these strategies to both high dividend yield strategies and exposure to defensive sectors, which have data back to 1927 and 1926 respectively, and use the longer term data to study the performance of low volatility strategies through the secular periods of rising and falling interest rates each of which lasted roughly four decades.

Finally, others have put forth explanations for the existence of the low volatility risk premium including structural reasons<sup>2</sup>, behavioral reasons<sup>3</sup> and even regulatory constraints. We study the behavior of this risk premium in different economic environments such as rising and falling growth expectations to see whether it has a role in the context of strategic asset allocation. We further use this understanding to explain whether low volatility strategies deliver an additional risk premium or not.

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<sup>1</sup> Jensen, Michael C., Black, Fischer and Scholes, Myron S. (1972), "The Capital Asset Pricing Model: Some Empirical Tests", Studies in the theory of Capital Markets, Praeger Publishers Inc., 1972

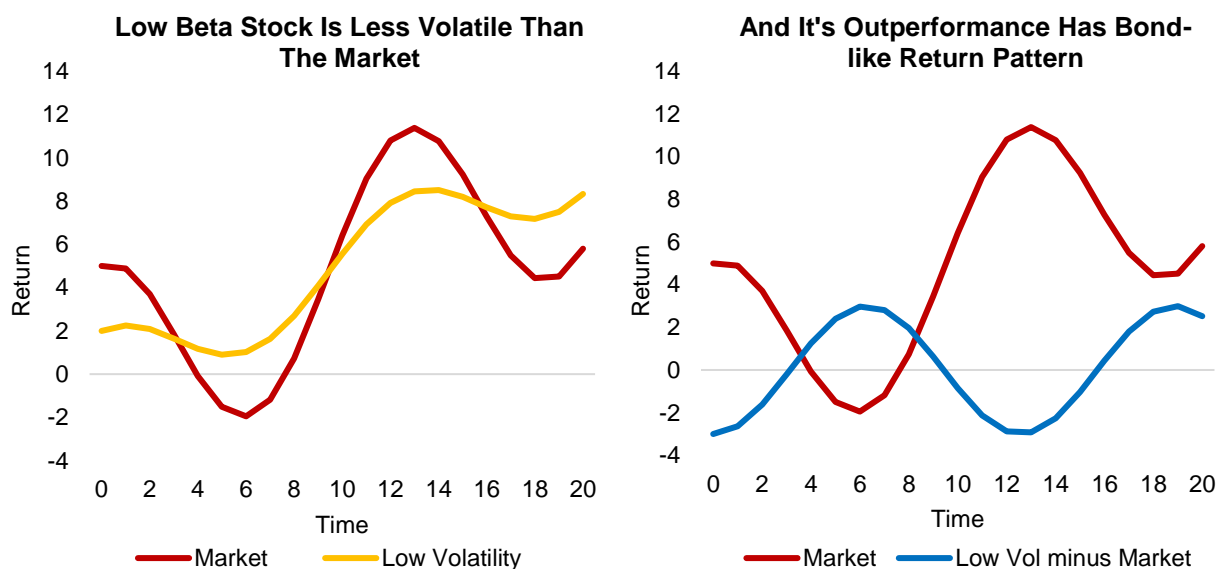
<sup>2</sup> Frazzini, Andrea and Pedersen, Lasse Heje, "Betting Against Beta", May 10, 2013

<sup>3</sup> <http://www.etf.com/sections/index-investor-corner/swedroe-explaining-low-vol-anomaly>

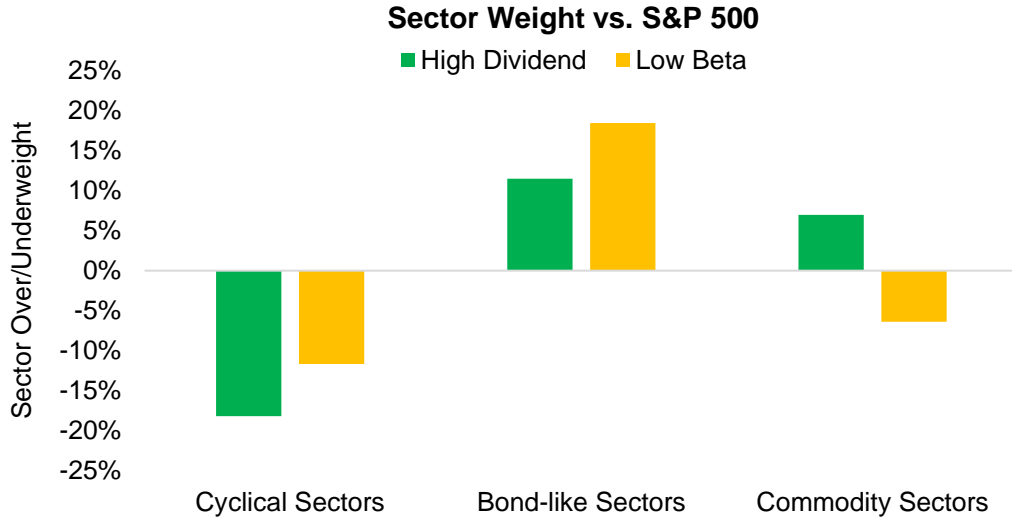
## Low Volatility Investing Is An Overweight To Bond-like Sectors

Low volatility investing is simply overweighting securities that have historically exhibited lower price volatility than market averages. In its basic form, it disregards any fundamental security analysis and claims the ability to outperform market averages using only historical price data. This notion goes against what market efficiency theory says with regards to all available information being incorporated into market prices. There are many measures used to define low volatility: daily volatility, monthly beta to the broad market, and idiosyncratic or excess volatility. Regardless of which measure is utilized, all move portfolios in the same direction, to overweight companies with more earnings stability, many of which are in defensive sectors such as food staples, tobacco, healthcare, and utilities. **We think of these sectors as bond-like due to their greater earnings consistency.** While this sector tilt is not the entirety of the low volatility effect, it captures the theme.

Equities with lower volatility than the market can be conceptually illustrated by the pictures below. The picture on the left shows how this type of stock goes up and down less than the market. All equities will have a significant part of their returns driven by movements in the broad equity market. To understand any economic biases in the low volatility return stream, we need to strip out this equity risk premium and analyze only the remaining excess return. Subtracting the two return streams, gives a return pattern like the blue line on the right. This return stream goes up when equities are falling (i.e. falling growth environment) and goes down when equities are rising (i.e. rising growth environment). This excess return pattern on the right is like a risk-free government bond.



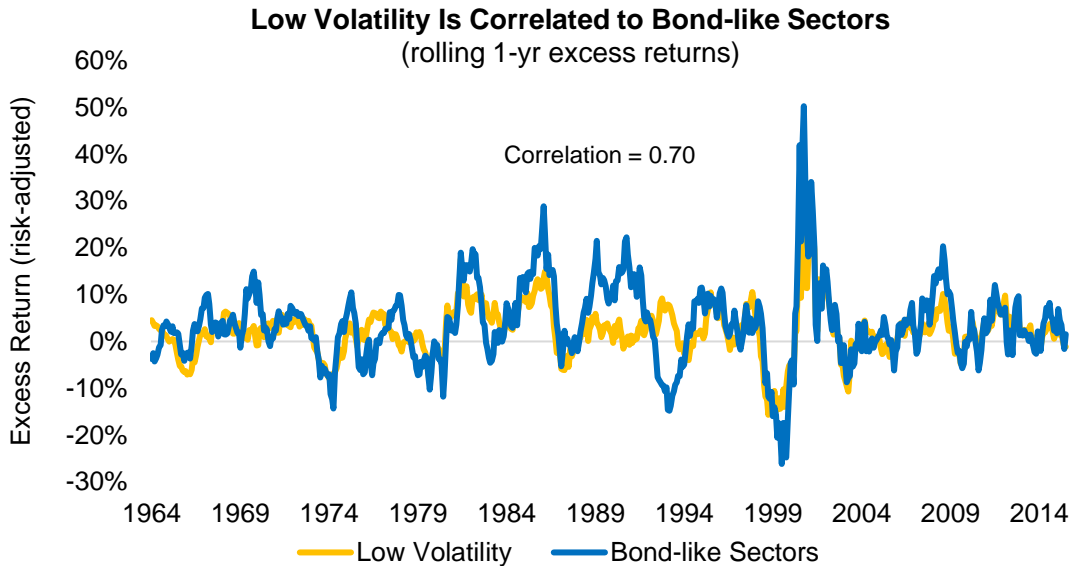
We expect defensive sectors like tobacco, food staples, healthcare, telecom, and utilities and therefore low volatility strategies to behave in this bond-like manner. Below we show the sector over- and underweights for low volatility ETFs available today and compare these sector tilts to high dividend paying strategies. Their sector tilts are very similar and away from cyclical sectors like industrials and technology and towards bond-like sectors such as staples, healthcare and utilities.



Source: Bloomberg, Greenline Partners analysis. Cyclical sectors are Consumer Discretionary + Financials + Industrials + Technology. Bond-like sectors are Consumer Staples + Healthcare + Telecom + Utilities. Commodity sectors are Energy + Materials. Low Beta is the average of the sector weights for min volatility ETFs: USMV and SPLV. High Dividend is the average of the sector weights for high dividend yield ETFs: HDV and DTD. Data as of April 8, 2016.

The performance of high dividend strategies is not solely driven by a sector tilt to bond-like sectors as there is also a valuation aspect to higher dividend paying companies, but we expect the sector bias to be moderately consistent over time as bond-like sectors like staples, telecoms, and utilities tend to pay higher dividends than the average equity and hence this indicates an overlap with low volatility. We therefore also include this strategy in our studies.

To see the historical similarity between low volatility strategies and bond-like sectors we strip out the equity beta to see the excess return performance. The chart below shows the excess return of the low volatility and bond-like sectors, after subtracting out the volatility-adjusted equity risk premium. Both portfolios are highly correlated to each other and should therefore deliver outperformance during the same economic environments.



Source: Ken French Data Library, Federal Reserve, Barclays, Greenline Partners analysis. Data from Jul 1963-Dec 2015.

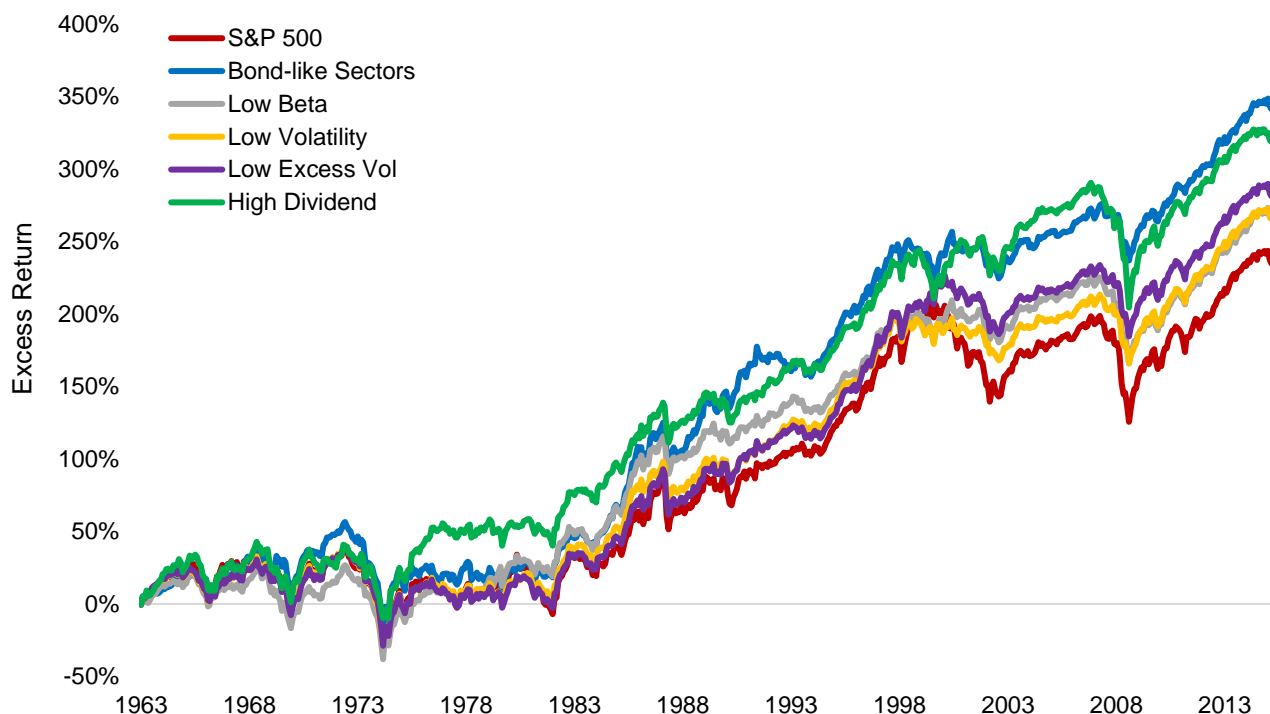
We discussed bond-like sectors and their tendency to behave like a bond in our paper from Dec 2015<sup>4</sup>. Given this tendency for these sectors and therefore low volatility strategies, we want to understand whether the additional risk premium in low volatility strategies is in fact driven by changes in interest rates and the implications for this asset class.

### Low Volatility Strategies Benefited From Falling Interest Rates

As we have written about before, we think that the economic factors of growth and inflation explain much of the market movement of different asset classes. Therefore, the primary asset classes: equities, interest rates, and commodities can be used to replicate the behavior of most complex asset classes. We use this framework to understand the behavior of the low volatility risk premium.

We start by looking at the long term performance of low volatility strategies including bond-like sectors and high dividend yield portfolios. From the chart below we can see that most of the outperformance of these strategies came during the 2000's, after the crash of the dot-com bubble. This period was one defined by falling growth expectations which drove interest rates down over the decade. It is noteworthy that both the high dividend construction and bond-like sectors outperformed today's most popular low volatility strategies.

**Most of Outperformance by Low Volatility During Decade of 2000's**



Source: Ken French Data Library, Greenline Partners analysis. Data from Jul 1963-Dec 2015.

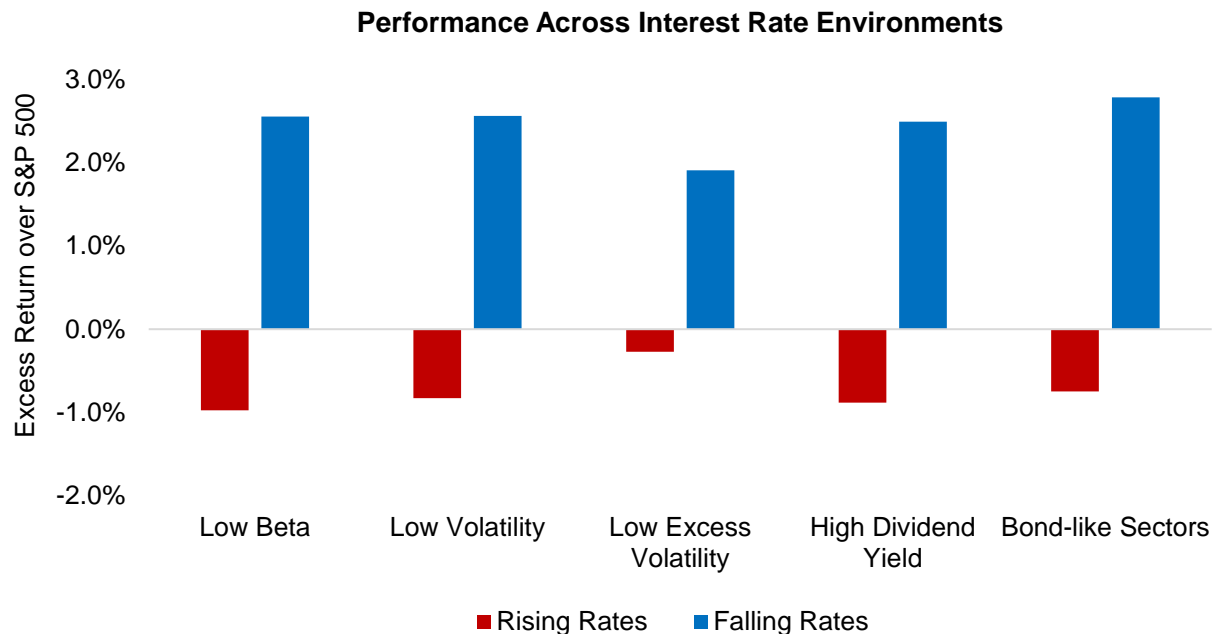
The table below summarizes the historical performance of each low volatility portfolio construction relative to the broad market S&P 500 index. We can see that in each case, the low volatility portfolio outperformed the S&P 500 with lower volatility. The average historical outperformance over this fifty year period was roughly 1-2% annually for each construction method.

<sup>4</sup> "Bond-like Stocks and Stock-like Bonds", Greenline Partners, LLC, Dec 2015

Jul 1963-Dec 2015	S&P 500	Bond-like Sectors	Low Beta	Low Volatility	Low Excess Volatility	High Dividend
Annual Total Return	10.0%	12.2%	10.6%	10.5%	10.9%	11.7%
Volatility	14.8%	13.5%	12.2%	11.9%	12.8%	13.7%
Sharpe Ratio	0.33	0.53	0.46	0.46	0.46	0.49

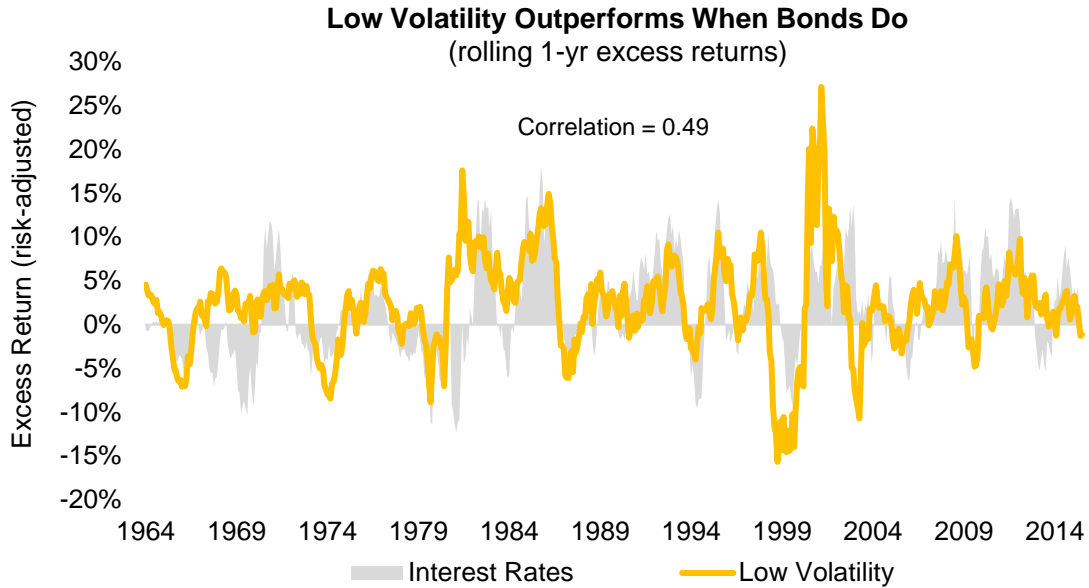
Source: Bond-like Sectors is a weighted average of Ken French industries of Food, Consumables, and Utilities. Low Beta is the quintile of equities with the lowest beta to the market based on trailing 60-months of returns. Low Volatility is the quintile of equities with the lowest trailing 60-day volatility. Low Excess Volatility is the quintile of equities with the lowest excess variance derived from the Fama-French 3-factor model. High Dividend Yield is the basket of equities with the highest 30% trailing 1 2-month dividend yields.

**Almost two thirds of the last 50 years has been a period of falling interest rates. We think this environment gave low volatility investing a tailwind that will likely not repeat going forward.** To quantify the interest rate bias, we spliced the historical data into periods of rising and falling interest rates. When we strip out the equity risk premium from low volatility portfolios, we can clearly see that the excess return has a bias to outperform when interest rates are falling, just like a bond. The chart below shows the average excess return over the volatility-adjusted S&P 500 of low volatility strategies across both interest rate environments.



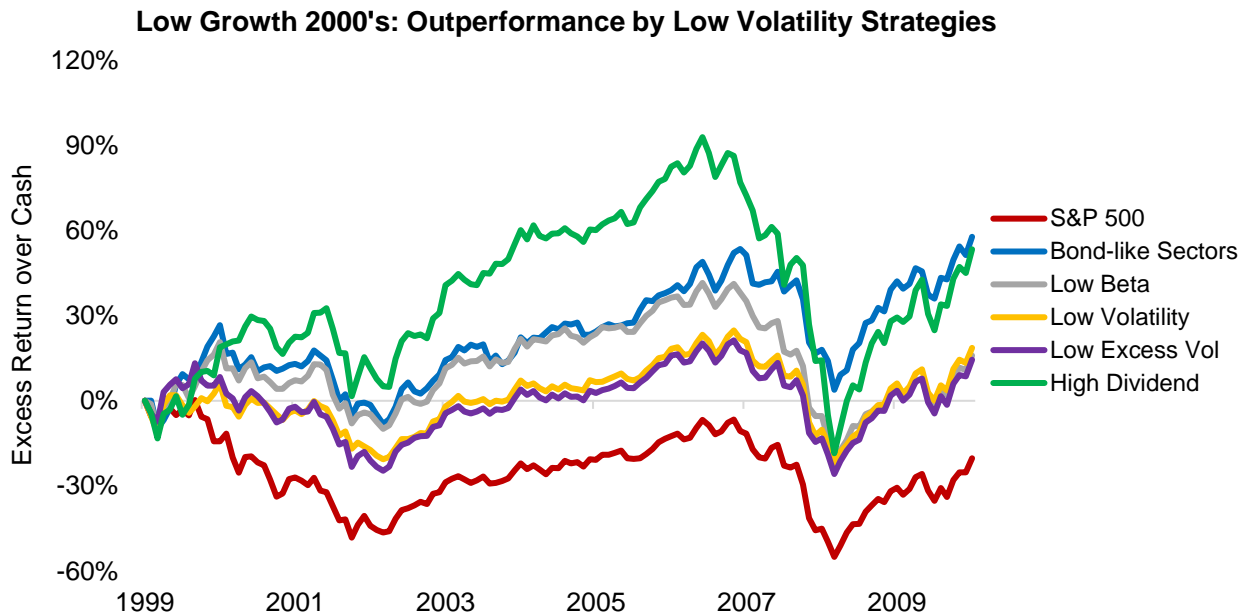
Source: Federal Reserve, Ken French Data Library, Greenline Partners analysis. Excess return is measured over the monthly volatility-adjusted S&P 500 returns. Data from Jul 1963 to Dec 2015

Another way to see this interest rate sensitivity is in the chart below which compares the rolling 1-yr excess return of the low volatility portfolio to US Treasury bonds. We see a high correlation on a rolling 1-yr basis to interest rates.



Source: Ken French Data Library, Federal Reserve, Barclays, Greenline Partners analysis. Low Volatility is the excess return over the S&P 500, volatility-adjusted. Interest Rates is the Barclays US Treasury index, scaled to the same volatility as the Low Volatility excess return stream. Data from Jul 1963-Dec 2015.

We can see this bias of low volatility strategies to interest rates play out over long periods of time, which is relevant to most investors when evaluating the merits of a strategy. Below we compare performance during distinctly different decades. The decade of the 2000's was defined by two equity market crashes, first the dot-com bubble in 2000-02 and then the global financial crisis of 2008-09. These events resulted in falling economic growth expectations and therefore falling interest rates as the 10-yr US Treasury fell from over 6% to just over 3% at the end of 2009. During this period, all of the low volatility portfolios we measured earned positive returns and outperformed the broad market index.



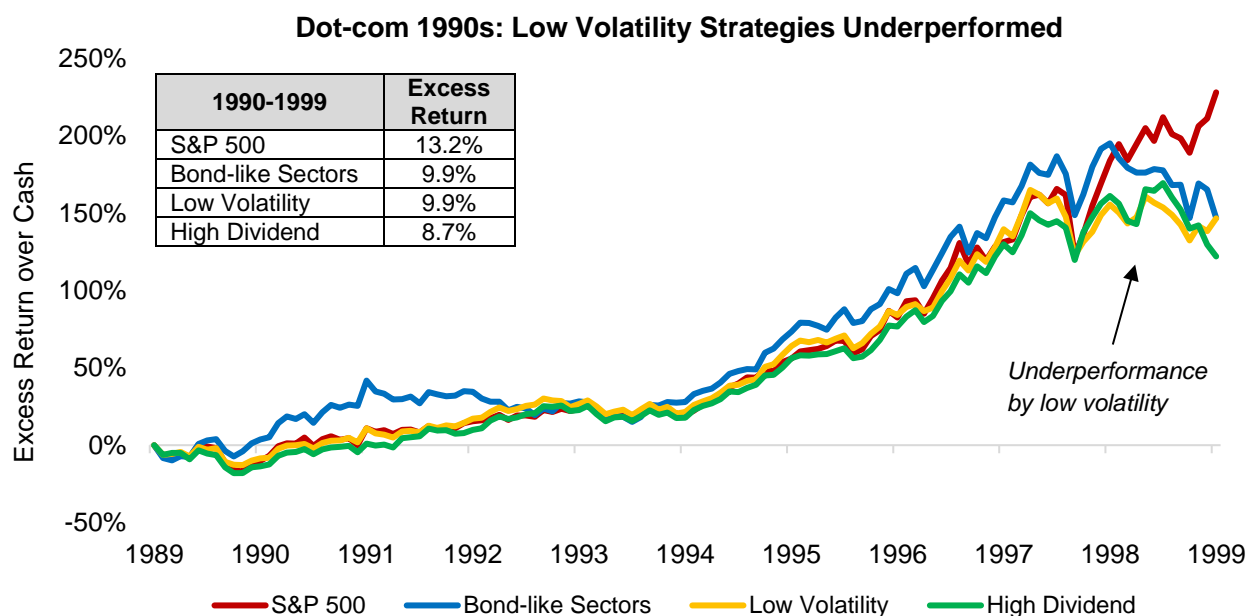
Source: Ken French Data Library, Greenline Partners analysis. Data from Jan 2000 to Dec 2009

From the table of annualized excess returns, we can see that these strategies beat the index by an average of 4.6% per annum during this period, significantly more than their long term average outperformance. No doubt this strong recent performance has helped the popularity of these strategies.

2000-2009	Bond-like Sectors	Low Volatility	Low Beta	Low Excess Volatility	High Dividend	Average
Excess over Cash	4.3%	1.6%	1.4%	1.3%	4.1%	<b>2.5%</b>
Excess over S&P 500	6.4%	3.7%	3.5%	3.3%	6.1%	<b>4.6%</b>

Source: Ken French Data Library, Greenline Partners analysis. Cash is the US 3-month T-Bill yield. Annualized cash return over this period was 2.5%. SP 500 annualized excess return over cash was -2.1% annualized. Data from Jan 2000 to Dec 2009

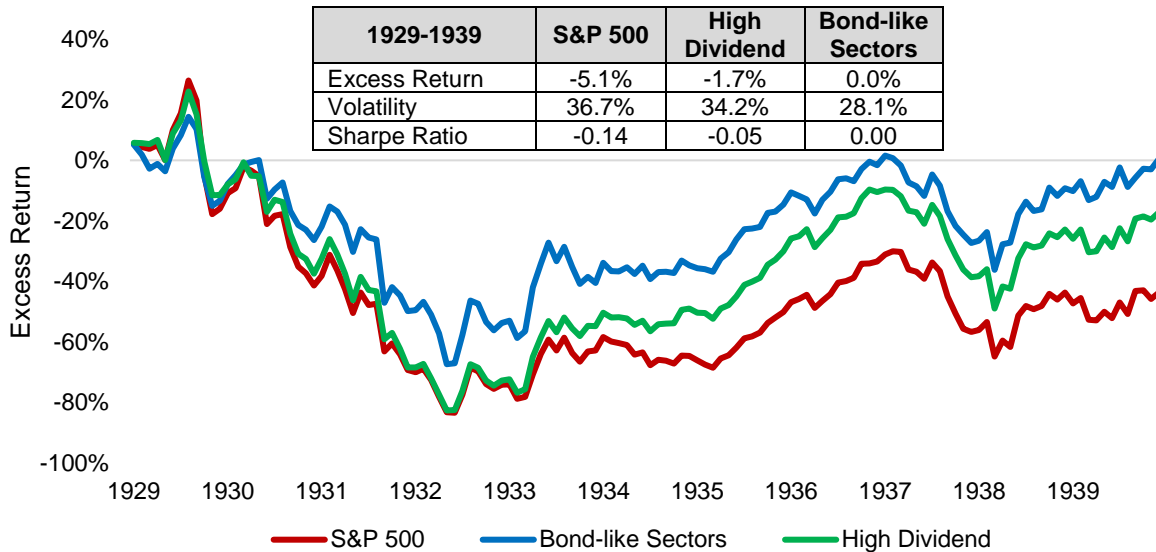
Their performance in the last decade is in sharp contrast to the late 1990s when the S&P 500 outperformed all low volatility portfolio constructions, primarily in the last few years of the decade. The dot-com boom resulted in high volatility internet stocks becoming the fad of that era driving them to bubble valuations. As dot-com mania was peaking in 1998-99, 10-yr US Treasury yields rose from around 5% to almost 7% driven by rising growth expectations. This is not coincidentally when we see low volatility strategies most acutely underperform the index.



Source: Ken French Data Library, Greenline Partners analysis. Data from Jan 1990 to Dec 1999

We also want to see how low volatility strategies would have performed in prior periods of changing interest rates but are limited by datasets which go back only to 1963. Since we have shown the similarity between low volatility strategies to both bond-like sectors and high dividend yield strategies, in both underlying holdings and return characteristics, we can extend the data series for low volatility strategies back to 1926 using bond-like sectors and high dividend strategies as proxies. The first chart below compares the performance of bond-like sectors and the high dividend yield portfolio to the S&P 500 during the Great Depression years of the 1930s. This was a period of falling interest rates driven by falling economic growth. As we would expect, the low volatility strategies with a bias to outperform during periods of falling interest rates did deliver.

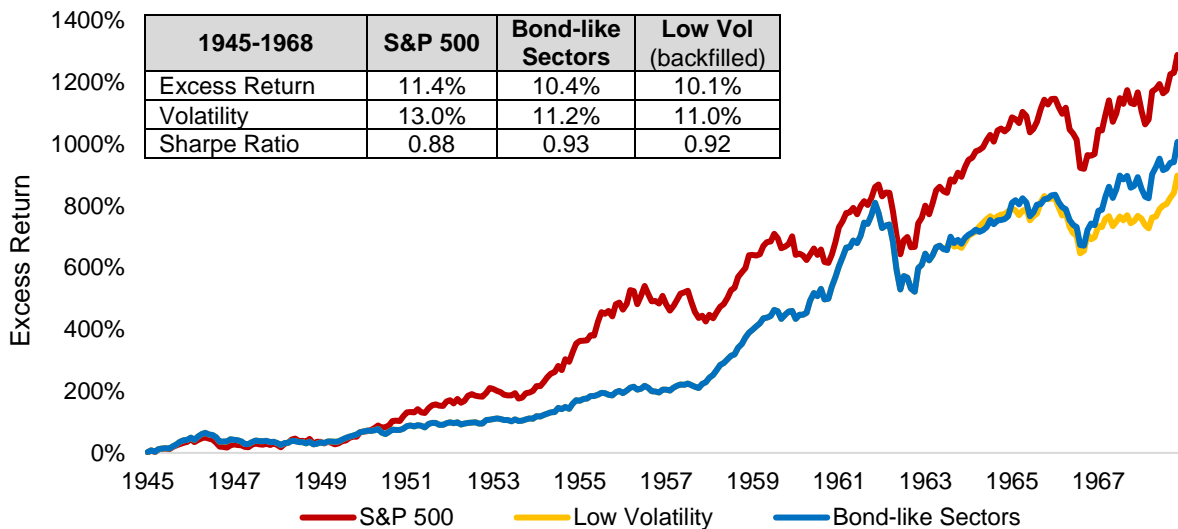
## Low Volatility Strategies Outperformed During Great Depression



Source: Ken French Data Library, Greenline Partners analysis. Data from Jan 1929 to Dec 1939

Next we study the performance of these strategies during the long secular bear market in bonds. The post-war years were largely a period of rising growth. This drove interest rates up from around 2% to over 6% by the late 1960s (an almost mirror image of the last fifteen years). Since low volatility strategy data only begins in 1963, we again backfill it with bond-like sectors data. The chart below compares the performance of bond-like sectors and low volatility, backfilled prior to July 1963, to the S&P 500 from 1945 to 1968, just before the onslaught of inflation in the 1970s. As in the 1990s, this period of rising interest rates drove lower than index returns for low volatility strategies. Note the volatility for these strategies is still lower and therefore Sharpe ratios higher. We think this is due to the diversification effect of the embedded bond-like return stream in these strategies, which we address in the final section of this paper.

## Low Volatility Underperforms During Rising Rates

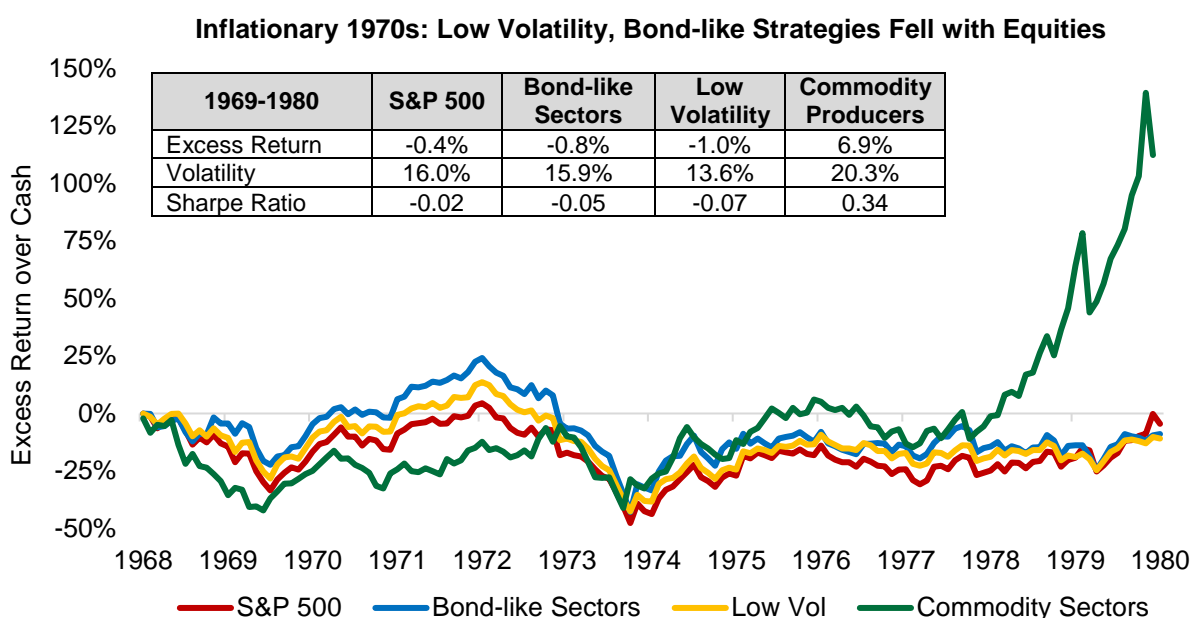


Source: Ken French Data Library, Greenline Partners analysis. Data from Jan 1945 to Dec 1968



Using bond-like sectors to replicate low volatility strategies is not meant to be a perfect comparison but can be used to make an informed decision about the interest rate and growth sensitivity of these strategies. This type of study points to the possible headwind these strategies may face in the event of rising interest rates.

One cannot comprehensively address rising interest rates without discussing the 1970s. This was a decade defined by high and rising inflation driven by the breakdown of Bretton Woods and the oil embargo. These inflation surprises are a different driver of interest rates than growth and therefore have a different effect on asset classes, namely that during such periods, bonds and equities fall together while commodities rise. In this environment, we would expect both low volatility strategies and the broader S&P 500 to perform poorly. The chart below comparing the S&P 500 and low volatility strategies confirms this performance. We also show the performance of commodity equity sectors to show how they protected against rising inflation due to their link to commodity prices.



Source: Ken French Data Library, Bloomberg, Greenline Partners analysis. Commodity sectors is 2/3 Ken French Oil sector and 1/3 Mining sector from the 17 Industry Portfolio dataset. Energy Data from Jan 1969-Dec 1980.

There are asset allocation implications to the falling interest rate/falling growth bias in low volatility strategies. Most portfolios have nominal interest rate exposure through direct holdings of fixed income. Today, many even elect to underweight this asset class given the sub-2% interest rates. For every dollar an investor moves into low volatility equities, they are also *adding* a dollar in Treasury bond-like exposure. If this same investor were taking a large active view on the direction of interest rates by selling half their bond portfolio, these actions are counterproductive as the rate exposure in low volatility strategies more than offsets the active view on bonds depending on the relative size of each position. We have discussed this topic of embedded interest rate exposure in more detail in our previous paper on Bond-like Equities<sup>5</sup>.

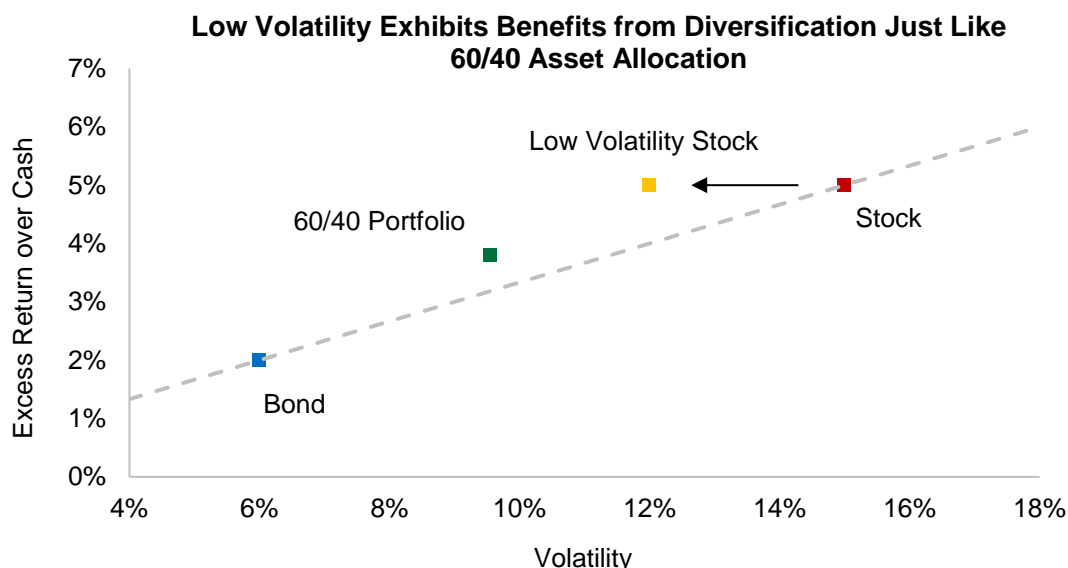
### Diversifying Power of Bonds Drives Higher Sharpe Ratios, Not a Return Anomaly

Modern portfolio theory and the efficient frontier suggest that combining two asset classes whose returns are lowly correlated should increase the volatility-adjusted return of the portfolio through diversification. This

<sup>5</sup> "Bond-like Stocks and Stock-like Bonds", Greenline Partners, LLC, Dec 2015

is the only so-called “free lunch” in investing. Low volatility strategies, being a combination of equities plus a bond-like risk premium, benefit from this effect.

The chart below illustrates how stocks and bonds combine into a portfolio (the most common allocation being 60% stocks+40% bonds) that should deliver higher volatility-adjusted returns than any asset class on its own. The gray dashed line is the constant Sharpe ratio that single asset classes should be expected to deliver. We can see the 60/40 portfolio, like low volatility equities, lies above this line because bonds are diversifying to stocks. **We think that the higher Sharpe ratios of low volatility strategies are due to the portfolio diversification effect, not a return anomaly.**



For illustrative purposes only. Stocks are assumed to earn a 5% excess return with 15% volatility and bonds a 2% excess return with 6% volatility and 0.1 correlation to stocks.

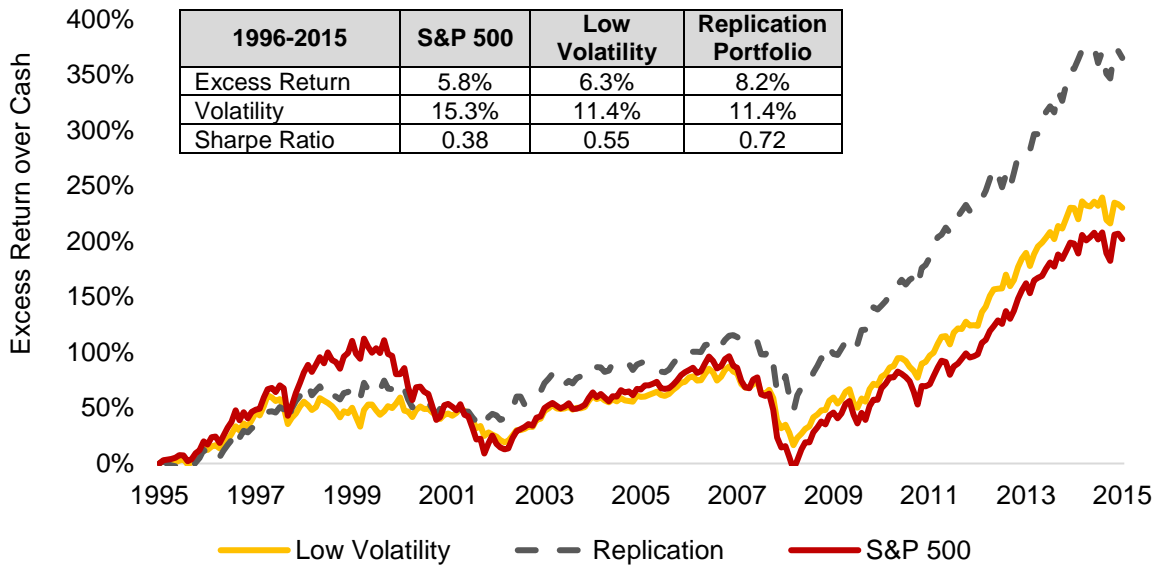
To put some numbers behind the impact of diversification, we look at two examples. First, since 1963, equities and Treasury bonds have both delivered Sharpe ratios of approximately 0.33 with a correlation of 0.1 to each other. Adding them together as if the asset classes were overlaid together gives a portfolio with similar statistics as the low volatility strategy over this same time period, per the table.

Portfolio Illustration 1	0.8x Equity Risk Premium (A)	Treasury Bond Risk Premium (B)	(A) + (B) = Portfolio	Historical Low Volatility
Excess Return over Cash	4.0%	2.0%	6.0%	5.5%
Volatility	12.0%	6.0%	13.7%	11.9%
Sharpe Ratio	0.33	0.33	0.44	0.46
Correlation	0.1			

Source: Ken French Data Library, Greenline Partners analysis. Data from Jul 1963-Dec 2015

The chart below illustrates how this simple portfolio of stocks and bonds compared to the low volatility strategy using actual data. We chose to show the last 20 years because it was a period of rising and then falling growth surprises, which most powerfully highlight the diversification benefits of bonds to stocks. Our replication is 0.72 x the S&P 500 plus the Barclays US Treasury Bond index. We can see our replication tracks the low volatility index closely but outperforms significantly.

### Simple Portfolio of Stocks + Bonds Outperformed Low Volatility



Source: Ken French Data Library, Bloomberg, Barclays, Greenline Partners analysis. Data from Jan 1996-Dec 2015.

Diversification works even when adding a zero return asset to a portfolio. For the second illustration, we assume there is no low volatility return premium. We add a zero return bond to a portfolio of equities with lower volatility than the index. Further, we assume these low volatility equities earn the same risk premium as other, more volatile equities. The results are similar to the example above in that the portfolio of equities plus zero return bond has a similar return but higher Sharpe ratio than the index because it benefits from the diversifying power of bonds.

Portfolio Illustration 2	Low Vol Equity Risk Premium (A)	Zero Return Bond (B)	(A) + (B) = Portfolio	S&P 500
Excess Return over Cash	5.0%	0.0%	5.0%	4.9%
Volatility	12.0%	6.0%	13.7%	14.8%
Sharpe Ratio	0.42	0.00	0.37	0.33
Correlation	0.1			

Source: Bloomberg, Greenline Partners analysis. Data from Jul 1963-Dec 2015

To us, these examples highlight the danger of confusing risk with volatility. It leads one to believe there is an anomaly due to the false precision of statistics. When in reality, low volatility strategies are just a bet on companies with more stable earnings than average, which delivered similar returns as other equities.

As with all investing, one needs to understand the fundamentals behind an investment (know what you own). Volatility or riskiness is just a spectrum. Within equities, on the low end of the risk spectrum are businesses with non-cyclical earnings and unlevered balance sheets. These businesses should do best in falling growth environments because their business characteristics and lack of leverage mean that economic growth should have only modest relative impact on their earnings. At the other extreme are highly cyclical businesses, like consumer discretionary products, with lots of balance sheet leverage. These stocks may do best in a bull market but many do not survive the inevitable downturn. We think about diversification and security selection at this fundamental level in order to build a margin of safety by understanding how our holdings and portfolios should behave through different economic environments.

## Conclusion

The low volatility anomaly has emerged as probably the most commercially successful smart beta factor of the last decade. Low volatility caters to investor's psychological preference for more certainty, especially after the decade of the 2000s delivered two significant drawdowns in global equity markets. The proliferation of these strategies has undoubtedly been helped by their strong recent performance influenced by falling bond yields. But as the first disclosure in every presentation states: "Past performance is not a guarantee of future results."

Low volatility strategies tilt portfolios toward defensive, bond-like sectors of the equity market. These sectors have inherently lower earnings volatility being utility, food staples and healthcare businesses. The bond-like excess returns of these sectors drives them to outperform when interest rates are falling and growth expectations are disappointing and underperform when interest rates are rising and growth expectations are surprising upwards. Low volatility strategies show this same bias and therefore future return expectations should be discounted especially if interest rates were to rise. ***Investors wanting lower volatility equities may find lower cost, more transparency, and superior performance with bond-like sector ETFs.*** There are asset allocation implications to the additional interest rate exposure embedded in low volatility strategies that should be explicitly considered as well.

Much has been written about low volatility strategies and their high volatility-adjusted historical returns. Rather than being an anomaly, we believe it is simply a result of portfolio diversification, from combining the equity risk premium with a bond-like return stream. Investors commonly confuse volatility with risk, which can lead to seeing things that do not exist.

Investors are too often fooled by optimistic backtests and cherry picked statistics. Smart Beta investing is just a new form of active management that happens to be rules-based and disciplined. But beating zero-sum markets will always be hard and like all attempts at alpha, in aggregate, smart beta will also fail. On the positive side, the fees on smart beta products tend to be lower than traditional active management products, which should result in less aggregate loss for investors to the extent that smart beta takes market share from more traditional active management products.

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