LOW-VOLATILITY INVESTING IN GLOBAL MARKETS

IN BRIEF

• Investors are significantly more risk averse following the global financial crisis, while also cognizant of the need for returns.
• Low-volatility strategies have been gaining acceptance as a long-term solution to the need for both returns and lower risk.
• Risk is the primary driver of low-volatility portfolio construction, with the result that these strategies can potentially exhibit extreme biases.
• We argue for an approach to low-volatility investing that incorporates fundamental research, diversification and active portfolio management.

The 2008 global financial crisis left an indelible imprint on the investment landscape across the globe. The severe equity market crash, just a few years after the technology bubble burst, left many investors — retail and institutional alike — markedly more risk averse.

In the wake of the crisis, investors have also sought to shore up their portfolios and replenish funding to achieve their objectives. In some cases, demographic patterns are resulting in increased liabilities, further compounding the need for investment returns. It is in this context that low-volatility strategies have been gaining acceptance as a long-term solution to the need for return generated within lower-risk parameters.

The concept of de-risking an equity strategy challenges the prevailing theory that higher risk leads to higher returns. The popular assumption, based on modern portfolio theory, is that an equity portfolio cannot have a low-risk budget without forfeiting some return. However, in recent decades, studies have concluded that high risk does not always result in high return. In fact, empirical academic research has shown that, over the long run, lower volatility portfolios actually tend to outperform their respective benchmarks.¹ This has become known as the “low-volatility anomaly.”

Low-volatility investing was first identified in the early 1970s by Fischer Black and Myron Scholes, and affirmed by Eugene Fama and Kenneth French in 1993. The low-volatility anomaly was championed by Robert Haugen, who spent most of his career disproving key features of modern
portfolio theory, including the efficient market hypothesis and the capital asset pricing model (CAPM). The most common interpretation of the low-volatility anomaly is that, given a universe of stocks, the least volatile 20% – 30% of the constituents tend to outperform the remaining 70% – 80%. The most frequent references to equity market “volatility” are based on standard deviation of equity returns over a time series; volatility data presented in this paper focus on standard deviation of returns over twenty-four months.

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Volatility and investment returns

Exhibit 1 shows the annualized relative return of 3,000 global, developed-market stocks from December 1987 through December 2013, based on volatility ranking by decile. It shows that the least volatile stocks outperformed their more volatile counterparts. The chart highlights the pronounced underperformance of the higher-volatility deciles — 8, 9 and 10 — compared to deciles 1 through 7. There is barely a 1% difference in relative performance for about 70% of the universe, while the underperformance of the higher volatility tail is very marked. This is a pattern that is observable for each of the developed equity markets. Indeed, one could argue that the “low-volatility anomaly” is actually more of a high-volatility anomaly.

The anomaly is largely dependent on market cycles in that high-volatility stocks consistently underperform low-volatility stocks, particularly during sharp downmarkets. The outcome is that although low-volatility stocks capture market upside, they tend to provide stronger preservation of capital during down markets. This is indicative of the performance expected of low-volatility strategies: During bull markets when high beta stocks outperform, low-volatility portfolios will lag (Exhibit 2), but during periods in which markets are in sharp decline, they offer a diversifying allocation that outperforms (Exhibit 3).

Exhibit 1: Global developed annualized relative return by volatility decile

Source: Factset. MFS methodology: Stocks grouped monthly into deciles based on standard deviation over 24 monthly returns. Data from December 1987 through December 2013. Global universe includes largest stocks by market cap for the following developed regions: 1,000 US, 400 Japan, 600 Europe, 200 Asia-Pacific ex-Japan. Returns are relative to the overall global universe. Based on linked monthly returns.

Exhibit 2: Global Up Markets: Annualized relative return by volatility decile

Based on six upmarket periods between December 1987 and December 2013


Exhibit 3: Global Down Markets: Annualized relative return by volatility decile

Based on five downmarket periods between December 1987 and December 2013

The pattern is less pronounced in emerging markets (EM). Nevertheless, as Exhibits 4 and 5 illustrate, even in EM, during down markets the most volatile stocks underperformed the least volatile.3

Compounding benefit is key

The intrigue of capturing higher longer-term relative performance by avoiding high-volatility stocks is partly driven by the compounding benefit of lower-volatility stocks. Albert Einstein called compound interest “the greatest mathematical discovery of all time,” perhaps in part because it has so many applications in daily life. Compounding is the process of generating earnings on an asset’s reinvested earnings. It requires two things: the reinvestment of earnings and time. The more time you give your investments, the more you are able to accelerate the potential growth of your original investment. High-volatility stocks experience periods of lower or negative returns that inhibit the potential asset growth that would otherwise accrue based on compounding. This is often referred to as “volatility drain.”

The theoretical basis of volatility drain — or the negative relative impact that volatility has on portfolio returns — was explained by James MacBeth, who estimated that actual compounded return is less than the expected return by about half of the portfolio variance or risk (when variance is defined as the squared standard deviation of returns).4

The compounding benefit is also apparent when one considers portfolio cash flows and liabilities: in a highly volatile portfolio, it is more challenging to manage flows in the market than it is with a low-volatility portfolio. For example, imagine investing a significant cash flow into equities just before a market free fall, and then having a large liability just as the market troughs. This could wreak havoc on an asset base and investors’ ability to manage future flows and liabilities.

What accounts for the anomaly?

The anomaly is typically explained by factors that are often associated with extreme volatility shifts and excessive market momentum, which are characteristic of high-volatility stocks. The explanations can be grouped into two categories: behavioral and structural.

Examples of behavioral explanations include risk-seeking biases exhibited by “the lottery effect” and prospect theory, as documented by Nobel Prize-winner Daniel Kahneman. Higher volatility helps to perpetuate speculative and risk-seeking behavior. Another behavioral influence results from investors’ emphasis on relative benchmark returns: Because investors are biased toward lower benchmark-relative tracking errors, portfolios are prone to capturing benchmark volatility rather than avoiding it. Investors fear that their portfolios might not capture the upside when the market is appreciating. As a result, the focus on capturing market appreciation at a low tracking error exposes portfolios to fluctuations in benchmark volatility.
Structural factors include technology and newer investment instruments that can sometimes serve as conduits of volatility. For example, in recent years, technology has improved to the extent that access to information is constant, as is the ability to react to it. Likewise, growth in investments such as ETFs, derivatives, hedge funds and asset allocation tools have enabled investors to quickly execute large reallocations. Higher volatility is often associated with sudden shifts in allocations and events that warrant immediate trading action (see Exhibit 6). Although structural improvements in recent years have advanced the capabilities and efficacy of investors, they have also contributed to volatility extremes.

The behavioral and structural factors not only offer a historical explanation for these patterns, they also offer support for the argument that the anomaly will persist in the future. In a benchmark-relative world, portfolios will remain tied to shocks in market volatility. Likewise, as long as we have stock markets, we will also have risk-seeking stockpickers. Furthermore, it is unrealistic to argue that structural advancements will somehow regress. Given these factors, volatility anomalies are here to stay.

Low-volatility universe

Low volatility universe strategies define a universe by volatility criteria — such as stocks ranked by volatility metrics — and limit holdings to the least volatile stocks based on those metrics. For example, the S&P Low Volatility ETF takes the least volatile 20% of stocks from the S&P 500 Index and inversely weights those 100 stocks based on volatility over the past 12 months. The Russell Global Defensive Index limits its holdings based on an overall “stability indicator” score, half of which is based on weighted-average volatility over short- and long-term periods.

Typically, low-volatility universe strategies rank stocks based on volatility within the overall universe rather than within sectors or regions, and therefore they exhibit strong biases in areas that have lower universe-relative volatility. Common overweight in these portfolios include defensive sectors such as consumer staples and utilities and countries such as Japan. Despite the specific design of these strategies, there is some overlap with other low volatility approaches; in practice, a low volatility objective tends to lead to concentration in the least volatile stocks of a given universe.

Low-volatility investing in practice

The question then becomes: Can a viable investment strategy be designed to exploit this anomaly? There is no shortage of research on this topic, especially in recent years. Several approaches exist, from variations of minimum variance and beta target to simpler constructions, which we will explain further. We have categorized the most common approaches as low-volatility universe, beta target and minimum variance. As we will demonstrate, capitalizing on this historical anomaly should not be done without caution.
Beta target
Beta-target strategies take a more systematic approach to producing lower volatility. These strategies are not limited to a “least volatile” universe of stocks, and can have exposure to higher-volatility names, as long as the overall portfolio beta meets a target that is less than an index. Although there is some correlation between beta and volatility, and deriving a low-beta portfolio naturally leads to over-weighting low-volatility stocks, a beta-targeted portfolio is expected to follow the direction of the underlying index more closely than other low-volatility methods. Nevertheless, a long-term global beta of between 0.7 and 0.8, typical of beta-target strategies, is within the range of other common low-volatility approaches.

Minimum variance
Minimum variance strategies use a quantitative risk optimizer to solve for a combination of portfolio weights that produces the lowest possible predicted portfolio variance. A simple example of this is using two stocks that have a low correlation: the combination of these two stocks will produce a portfolio that has a lower variance than either individual stock.

An advantage of risk optimization is that it allows for assumptions and constraints, including sector, region and style. The optimizer systematically manages these exposures while identifying complementary risk profiles at the stock level. One criticism of minimum variance, however, is that these complementary weights are found using stocks that move in different directions. For example, the risk of a stock that has a series of positive returns may be offset by the risk of a stock that has a series of negative returns. The net variance of these two stocks will be low, but does it make sense for an investor to hold a weaker investment simply because of its low correlation with other stocks?

Although there will still be some overlap with holdings derived from the other approaches, the goal with minimum variance is to produce a portfolio with idiosyncratic rather than systematic series of returns. By this we mean the focus is more on risk that has little or no correlation with market risk and can be mitigated by diversification (idiosyncratic risk) as opposed to market risk or “undiversifiable risk” (systematic risk).

One variation of the minimum variance approach is “target variance,” where the optimizer solves for a specific, acceptable level of risk as opposed to the “minimum” level of risk. For example, if market volatility is 20% annualized standard deviation and a minimum variance solution results in predicted volatility of 10%; however, if an investor feels that a more optimal low volatility portfolio can be achieved at a target volatility of 11%, the latter portfolio would be preferable. Once again, the outcome of these strategies overlap with the limited-universe and beta-target approaches: Over the long run, all three types of approaches produce a variance that is about 25% to 35% less than relative market indices.

Regardless of the method, the low-risk objective ultimately drives portfolio weights. Over any given period, market risk is influenced by a certain number of variables. Consequently, all of these low-risk strategies share similar characteristics. Global low-volatility portfolios tend to have a beta of between 0.7 and 0.8, be smaller-cap and have a slightly higher dividend yield, as well as a volatility reduction of 25% to 35%. In addition, they exhibit the biases mentioned above, i.e., favoring Japan and the defensive sectors.

Global minimum variance optimization
The model global portfolio, summarized in Exhibit 7, is based on a global minimum variance optimization using the MSCI All Country World Index (ACWI) as the universe of stocks (it is labeled Minimum Variance). It is designed to be comparable to an investable minimum variance strategy with the following parameters: monthly rebalancing, a holdings range from 80 to 120 positions, stock weights between 5 and 250 basis points (0.05% – 2.5%), sectors and regions within 10% of the index, limitations on style and industry exposures, and optimized to an asset that represents a risk-free rate (in this case, the US 3-month Treasury bill).

<table>
<thead>
<tr>
<th>Exhibit 7: Global model portfolio risk and returns</th>
<th>ACWI</th>
<th>Minimum variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annualized return</td>
<td>6.5%</td>
<td>6.9%</td>
</tr>
<tr>
<td>Annualized std. dev.</td>
<td>16.6%</td>
<td>9.4%</td>
</tr>
<tr>
<td>Risk reduction</td>
<td>N/A</td>
<td>43%</td>
</tr>
<tr>
<td>Beta</td>
<td>N/A</td>
<td>0.78</td>
</tr>
<tr>
<td>Sharpe ratio*</td>
<td>0.25</td>
<td>0.48</td>
</tr>
<tr>
<td>Annualized turnover</td>
<td>N/A</td>
<td>250%</td>
</tr>
<tr>
<td>Three largest sectors</td>
<td>38%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Sources: Factset, MSCI Barra.

*Risk-free rate is annualized 3-month T-bill return from BARRA.
The strategy outperforms ACWI by an annualized 0.4% with a risk reduction of 43% (based on annualized standard deviation of returns) and a beta of 0.78. Despite the constraints, the strategy exhibits persistent biases in consumer staples and utilities, where overweights averaged 8.4% and 5.0%, respectively, while being underweight financials and technology by 8.2% and 8.0%, respectively.

Furthermore, although the strategy was constrained to prevent excessive smaller-cap exposure, the optimizer drifted toward a smaller-cap bias to the extent allowed by the constraint. This base case also remained consistently overweight emerging markets as well as Japan, by 10.0% and 5.6%, respectively. Health care, financials and consumer staples on average accounted for 45% of the portfolio’s weight, compared to 38% for ACWI.

There are a number of factors that can contribute to an idiosyncratic volatility shock, which leads to certain sectors, industries or regions being exposed to volatility spikes. Although the strategy performed well while employing diversification parameters, this demonstrates some of the reasons for caution when using historically-biased risk models. At the time of the 2011 Fukushima crisis, the portfolio was overweight Japan by the maximum allowable 10% and over-weight utilities by the maximum 5%, along with an average annual turnover of 250%. Needless to say, the volatility of both Japan and utilities escalated after the crisis.

Nevertheless, although this is a theoretical back test, it shows that a basic minimum variance strategy has the potential to produce index-like returns at substantially reduced volatility. The core criticism of the basic minimum variance approach is that it does not discern between strong and weak investment ideas, and a portfolio could end up holding positions in weak companies simply because they have a standard deviation of returns that helps to reduce variance at the overall portfolio level.

Avoiding high-volatility stocks

Our research has shown that in recent years high volatility tends to be concentrated in about 30% to 40% of stocks within a broad global universe; this also holds true for individual regions. Exhibit 8 shows that since 1998, other than during the period from 2005 through 2008, the most volatile stocks as a group had a standard deviation of returns nearly twice that of the lower volatility group.

As shown in Exhibits 1 and 3, this same highly volatile group tends to underperform over the long run, particularly during down markets. When solving for a low-risk target with an alpha input (stock-level research), in addition to meeting the diversification parameters, an optimizer is likely to add at least some exposure to these undesirable high-volatility stocks. However, by excluding these most volatile stocks from the investable universe — effectively investing the portfolio only...
in those stocks that are less likely to underperform in down markets — this effect can be removed.

**Enforcing diversification**

Volatility changes over time: The causes and extent of volatility in one environment are different from that of another. Although trending volatility helps one manage near-term portfolio fluctuations, we can only speculate as to the timing and degree of contagion of the next market crisis. The benefits of diversification have been widely documented: Greater diversification lowers overall investment risk. Sectors can rotate from low to high volatility and indices can reflect inflated weights in trending sectors. Shifts can often be dramatic, as we saw in the technology bubble and the global financial crisis. Even in a low-volatility framework, sector and country diversification is critical.

For instance, as mentioned above, Japan tends to be a favorite overweight in low-volatility strategies because of its historical low-risk profile compared with other countries. Likewise, the utilities sector is a typical low-volatility overweight. Yet in the weeks following the Fukushima disaster, both Japan and global utilities became highly volatile. Predicting market volatility is often futile; remaining diversified helps to minimize the portfolio’s exposure to volatility shocks.

**Incorporating investment research**

Optimizers are only as good as their assumptions, despite their theoretical foundations. When constructing a risk-based portfolio, it is important to consider the inherent biases of the optimization process. An optimizer can place little to no importance on factors such as the quality of a company, its market prospects or how well the company is known by analysts.

In our research, we have discovered that in a global universe, there are often reasons that explain why certain stocks appear to exhibit low volatility. Sometimes stocks are less volatile for a reason and are, similarly, ignored by analysts and investors for valid reasons. In the same way that valuation-sensitive investors might caution against owning “value traps,” we would caution against owning “low-volatility traps.” Furthermore, our research shows that investment oversight can have a positive impact on risk-adjusted returns.

**Optimizing in a minimum variance framework**

There are numerous approaches to addressing these types of optimization biases. Perhaps the simplest is to adjust an investable universe so that it is void of undesirable properties such as illiquidity and poor earnings quality. Once the universe has been established, diversification constraints have been determined and information from investment research has been incorporated, a portfolio optimization model can be applied. Quantitative optimizers use multifactor risk models that consider sources of systematic risk — such as industry, company size, style and financial leverage — as well as companies’ idiosyncratic risk.

An optimizer solves for a risk objective, a return objective or a utility function, which is an optimal balance of return and risk compared with an index. A minimum variance approach seeks to achieve a low level of variance in a nonsystematic way; rather than minimize risk compared with an index, which would effectively result in reduced tracking error versus that index, the minimum variance approach seeks to reduce risk compared to an index-agnostic asset, such as a short-term interest rate. The result is a portfolio that avoids much of the risk characteristics of the index (Exhibit 7). Note that the minimum variance model portfolio portrayed in exhibit 7 does not incorporate investment research as described above.

**Conclusion**

In a world in which investors are both risk-averse and in search of yield, low-volatility strategies have emerged as a viable option to address both of these challenges. Several approaches exist to low-volatility investing. We have characterized the most common ones as low-volatility universe, beta target and minimum variance.

Regardless of the method, the low-risk objective ultimately drives portfolio weights in these portfolios. Since market risk is influenced by a certain number of variables, all of these low-risk strategies share similar characteristics: They tend to have a beta of between 0.7 and 0.8 and a volatility reduction of 25% to 35%, as well as a smaller-cap bias and a slightly higher dividend yield. They also tend to exhibit country and sector biases, such as favoring Japan and the defensive sectors.

We are of the view that risk should not be the exclusive catalyst for owning a stock and that a low-volatility portfolio is likely to perform better over a longer time horizon if it is broadly diversified, includes liquid stocks that are well-known by analysts and incorporates stock-level research rather than being exclusively driven by a risk objective. To achieve this, we recommend avoiding historically high-volatility stocks, employing rules of portfolio diversification, incorporating fundamental input and optimizing within a minimum variance framework.
Endnotes


3 EM up markets (cumulative MSCI Emerging Market index return): 1/90 – 6/97 (16%), 9/98 – 1/00 (69%), 4/03 – 10/07 (46%), 03/09 – 04/11 (54%), 12/12 – 12/13 (2%). EM down markets (cumulative MSCI Emerging Market Index return): 07/97 – 08/98 (-55%), 02/00 – 03/03 (-73%), 11/07 – 02/09 (-82%), 05/11 – 11/12 (-8%).

