TD Asset Management

NEW THINKING

Low Volatility: How Rock Solid is your Risk Reduction?

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Conventional investment theory holds that expected equity returns should rise with systematic (i.e. market) risk. However, empirical evidence shows otherwise, as low volatility equities have outperformed high volatility equities over prolonged periods and across varying equity markets[1]. The consistent outperformance of low volatility equities and simultaneous disproof of conventional investment thinking is referred to in academic literature as the *low volatility anomaly*[2].

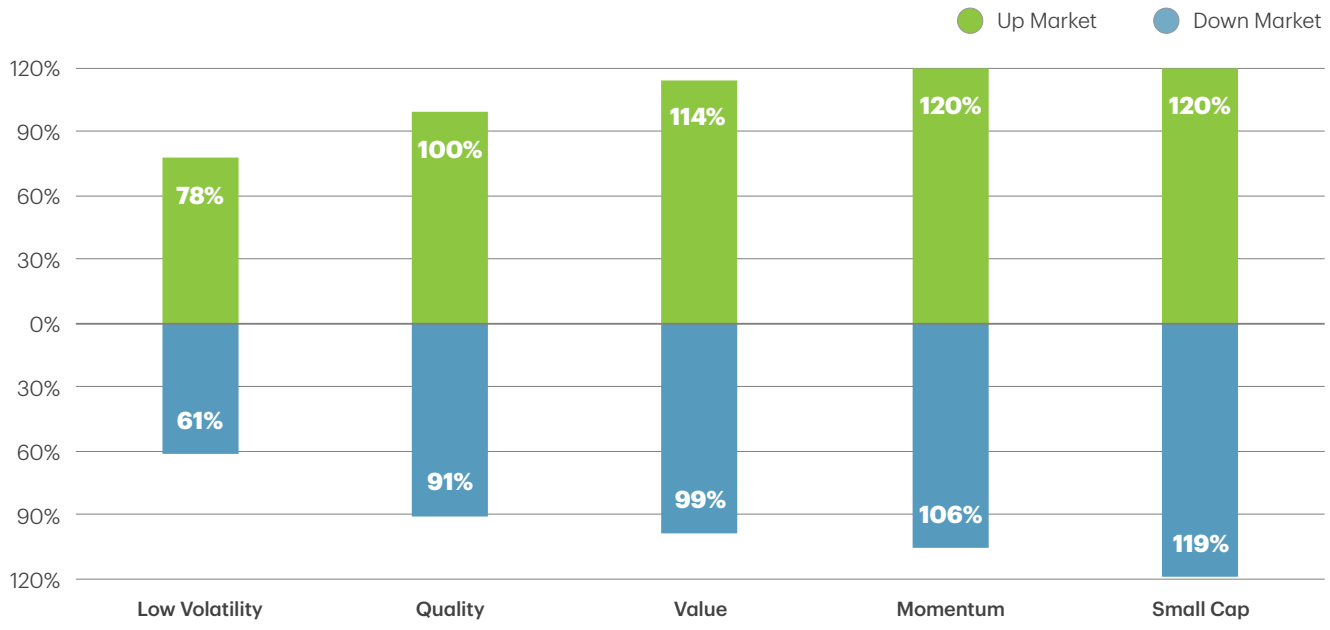
Though the risk reduction capabilities of low volatility equities are generally well known, the consistency of the risk reduction properties inherent to low volatility equities has been studied far less than the existence of the anomaly itself. This paper will highlight the consistent nature of low volatility equities, particularly during changing economic cycles. Also examined is the performance differentiation exhibited by the low volatility investment factor, relative to other commonly known investment factors.

Low Volatility at a glance

Low volatility investing can deliver less equity market risk, for comparable or higher returns than equity markets, ultimately delivering a greater reward for each unit of risk assumed by an investor.

The illustration below (**Chart 1**) looks at the upside and downside capture ratios of the Fama & French Factor quintiles since 1963. As observed from the chart, we can determine how low volatility stocks fared in both up and down markets, compared to other well-known investment factors.

Chart 1: Capture Ratios of Fama & French Quintiles, from 1963 to 2018



Data as of December 31, 2018. Source: TDAM, Fama & French, December 2018.

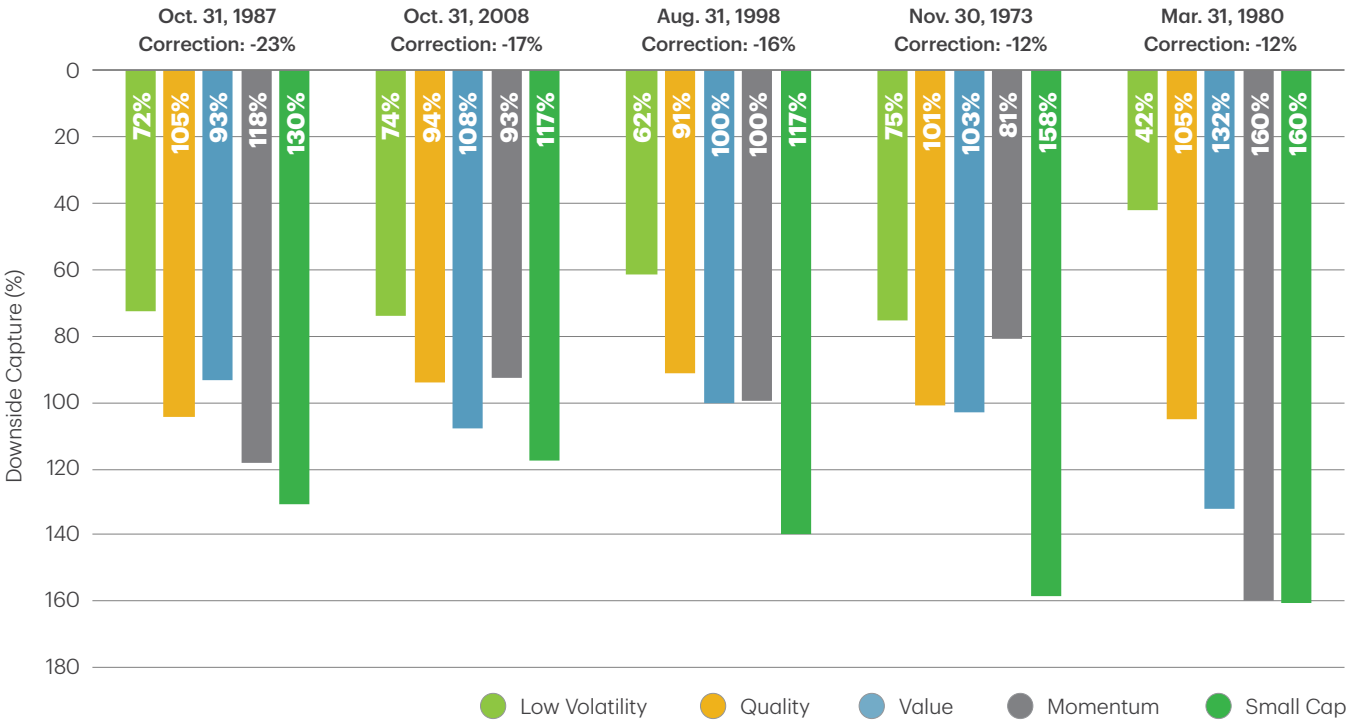
Among the investment factors in **Chart 1**, low volatility has provided the best downside protection. Furthermore, as observed with other investment factors, low volatility generally offers greater downside protection in declining markets than the upside participation given up in rising markets. This is illustrated in **Chart 1** by the asymmetry between the down and up market captures. This asymmetry is directly related to alpha, or positive returns that cannot be attributed to the systematic risk of stocks. By delivering market-like returns, with less risk than the market, low volatility stocks can generate an asymmetric upside/downside capture profile that most investors seek. Simply put, with low volatility equities, investors can mitigate their losses during a market downturn and participate in a market upswing, when either event occurs.

Risk reduction under Market Stress

Despite the observable performance of low volatility equities, there have been doubts raised by market participants regarding the risk reduction effectiveness of the strategy, particularly during periods of heightened market uncertainty. The common belief that 'all correlations become one' during a market correction often leads to the belief that low volatility equities lose their risk reduction qualities during the worst market circumstances. Despite the *low volatility anomaly* being factually proven, many investors remain skeptical that low volatility strategies can deliver on their promise during the most difficult market conditions.

[1] (Bodjov & Lemprière, 2015)
[2] (Baker & Haugen, 1991,1996,2012)

Chart 2: A comparative look at the performance of investment factors, during the five worst corrections of the S&P 500 Index. From 1963 to 2018



Data as of December 31, 2018. Source: TDAM, Fama & French, December 2018.

To address this misconception, a comparative look at the downside capture of the low volatility investment factor relative to other generally recognized investment factors was done, using the five worst corrections of the S&P 500 Index from 1963 to 2018.

As illustrated in **Chart 2**, over a 55-year period, low volatility equities have consistently delivered meaningful downside protection in the worst market conditions, both in absolute terms and relative to other factors. Though correlations tend to increase when markets are down, these events are also generally accompanied by an overall increase in equity return dispersion. Therefore, despite the increased correlation and homogeneity of movement that occurs with equities during a market downturn, the amplitude (i.e. degree) of their movement will tend to vary much more during these periods than in periods of relative stability. This is what enables low volatility stocks to keep outperforming the rest of the market, even in periods of heightened market uncertainty.

Risk reduction under Growth and Inflation Uncertainty

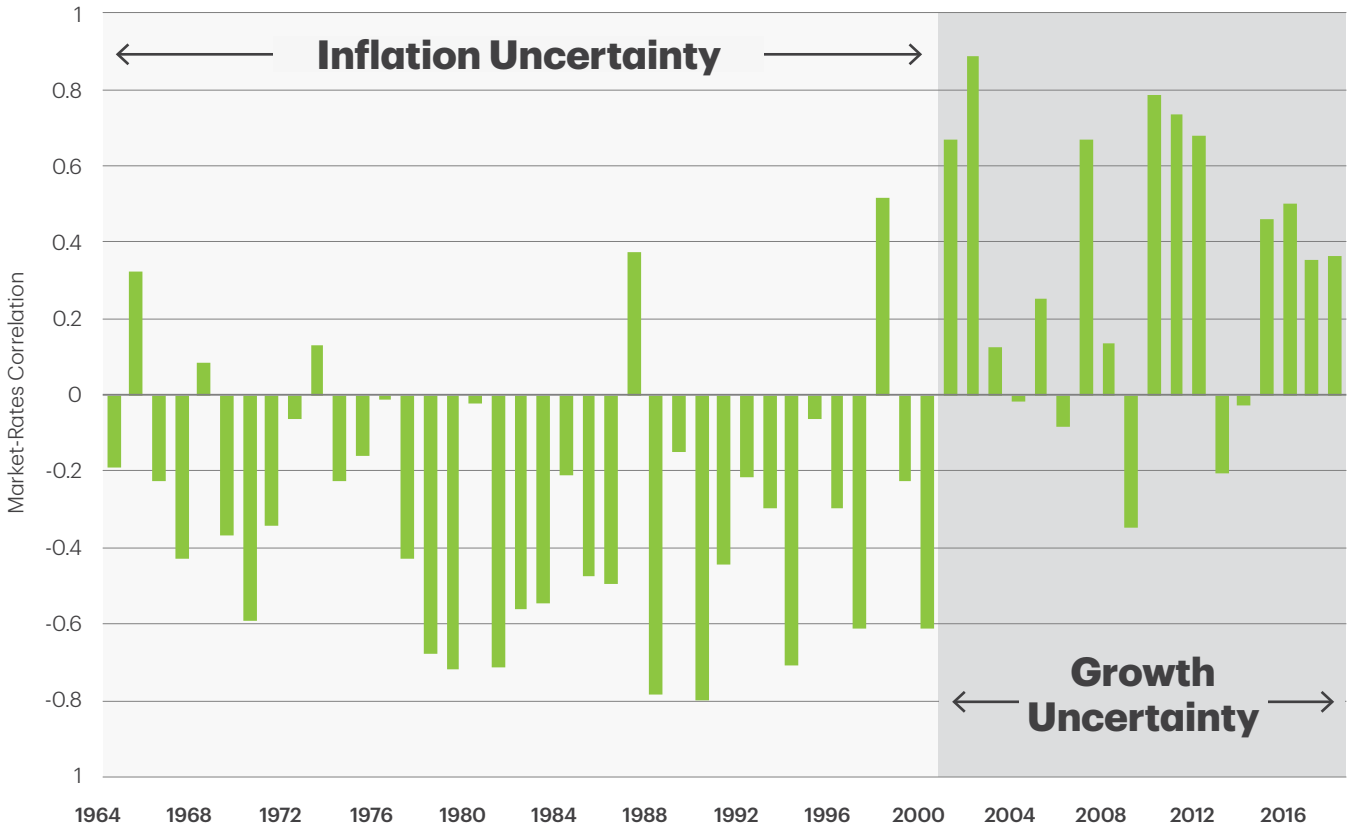
Among the other questions raised regarding the risk reduction consistency of low volatility equities is, how does it stand up to changing economic conditions? Specifically, a rising interest rate environment? Given that low volatility equities are typically found in defensive, less cyclical sectors such as Utilities, Consumer Staples and Real Estate, there is a long-held belief that low volatility equities will behave differently and be adversely impacted by rising yields. While this is generally a concern regarding the overall performance of the strategy, it also implies that if markets were to fall in a rising yield environment, low volatility equities should be less effective in reducing risk and providing downside protection in such circumstances.

Since the Asian crisis of 1997, we have mostly witnessed an environment in which falling equity markets generally coincided with declining

bond yields and rallying equity markets generally corresponded with rising bond yields. This positive 'equity market-interest rate' correlation occurrence, observed over the last two decades, can largely be attributed to the 'low inflation and high growth uncertainty' environment that has also been present. During this period, most asset repricing has been the result of fairly strong shocks in production, as opposed to uncertainty surrounding inflation. This has not always been the case.

Fortunately, the *Fama & French* factor data is rich enough to give us a broad view of how low volatility risk reduction and downside protection varies in

Chart 3: Correlation between Equity Market & Interest Rates, from 1964 to 2018

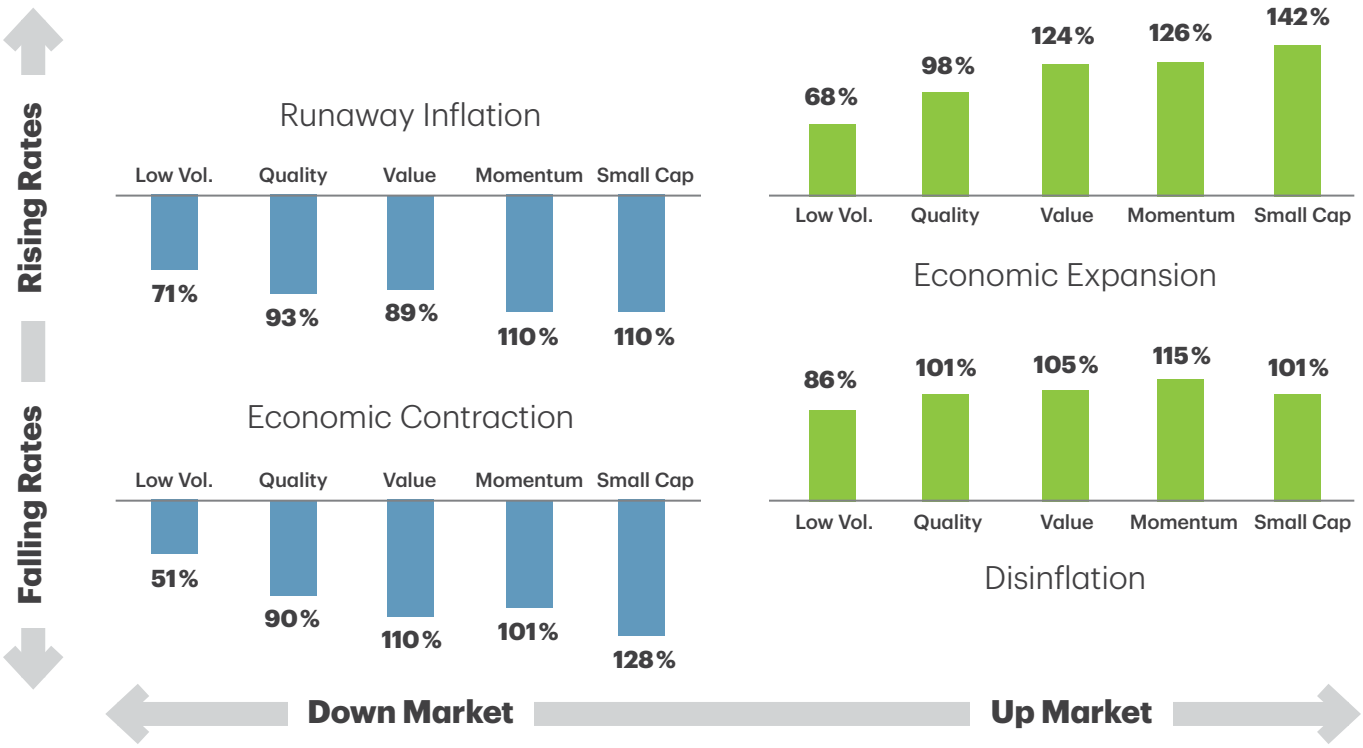


Data as of December 31, 2018. Source: TDAM, Bloomberg Financial L.P. December 2018.

environments of inflation uncertainty and growth uncertainty. Breaking up market conditions across both market and rate dimensions allows us to look at the downside capture of low volatility, along with other investment factors, in environments where equity markets are both positively and negatively correlated to interest rates.

What we observe from such an analysis is quite interesting. On one hand, low volatility equities appear to reduce risk in every one of the major scenarios, exhibiting capture ratios less than 100% in every quadrant. However, as one would suspect, low volatility equities do have, overall, both a higher downside capture, and a lower upside capture, in

Chart 4: A contrasting look at investment factors, during changing interest rate environments



Data as of December 2018. Source: TDAM, December 2018.

rising rate scenarios than in declining rate scenarios; indicating that the low volatility alpha is less meaningful in those conditions.

This would partially confirm some of the concerns raised by opponents of low volatility strategies. Those concerns however assume that one has foresight into whether a declining or rising rate environment is imminent, going forward. If this was the case, then the same view would apply to fixed income instruments – they will offer less downside protection and allow for lower upside capture in a rising yield environment, than a declining yield environment. However, the likelihood that someone has perfect foresight into the future direction of interest rates is much lower than having a reasonable idea of whether the economy, for the next few years to come, will be in a growth uncertainty environment or inflation uncertainty environment.

While it is true that low volatility strategies can capture more market downside, if the markets were to fall under an inflation shock – in which case bonds would be expected to fall as well- it also happens that low volatility strategies typically deliver a higher upside capture in such environments as well. This would be illustrated by the upper left and lower right quadrants. Therefore, even though low volatility strategies would have slightly less risk reduction capacity in an inflation uncertainty environment (as shown by the higher downside and upside capture ratios), the strategy nevertheless delivers an attractive upside/downside capture asymmetry. It is also worth contrasting this phenomenon with the behavior of value and small cap stocks, which both seem to deliver higher upside and downside capture ratios in growth uncertainty environments, than in inflation uncertainty environments.

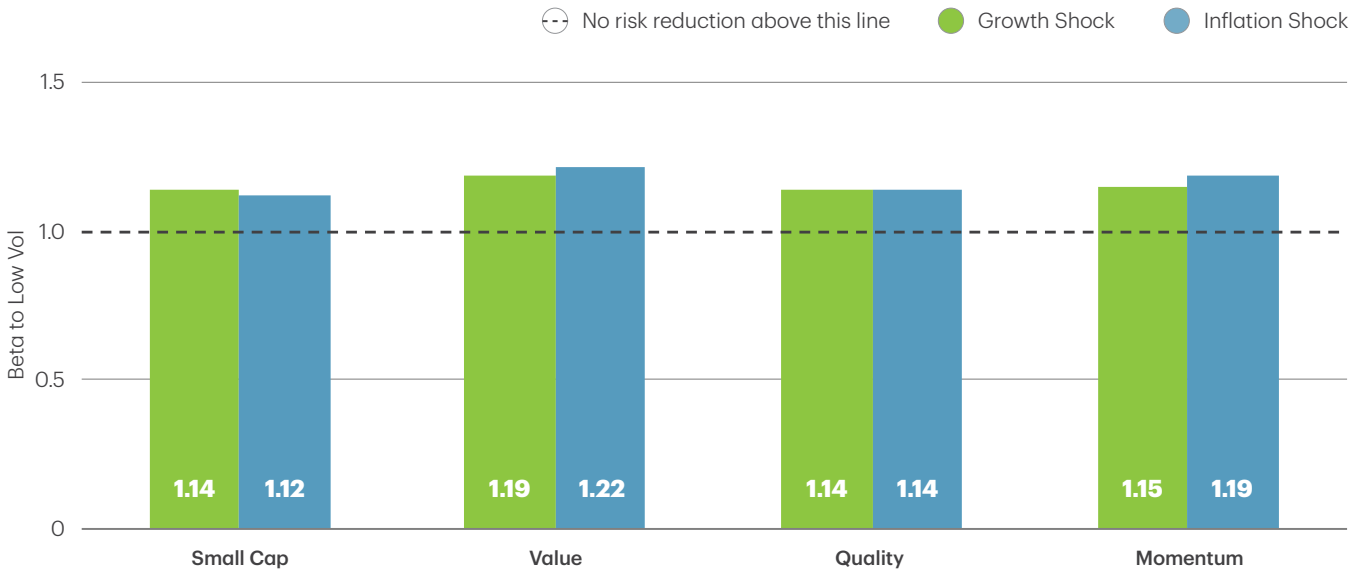
The comparative analysis conducted among the investment factors brings forth a new question: can other factors help us to further reduce risk in inflation uncertainty environments, by providing diversification to pure low volatility portfolios?

Factor Diversification and Risk Reduction

The proper way to assess the marginal diversification benefit brought by other factors to a low volatility portfolio is to look at the marginal contribution of said factors to the risk of the low volatility portfolio. If this marginal contribution is lower than the volatility of the low volatility portfolio, then there is indeed a marginal diversification benefit obtained from adding exposure to the factor in question. The ratio of the marginal contribution to risk of a factor to the volatility of a fund can be interpreted as the beta of the factor to the fund in question.

We illustrate below the beta of the top small cap, value, quality and momentum quintiles with regards to the bottom low volatility quintile, historically since 1966, under both growth and inflation shocks. While we previously observed that the low volatility portfolio maintained a certain degree of risk reduction regardless of the economic conditions that were present, it is reasonable to raise questions regarding further risk reduction by introducing additional exposure to some of those factors.

Chart 5: Investment Factor Marginal Contribution to Risk



Data as of December, 2018. Source: TDAM, Fama & French, December 2018.

As we can see, under both growth and inflation shocks, the other generally recognized factors would fail, even at the margin, to further reduce the risk of a low volatility portfolio. This is illustrated by the beta of all those factors to low volatility being above one in both scenarios. It is worth mentioning that this is tested using a simple low volatility portfolio construction approach, strictly taking into account the volatilities of the stocks held and ignoring their correlations. Under a full portfolio construction approach, it could be easily assumed that the low volatility portfolio would be even more properly diversified, and that other factors would be even less likely to further offer diversification benefits to the low volatility portfolio.

Conclusion

Multiple research papers have, in the past, studied the persistence of the low volatility anomaly and concluded that it is a real and persistent feature of global equity markets. Few papers have, however, examined the stability of the risk reduction and downside protection features of low volatility strategies. As observed in this paper, low volatility strategies, even implemented in their simplest form, can provide meaningful protection against the worst market corrections, under various economic conditions. Additionally, a low volatility portfolio is a low volatility portfolio by construction and little can be done to systematically reduce its volatility much further, regardless of the economic conditions observed. Therefore, while an investor may seek additional exposure to other factors in the hope of adding to the expected return of their equity portfolio, it will generally have to be done at the cost of additional risk and additional downside capture in the most likely economic scenarios. ■

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