Leveraging the Low-Volatility Effect

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KEY FINDINGS

- The authors offer practical solutions to overcome benchmark constraints and capitalize on the widely recognized but underutilized low-volatility factor.
- They construct leveraged low-volatility strategies, including long and short extensions with stocks and futures, to unlock their full potential.
- The authors show that these approaches help to meet various investment goals, from return seeking, to stable performance, to market-neutral returns, and a cost-effective alternative to put options for tail-risk hedging.

ABSTRACT

Low volatility has become a mainstream investment style over the past two decades, recognized for delivering high risk-adjusted returns. Many investors fail to fully capitalize on this strategy, however, due to benchmark constraints. Low-volatility stocks tend to lag during prolonged bull markets, a challenge that can be addressed using leverage. This article outlines five use cases to leverage upon the low-volatility effect, including an enhanced strategy, an alternative to the 60/40 asset allocation, and the use of long and short extensions with stocks and market futures. These approaches help investors aiming to meet objectives ranging from stable performance, consistent outperformance, market-neutral returns, or as an alternative for put options, unlocking the full potential of this underutilized factor.

Over the past two decades, low-volatility investing has emerged as a mainstream practice in the investment industry, recognized as a key style factor alongside value, quality, and momentum. This defensive strategy capitalizes on one of the most significant and robust equity market phenomena: Low-volatility stocks earn higher risk-adjusted returns than high-volatility stocks. This persistent market anomaly has been thoroughly documented across all major stock markets and over extended periods of time (Blitz, van Vliet, and Baltussen 2020). Blitz, Falkenstein, and van Vliet (2014) provide a comprehensive literature review, offering a range of explanations and highlighting the constraints faced by investors.[1] For instance, Black (1972) demonstrated early on that leverage constraints contribute to flattening the empirical risk–return relationship.

[1] Low volatility is the common name for related variables including idiosyncratic volatility (Ang et al. 2006) and market beta.

The volatility effect is difficult to reconcile with a traditional CAPM-based explanation and also difficult to arbitrage.[2] For benchmark-constrained investors who want to consistently outperform the market, the volatility effect is unappealing due to its high relative risk and limited outperformance potential (Baker, Bradley, and Wurgler 2011). For each dollar invested in the global equity market, an investor would need to invest about 1.4 dollars in low-volatility equities to achieve a market beta of around 1. Notwithstanding, Black (1993) suggests that investors could benefit by reallocating assets from bonds to low-risk equities within their strategic asset allocation, thereby using implicit leverage.[3] In contrast, factor premiums like value and momentum are easier to arbitrage, offering outperformance with market-like risk. Academics also struggle to understand this puzzle from a risk perspective, and therefore, well-known factor models, such as the Fama and French (2015) five-factor model, do not include low volatility as a factor in their five-factor model, like their exclusion of momentum.

This article explores various strategies to leverage the volatility factor to meet various investment objectives. We use publicly available data starting from 1990 and focus on the largest 1,000 US stocks. First, we integrate momentum and value (net-payout yield) return factors into an active low-volatility portfolio. This improved approach to low-volatility investing serves as our baseline for the subsequent use cases. The intuition is to prevent purchasing low-volatility stocks that have been selling off recently or that are excessively expensive. These tilts enhance returns, reduce relative risk, and improve both relative and absolute risk–return ratios while the portfolio retains key defensive characteristics, thus outperforming a naive single-factor low-volatility strategy in virtually all dimensions.

Second, we consider the strategic asset allocation (SAA) level. Investors may allocate more to low-volatility stocks at the expense of equities and bonds, boosting long-term portfolio returns without significantly altering risk.

Third, we consider a long extension through leveraged positions in low-volatility stocks or using market futures, targeting a beta of 1 to the broad equity market. Risk reduction is hereby translated into outperformance and the high Sharpe ratio also results in a high information ratio.

Fourth, for investors seeking to isolate the absolute returns of the low-volatility anomaly (with a market beta of 0), we present shorting strategies using market futures or "informed" leverage by shorting speculative high-volatility stocks. Frazzini and Pedersen (2014) proposed a similar zero-beta solution, but this approach has been criticized by Novy-Marx and Velikov (2022) for relying on shorting illiquid high-beta stocks and its dependence on dynamic trading. By applying static leverage over time, using a liquid investment universe, and incorporating prudent borrowing and leverage costs, we aim to address these concerns. Both shorting strategies are found to be feasible, realizing positive 12-month returns about 83% of the time and allowing investors to get access to a unique and uncorrelated return stream.

Finally, we explore a negative-beta strategy (–0.5), designed to offer downside protection similar to buying put options but without the associated performance drag. In this approach, the portfolio is structured to have a negative correlation with the overall market, generating positive returns during significant market downturns, again by shorting individual stocks or shorting market futures. We find clear added value to a passive equity portfolio. Full economic cycle return expectations are maintained or

[2] Fischer Black proposed a leveraged low-volatility strategy at Wells Fargo in the early 1970s, aiming to enhance returns by leveraging low-risk stocks. Although innovative, the idea faced resistance due to reluctance to leverage. See Bernstein's (2012) book, *Capital Ideas: The Improbable Origins of Modern Wall Street*.

[3] Black (1993) defines risk in terms of CAPM beta, whereas Ang et al. (2006) use idiosyncratic volatility as their risk measure. In this study, we use total volatility, which sits between these two measures, as the primary indicator of risk.

improved, while portfolio volatility is much reduced. This result stands in contrast to a plain put overlay, which also reduces volatility but at a high cost to performance.

To summarize, the five use cases presented cater to different investment objectives and benchmarks, including a low-volatility index, 60/40 equities and bonds, equities, cash, and equity put options. Given the importance of benchmark constraints for many investors, these applications provide a framework for profiting from this well-documented and persistent market anomaly.

FIRST CASE: ENHANCING LOW-VOLATILITY WITH RETURN FACTORS

The first case does not require explicit leverage but aims to profit from increased exposure to other well-established asset pricing factors. By integrating these factors into a defensive strategy, the return can be enhanced, as shown by Blitz and van Vliet (2018). We compare this enhanced low-volatility strategy with a single-factor low-volatility strategy.

For this analysis, we use publicly available US market data starting from January 1990. This start date provides a high benchmark for a low-volatility strategy, as this period was characterized by strong equity market returns and relatively few drawdowns. US bond data and credit spreads are sourced from the FRED database, with bond returns calculated using the 10-year government bond yield.[4] The equity and one-month T-bill rate are from Kenneth French's Data Library website,[5] and the low-volatility data are from the Robeco website.[6]

In Exhibit 1, the standard low-volatility strategy, Lowvol, selects the 100 stocks with the lowest three-year volatility from the largest 1,000 US stocks and rebalances monthly. The enhanced strategy, Lowvol+, referred to as the *conservative formula* by Blitz and van Vliet (2018), involves two steps. First, it filters the opportunity set by selecting the 500 lowest-volatility stocks from the index of 1,000. Then, it selects the top 100 stocks with the highest combined net payout yield and 12–1-month price momentum within those 500 low-volatility stocks.

The average compounded annual return of the low-volatility strategy is 10.5%, which is similar to that of the market portfolio. As expected, the volatility is 27% lower than the market's, resulting in a Sharpe ratio of 0.68, compared with 0.50 for the market portfolio. The Lowvol+ portfolio achieves an additional 2.0% return, with somewhat higher volatility, leading to an improved Sharpe ratio of 0.73.

EXHIBIT 1

Risk and Return of Two Low-Volatility Strategies, 1990–2023

	Lowvol	Lowvol+	Equities	Bonds
Return	10.5%	12.5%	10.4%	5.3%
Volatility	11.3%	13.2%	15.4%	7.4%
Equity Beta	0.60	0.72	1.00	0.03
Bond Beta	0.44	0.28	0.17	1.00
Relative Risk	11.4%	8.4%	–	–
Sharpe Ratio	0.68	0.73	0.50	0.36

[4] The DSG10 yields are from the FRED database (https://fred.stlouisfed.org) and are used to calculate US 10-year bond returns, as discussed in Swinkels (2019).

[5] Kenneth R. French Data Library, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[6] Additionally, for the fifth case, we use the VIX index to calculate equity put option returns. The VIX data begin in January 1990.

Relative risk, as measured by the volatility of the relative performance against the equity market portfolio, is 11.4% for the low-volatility strategy and decreases to 8.4% for the Lowvol+ strategy. This reduction is due to the asymmetric nature of relative performance, with the strategy lagging in bull markets but outperforming in bear markets. The Lowvol+ portfolio moves more in line with the broad equity market due to its weighting toward momentum and value, resulting in a beta of 0.72 versus 0.60 for the generic Lowvol portfolio. Interest rate risk is lower, as seen in the bond beta of 0.28 for Lowvol+ versus 0.44 for Lowvol.

Overall, the case for an integrated strategy is compelling: Returns increase, the Sharpe ratio improves, bond risk decreases, and relative risk decreases. Although absolute risk and beta rise somewhat, they remain well below benchmark levels, preserving the strategy's defensive characteristics. A single-factor low-volatility index can serve as a performance benchmark for strategic investors, allowing a defensive equity manager to be evaluated by separating performance attribution into style and manager alpha. For the remainder of this analysis, we use the Lowvol+ portfolio as the baseline low-volatility strategy given its attractive characteristics.

SECOND CASE: LEVERAGE IN THE STRATEGIC ASSET ALLOCATION

While a pure equity investor might not fully capitalize on the low-volatility anomaly because of benchmark constraints (see Baker, Bradley, and Wurgler 2011), these constraints are less restrictive at the strategic asset allocation level as bonds can be reduced in the portfolio to increase equity exposure. Black (1993) proposed reducing bond allocations and increasing low-risk equities within the SAA, effectively using implicit leverage to take advantage of the low-risk anomaly. Low-volatility stocks share characteristics with both equities and bonds. The risk profile of low-volatility stocks falls between that of equities and bonds, making the traditional 60/40 portfolio a natural reference point. Exhibit 2 shows the mean–variance-efficient frontier and illustrates Lowvol+ has the highest Sharpe ratio, spanning bonds, equities, as well as combinations of bonds and equities like 60/40.

Exhibit 3 presents the statistics of three portfolio combinations, starting with a 60/40 equity/bond strategic asset allocation. In the first SAA portfolio, 15% is allocated to Lowvol+ equities by replacing 10% equities and 5% bonds. The second SAA portfolio applies an equal 1/N allocation across all three assets. Finally, the third SAA portfolio invests 70% in Lowvol+ equities and 30% in bonds.

In all cases, portfolio volatility remains around 9.5%, while returns steadily increase with higher allocations to Lowvol+ equities.[7] As a result, the Sharpe ratio improves consistently, rising from 0.64 to 0.70, then 0.75, and reaching 0.82. Interestingly, bonds continue to add value alongside a Lowvol strategy, as evidenced by the higher Sharpe ratio of 0.82 compared with the stand-alone Sharpe ratio of 0.73. However, this higher Sharpe ratio comes with increased relative risk compared with the 60/40 reference index. Relative volatility increases from 1.0% with a 15% Lowvol+ allocation to 4.7% with a 70% allocation. Thus, by incorporating Lowvol+ into their strategic asset allocation, investors can achieve enhanced returns through risk reduction, provided they are not constrained by benchmarks. Compared with the traditional 60/40 portfolio, returns can increase by as much as 1.8% per annum over this sample period.[8]

[7] Volatility is not a comprehensive risk measure, so we also consider alternative measures based on downside risk, all of which yield comparable results.

[8] When gold is added to the asset mix besides equities and bonds, low volatility offers added value, as explored in greater detail by van Vliet and Lohre (2024).

EXHIBIT 2

Strategic Asset Allocation: Return and Volatility, 1990–2023

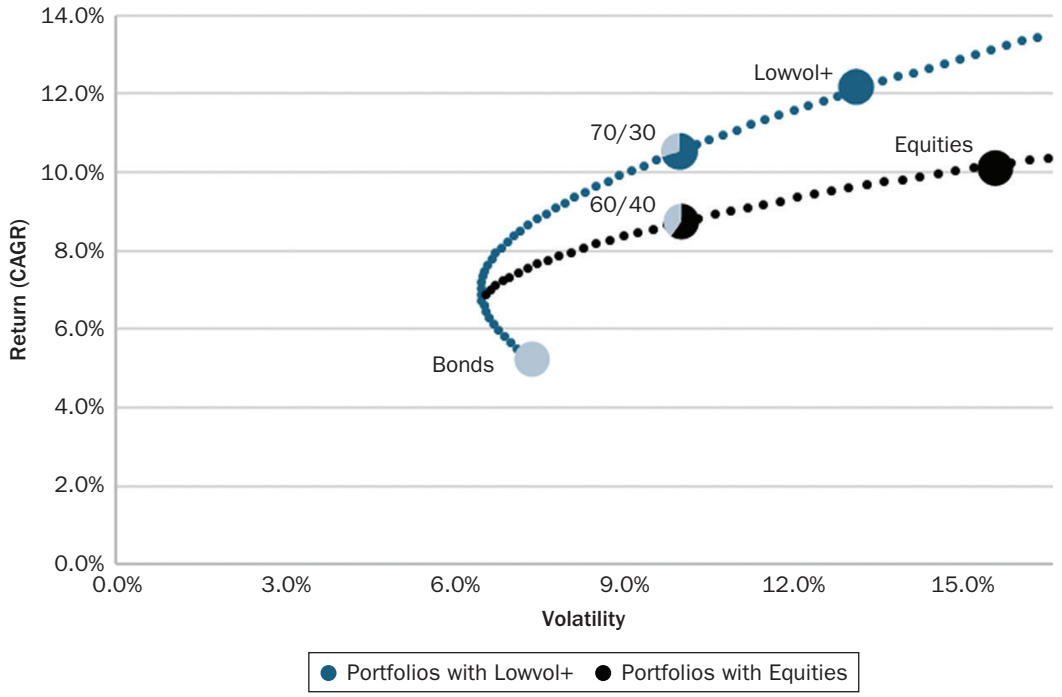


EXHIBIT 3

Risk and Return of Equities, Bonds, Low-Volatility Equity, and Combinations, 1990–2023

	60/40	SAA 1	SAA 2	SAA 3
Equities	60%	50%	33%	–
Lowvol+	–	15%	33%	70%
Bonds	40%	35%	33%	30%
Return	8.8%	9.3%	9.8%	10.6%
Volatility	9.5%	9.6%	9.4%	9.5%
Relative Risk	–	1.0%	2.2%	4.7%
Sharpe Ratio	0.64	0.70	0.75	0.82

Because most of the risk in a 60/40 portfolio still comes from the equity part, a much more conservative mix is a 20/80 equity/bond allocation. This portfolio provides a more balanced risk contribution between equities and bonds and better matches the liabilities of insurance companies. It offers an annualized return of 3.9%.[9] By comparison, a 30/70 mix of Lowvol+ and bonds yields similar risk but with an additional 1.1% return. The case for using low-volatility strategies to replace equities in a portfolio insurance context is discussed in more detail by Lohre, Happersberger, and Cherkezov (2018).

In Europe, institutional investors adjusting their strategic asset allocation still face regulatory constraints under Solvency II, which distinguishes between developed and emerging market equities but ignores differences in market beta within these categories. This can encourage risk taking, as higher-risk portfolios face the same capital

[9]This portfolio is closely aligned with the risk-parity strategy discussed by Asness, Frazzini, and Pedersen (2012), which offers the potential for the highest Sharpe ratio.

requirements as lower-risk ones. Swinkels et al. (2018) propose refining Solvency II by adjusting capital charges based on portfolio volatility compared with the market. Riskier portfolios would require more capital, while safer ones would need less. This approach incentivizes better risk management, enhances market efficiency, and aligns more closely with mutual fund regulations, reducing regulatory arbitrage.

THIRD CASE: LEVERAGE TO BEAT THE MARKET

Although risk reduction is an attractive feature of low-volatility investing, some investors may prioritize increasing total returns over reducing risk, aiming to outperform a benchmark. A straightforward way to achieve this is by leveraging the enhanced low-volatility strategy (Lowvol+) to match market risk with a beta of 1. This can be done either by borrowing to invest in individual low-volatility stocks or by gaining passive equity exposure through long futures positions. It is essential to account for the costs of leverage. For market futures, we include 0.2% per annum of return slippage and implicit costs, while for individual stocks, we use the credit spread over the T-bill rate as the borrowing cost. Over this sample, the average T-bill rate was 2.6% per annum, and the Baa–Aaa credit spread was 1.0% per annum.

To achieve a beta-1 strategy, we can take a 140% long position in low-volatility stocks, financed by borrowing 40%. This leverage allows the risk reduction to translate into outperformance. As shown in Exhibit 4, this approach results in a return of 15.7%, significantly outperforming the market, which had a return of 10.4% over the sample period. However, targeting a beta of 1 also increases volatility, which rises to 18.4%, surpassing the market's volatility. Despite this, the increase in volatility is rewarded with higher returns, as shown by a Sharpe ratio of 0.69, compared with the market's 0.51. The Sharpe ratio for this beta-1 strategy is slightly lower than the 0.73 for the unleveraged Lowvol+ portfolio due to financing costs.

To achieve a beta-1 strategy, we can also use equity market index futures. This approach requires less leverage (30%) and incurs lower costs. Both returns and risk increase compared with the market, though less so compared with the single-stock approach, as futures closely track the market. The maximum drawdown for this approach is –54.4%, and the Sharpe ratio remains strong at 0.68. Leveraging through futures is liquid, cost-effective, and straightforward, making it an attractive option for translating risk reduction into higher returns. However, futures provide passive, uninformed leverage, and this strategy offers 1.1% lower return versus the long low-volatility stocks variant.

To gain a deeper understanding of the behavior of these strategies over time, Exhibit 5 illustrates the cumulative (out)performance over time. For the sake of

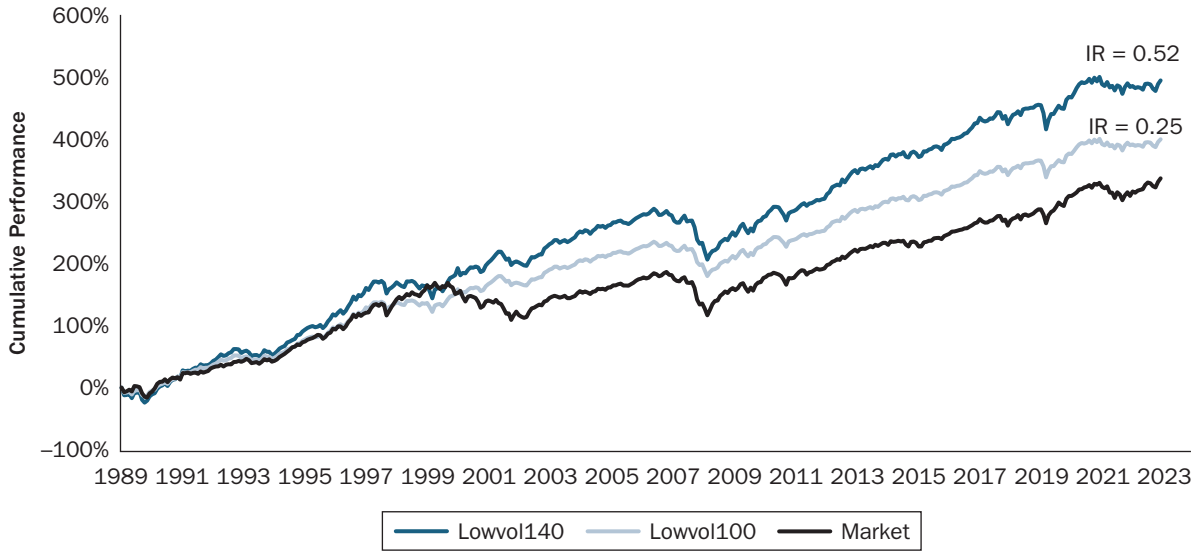
EXHIBIT 4

Leveraging Low Volatility to Beta 1 with Single Stocks and Index Futures, 1990–2023

	Lowvol+	Equities	Beta 1 +40% Stocks	Beta 1 +30% Futures
Return	12.5%	10.4%	15.7%	14.6%
Volatility	13.2%	15.4%	18.4%	17.3%
Sharpe Ratio	0.73	0.51	0.69	0.68
Beta	0.72	1.00	1.01	1.02
Relative Risk	8.4%	–	10.0%	7.2%
Maximum Drawdown	–42.5%	–50.4%	–56.1%	–54.4%
Exposure	100%	100%	140%	130%

EXHIBIT 5

Cumulative Performance over Time, 1990–2023



parsimony, we focus on the leveraged low-volatility stocks variant. The unleveraged low-volatility portfolio realizes unstable relative returns through time with weak relative performance in the late 1990s before strongly recovering during the dot-com crisis. The information ratio (IR), defined as outperformance divided by relative risk, is 0.25.

In contrast, the beta-1 version, which employs 140% exposure to low-volatility stocks, shows more consistent relative performance over time. The reduction in volatility is effectively translated into outperformance. The information ratio doubles with the use of leverage. It is worth noting that the quality of this outperformance can be significantly enhanced through portfolio construction techniques, such as sector constraints and tracking error limits, leading to a further increase in the Information ratio, as described by Blitz et al. (2025).[10]

FOURTH CASE: ABSOLUTE RETURNS

Next, we consider an investor seeking a return profile that is, on average, positive and independent of the general equity market—targeting a long-term beta of 0, as often pursued by alternative risk premia strategies and hedge funds. This can be achieved by either shorting the market using index futures or by taking short positions in individual stocks. Shorting individual stocks, particularly small-capitalization stocks, can be costly, so it is convenient that this analysis uses the largest 1,000 US stocks that are liquid and can be efficiently shorted.

The stocks selected for shorting are the "speculative stocks" described by Blitz and van Vliet (2018), characterized by high volatility, weak net payout yield, and poor 12–1-month momentum. Shorting the index via futures is straightforward, low-cost, and liquid, while shorting individual stocks allows for a more informed use of leverage and, consequently, requires less overall leverage. Because low-volatility stocks tend to have a lower beta than the market and speculative stocks tend to have

[10] The performance of the strategy can also be improved with a stop-loss rule. We evaluated a dynamic rule that scales back to the market portfolio when the six-month relative return of the Lowvol140 strategy is negative. This strategy further enhances return and reduces relative risk.

a high beta, only a relatively small, short position in speculative stocks is needed to achieve a market beta of zero compared with the fully funded long portfolio. This is advantageous, as shorting individual stocks is more expensive than shorting the index, but less shorting is required to achieve market-neutral returns.

Daniel, Klos, and Rottke (2024) show that shorting costs remain well below 2% for stocks with a market capitalization above USD 1 billion. Although the 1,000 largest US stocks used in this study exceed this threshold, we conservatively assume a shorting cost of 2%, thus adding 1% on top of the borrowing costs applied for the long-extension strategy. For futures, we assume implementation costs of 0.2% per annum. As before, we begin with the 100% long-only low-volatility portfolio, Lowvol+, with the results detailed in Exhibit 6.

The average return of the beta 0 strategy, using short positions in individual stocks, is 9.6% per annum, with a volatility of 10.6%. This strategy takes 100% long positions in Lowvol+ stocks and –48% short positions in speculative stocks. The Sharpe ratio is 0.65, benefiting from the negative alpha in the shorted stocks. In contrast, the beta 0 strategy using index futures requires more leverage (72%) and achieves a lower return due to the high equity premium over the period. Risk is lower with 7.2% volatility, however, as futures closely track the index without adding volatility as speculative stocks tend to do, resulting in a Sharpe ratio of 0.50.

Exhibit 7 shows the rolling 12-month total returns for the two market-neutral strategies. Both strategies perform well, with the short-speculative-stocks variant achieving higher returns but at greater risk. On average, 83% of the time the strategies have positive 12-month returns. Periods of underperformance occur when speculative "junk" stocks rally, such as in 2009, which impacts the futures variant much less.[11] Both strategies deliver high returns during the 2000s and remain stable in the 2010s but become more volatile in the 2020s.

These practical applications show how low volatility can be used to generate absolute returns using asymmetric leverage. The obtained simulated Sharpe ratio of around 0.6 obtained from low volatility can be improved through portfolio construction techniques, such as sector constraints and volatility targets, leading to a more stable return with smaller drawdowns. It can be added next to other style factors, alternative risk premia, or short-term signals. Interestingly, although hedge funds face limited leverage constraints and typically target a beta of zero, one would expect them to have

EXHIBIT 6

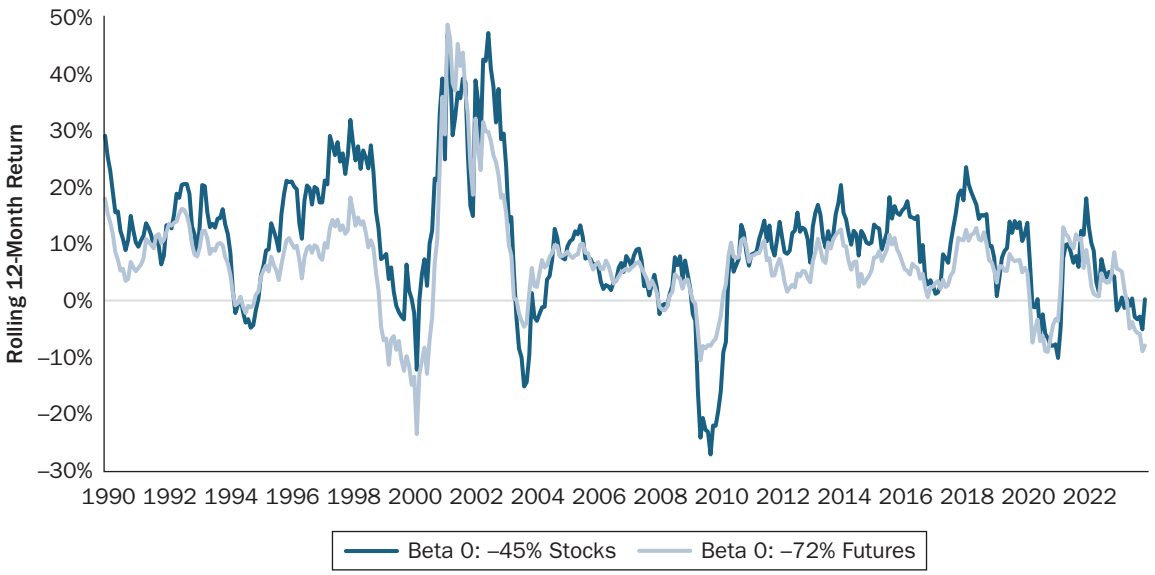
Leveraging Low Volatility to Beta 0 with Single Stocks and Index Futures, 1990–2023

	Lowvol+	Beta 0 –48% Stocks	Beta 0 –72% Futures
Return	12.5%	9.6%	6.5%
Volatility	13.2%	10.6%	7.2%
Sharpe Ratio	0.73	0.65	0.50
Market Beta	0.72	0.00	0.00
Maximum Drawdown	–42.5%	–26.4%	–28.9%
Exposure	100%	148%	172%

[11] Shorting high-volatility stocks encounters asymmetry in arbitrage, as discussed by Stambaugh, Yu, and Yuan (2015). This is particularly relevant to "noise-trader" risk (Shleifer and Vishny 1997), where adverse price movements may force the closure of a position before the mispricing correction can yield profit.

EXHIBIT 7

Rolling 12-Month Returns of Beta 0 Portfolios, 1990–2023



positive exposure to the low-volatility factor, whereas the opposite is true.[12] Given the typical negative correlation, an asymmetric long–short low-volatility strategy could therefore be added to a multistrategy hedge fund or complement other hedge funds.

FIFTH CASE: DOWNSIDE PROTECTION

In this last case, we move beyond zero beta to a negative market beta. This implies that the strategy should generate positive returns when equity market returns are negative. As a benchmark, we use a systematically long 5% out-of-the-money (OTM) one-month put options strategy, as in Harvey et al. (2019). We use the CBOE put index to calculate put option returns, which is rebalanced monthly, typically on the third Friday of a month.[13] To estimate downside risk, instead of using regular beta, a better measure is downside tail beta using the lower partial moment (LPM) framework as described in Bawa and Lindenberg (1977). We use –5% as the LPM threshold, equal to the strike price of the put and find a beta of about –0.5 for the 5% OTM one-month put-options strategy.

Targeting a beta of –0.5 and using the low-volatility anomaly, we first construct a portfolio with a 30% long position in low-volatility stocks combined with a –50% short position in speculative stocks. Additionally, we combine a 70% long position in low-volatility stocks with a –100% short position using market futures. Both approaches result in a portfolio with similar downside beta of around –0.5 and generally strong defensive properties versus equities.

[12] Interestingly, Blitz (2018) shows that hedge funds, which do not face leverage constraints, are loading negative on the low-volatility effect.

[13] Bloomberg: PPUT Index. Through removing the returns of the stand-alone equity index, the put returns are found. As validation we utilize daily VIX values and the 30-day T-bill rate to compute theoretical option prices and generate a monthly total return series that matches calendar month returns better than the put option index. Results are very similar. The average put price is 0.6%, though it fluctuates over time, exceeding 3% in some cases, such as during the Global Financial Crisis (2008–2009) and briefly during the COVID-19 pandemic in 2020.

A risk-reducing overlay should be assessed in conjunction with the portfolio it is designed to protect. Therefore, in Exhibit 8, apart from highlighting key characteristics of the stand-alone strategies, characteristics when these strategies are added to a passive equity portfolio are presented as well.

Similar to the findings of Coval and Shumway (2001), Harvey et al. (2019) and Ilmanen et al. (2021), buying put options is costly—witness the negative excess return of –3.6%.[14] Therefore, systematic put buying must be done alongside equities to avoid depleting capital before a crash. When added to equities, the total return is 7.3%, a cost of 3.1% per annum for downside protection, lowering the Sharpe ratio to 0.37.[15]

In contrast, the 30% long/50% short stocks portfolio offers better performance. Its negative excess return is much more benign than the –3.6% of the put option, so that the unfunded inclusion on top of the equity portfolio actually results in an improvement of total return. This is driven by capital protection during downturns, lifting combined portfolio returns to 11.2%, with a Sharpe ratio of 0.85. The 70% long/100% short futures portfolio also performs well, achieving a return of 9.4% with a Sharpe ratio of 0.74. At the cost of –1% in performance, portfolio volatility is significantly reduced from 15.4% to 9.2%.[16]

All three strategies reduce downside beta from 1.00 to approximately 0.50 and significantly lower volatility and maximum drawdowns to –38.1%, –31.4%, and –31.1%, respectively. Overall, long–short strategies are more effective than put options in reducing downside risk and portfolio volatility. Unlike put options, which require paying an insurance premium, long–short low-volatility strategies provide downside protection with better long-term returns. Additionally, long–short strategies are more effective in reducing drawdowns, as they avoid the need for frequent rollovers during periods of implied volatility spikes, when put options become costly. Moreover, they tend to deliver positive returns during moderate market declines between 0% and –5%, offering significantly better performance in equity downturns compared with put options.

There is a downside to using leveraged low-volatility for the purpose of tail-risk hedging. The payoff patterns of put options and long–short strategies differ significantly. While put options cap losses at the premium paid, long–short strategies can expose investors to larger losses, posing a limit to arbitrage (Shleifer and Vishny 1997).[17]

EXHIBIT 8

Long-Term Statistics of Downside Protection Strategies: 1990–2023

1990–2023	Equity	5% OTM Put	Equity + Put	30/–50 Stocks	Equity + 30/–50	70/–100 Futures	Equity + 70/–100
Return	10.4%	–1.0%	7.3%	1.9%	11.2%	0.5%	9.4%
Return-Rf	7.9%	–3.6%	4.7%	–0.7%	8.6%	–2.1%	6.8%
Volatility	15.4%	6.4%	12.5%	11.2%	10.1%	9.2%	9.2%
Sharpe Ratio	0.51	–0.55	0.37	–0.06	0.85	–0.23	0.74
Max Drawdown	–50.4%		–38.1%		–31.4%		–31.1%
Downside Beta	1.00	–0.48	0.52	–0.51	0.49	–0.48	0.52
Equity Up	3.5%	–0.6%	2.7%	–1.2%	2.1%	–1.2%	2.1%
Equity Down	–3.8%	0.9%	–3.1%	2.8%	–1.2%	2.4%	–1.6%

[14] This number is relatively benign, as it assumes a 100% cash portfolio combined with a put overlay.

[15] We also evaluated an at-the-money (ATM) put option strategy which gave lower returns and a lower Sharpe ratio compared to the 5% OTM strategy.

[16] The Sortino ratio, which corrects for asymmetric risk, gives similar results when comparing the downside protection strategies.

[17] As the options are typically rolled the third Friday of the month, their valuation is asynchronous with calendar months. If an option is deep in the money at month-end with strong gains, it can revert before the roll, potentially leading to a larger loss than the paid premium in the following month.

EXHIBIT 9

Monthly Return Profile of Put Option (left) and Long-Short Strategies (right): 1990–2023

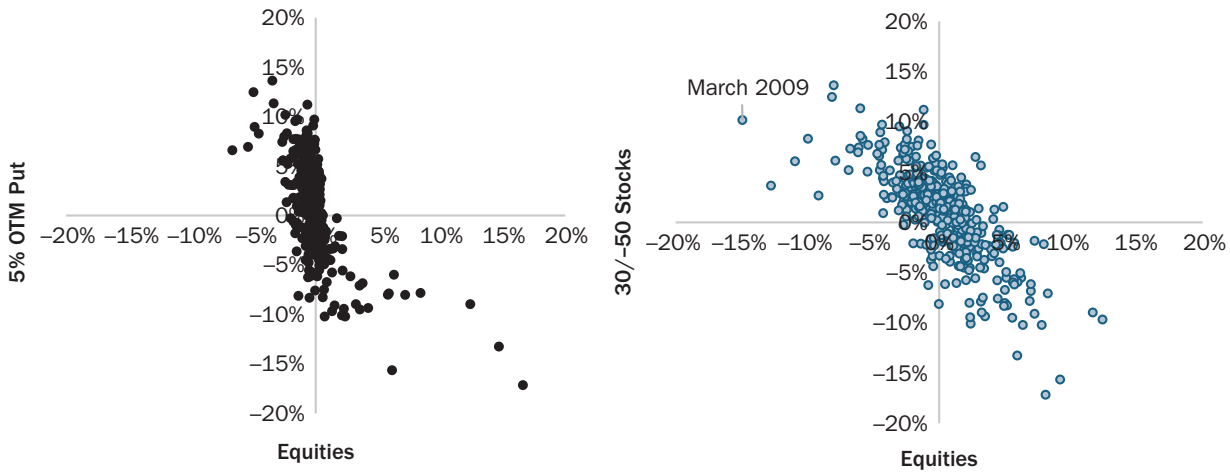


Exhibit 9 highlights the asymmetry in the payoffs between these two strategies across all months.

Both strategies are negatively correlated with the equity market, as intended. In general, the lower the equity market returns, the better the performance of these strategies. The put option exhibits a convex payoff structure, with no severe drawdowns, numerous moderate losing months, and significant value added during sharp market sell-offs below –5%. In contrast, the long–short low-volatility strategy follows a more linear pattern with higher volatility in returns. It can lag during strong market rallies, particularly in high-risk junk stocks, as seen in March 2009. However, the strategy compensates for these periods with positive returns in stagnant markets and performs strongly during moderate downturns, which are much more common than extreme market crashes.

In extreme market downturns of –10% or more, both put options and long–short strategies deliver positive returns, averaging +7.1% and +6.7%, respectively. The trade-off between these two approaches lies in their cost and performance profile. The put option serves as a costly but reliable hedge that only pays off in deep downturns, while the long–short low-volatility strategy, though prone to occasional larger losses and greater stand-alone volatility, tends to outperform the put option, on average, by generating returns in flat to moderately declining markets. This makes the long–short strategy an imperfect but feasible and attractive hedge for investors with long-term holding periods.

CONCLUSION

The low-volatility anomaly is often overlooked and difficult to arbitrage, as it may not suit investors facing constraints related to leverage, shorting, or benchmarks. This article highlights five distinct use cases that enable investors to leverage the low-volatility effect to enhance portfolio performance across different objectives. These strategies range from improving the stand-alone performance of low-volatility portfolios to incorporating them into broader strategic asset allocations, using them to boost returns, and creating market-agnostic, absolute return strategies. Additionally, the low-volatility effect can offer a more cost-effective alternative to traditional tail-risk hedging techniques, such as put options.

Among the strategies discussed, the first case—enhancing low-volatility portfolios with momentum and value factors—emerges as a highly effective solution. It boosts returns, reduces risk, and improves overall performance with minimal downside, making it especially appealing for investors constrained by leverage or benchmarks.

The other strategies can be tailored to suit varying risk appetites and objectives, providing flexibility for both benchmark-constrained and unconstrained investors. The choice depends on individual preferences for risk and return and investment constraints. In all cases, the low-volatility anomaly remains a valuable inefficiency, offering significant benefits in risk reduction and long-term return enhancement.

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