

Quantitative Equities

Low Volatility investing: now more than ever

- Short exuberance and junk positioning helps explain underperformance
- Recent rise of retail investor could support Low Volatility anomaly
- Low Volatility stocks can potentially deliver in current interest rate context

Low Volatility investing has rapidly matured into an established investment style, despite being a relatively young phenomenon. The Robeco Conservative Equities live track record – since the mid-2000s – shows how Low Volatility strategies managed to achieve their objective of delivering lower levels of risk without sacrificing returns. That said, Low Volatility strategies have encountered recent performance challenges and currently lag the market by more than 20% since the last months of 2019. This has raised concerns about the reliability of the approach. Moreover, many Low Volatility strategies failed to provide adequate downside protection during the Covid-19-induced market crash in the first quarter of 2020. Looking forward, there are doubts about whether Low Volatility strategies can handle changes in the investment landscape, such as the recent rise of the retail investor, and durably low or increasing interest rates. In this note, we address these concerns and conclude that the case for Low Volatility has not weakened, but is actually stronger than ever.

Recent performance

Popular low volatility indices, such as the S&P 500 Low Volatility Index, the MSCI World Minimum Volatility Index, and the MSCI Emerging Markets Minimum Volatility Index, have lagged their parent indices by over 20%, since the autumn of 2019. The theoretical volatility (VOL) factor of Blitz, van Vliet, and Baltussen,¹ which takes long and short positions in low volatility and high volatility stocks, both levered to a beta of 1, has experienced a similar-sized drawdown.² This tough period for the low volatility factor is related to the broader crisis for various quant factors,³ but it started later and has yet to reverse.

¹ See: Blitz, D., van Vliet, P., and Baltussen, G., 2020. "The volatility effect revisited." *Journal of Portfolio Management* 46(2), 45-63.

² Data for the VOL factor is available online at <https://www.paradoxinvesting.com/data/>

³ See: Blitz, D., 2021. "The Quant Crisis of 2018-2020: Cornered by big growth." *Journal of Portfolio Management* 47(6), 8-21.

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The recent low volatility woes can be explained by the fact that the market has been in 'risk-on' mode, i.e., riskier assets have fared better than safer ones. This has been the case not just within the equity market, but also at the asset class level and within other asset classes. For instance, equities have posted double-digit returns, credit spreads have tightened significantly, and bitcoin has reached all-time highs. Intriguingly, this has all occurred in the midst of one of the biggest economic contractions in modern history, instigated by lockdown measures worldwide as a result of the Covid-19 pandemic. Although this caused a brief panic in financial markets in early 2020, investors quickly discounted the news and returned to 'risk-on' mode.

In recent years, equity markets have largely been driven by the rally of large growth stocks. This has not only caused the widely documented underperformance of the classic value factor, which avoided these stocks because of their expensive valuations, but it also hurt the low volatility factor, which did not select these stocks owing to their typically elevated volatility levels. It is not surprising that the failure of the low volatility factor coincides with the quant winter for classic factors, as they share certain commonalities. Low volatility stocks tend to be mature firms with stable earnings and high dividends, which relates to the academic value (HML), investment (CMA) and profitability (RMW) factors. Due to these shared preferences, the VOL factor exhibits positive long-term correlations of about 40% with each of these factors.

Given these style characteristics, low volatility strategies generally tend to struggle during rallies of expensive risky stocks, with rapidly growing balance sheets and weak profitability. The recent drawdown is not the first example of this. Low volatility strategies experienced similar pullbacks during the tech bubble of the late nineties and other growth rallies further back in time. While it is important for investors to be cognizant of this vulnerability of low volatility strategies, they should not interpret it as a fatal flaw, because the growth rallies in question are not supported by improving firm fundamentals. Instead, they are fueled by massive multiple expansion, which eventually tends to mean revert. Thus, **low volatility strategies are short exuberance**, and although this can cause significant underperformance in the short run, this positioning should ultimately pay off.

Low volatility strategies also tend to suffer when distressed stocks rebound. This was the case during the recovery in oversold financials in 2009 and beaten-down tech companies in the second half of 2002. These so-called 'junk rallies' tend to be shorter-lived phenomena than the growth rallies discussed above, but share many similarities from a factor perspective. The stocks in question tend to involve high uncertainty, low dividends, a need for fresh capital and low profitability. Therefore, in addition to being short exuberance, **low volatility strategies are also short junk**. These features help explain the major drawdowns of low volatility strategies, but also highlight the main risk investors need to accept in order to harvest the VOL premium in the long run.

Downside protection

Many investors count on low volatility strategies to provide capital preservation during severe market downturns. These strategies have generally been able to deliver on this promise, for example during the debt crisis of 2008 and subsequent market downturns. But during the Covid-19-induced market crash of the first quarter of 2020, the downside protection they offered mostly fell short of expectations.⁴ This was a nasty surprise for investors who counted on their low volatility portfolio to behave like a safe haven, especially in this kind of scenario. It could be purported that low volatility strategies do not live up to their name, if they cannot be relied upon to fall less than the market during stress events.

But is it reasonable to expect low volatility strategies to offer a 100% success rate at providing downside protection? A low volatility strategy, with a beta of 0.7, shows similar short-term return behavior as a portfolio which invests 70% in the equity market and 30% in short-term Treasury bills, but only the latter can guarantee better downside protection. The low volatility strategy remains 100% invested in stocks, and although historical volatility generally does a good job at predicting future volatility, there is no certainty that the stocks that were least risky in the past will remain less risky in the future. For instance, low volatility stocks tend to be concentrated in certain industries, and in specific scenarios, these usually stable sectors may be hit harder than the more volatile ones.

⁴ See: Mosselaar, J.S., 2021. "Dissecting the 2020 performance of low volatility indices." Robeco article.

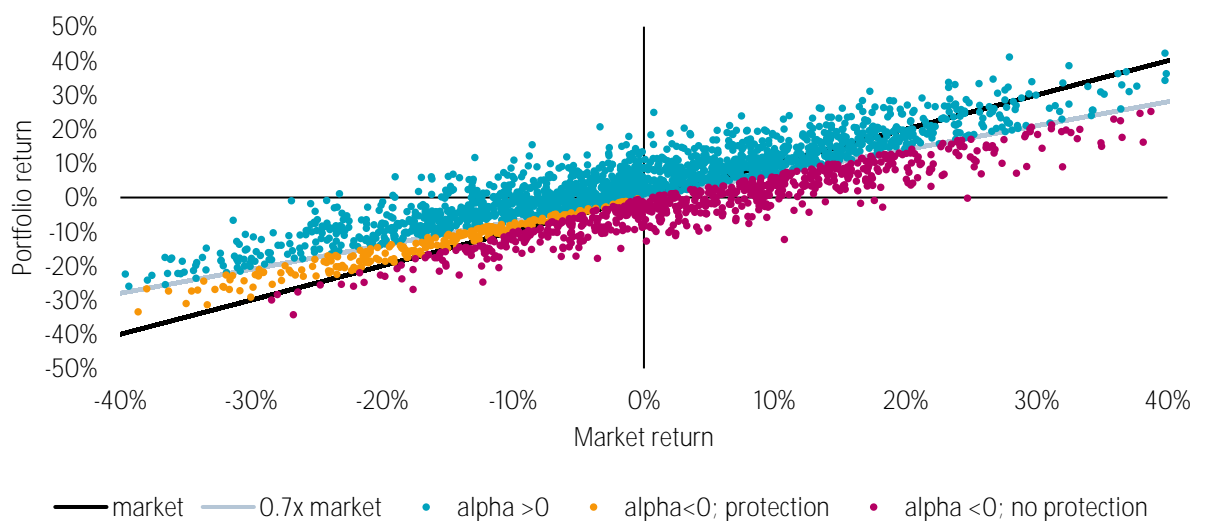
The ability to provide downside protection can be quantified with some simple back-of-the-envelope calculations. For this, we will break the return of a portfolio down using the following formula:

$$R_p = \alpha + \beta R_b$$

where R_p and R_b are the portfolio and benchmark returns in excess of the risk-free return, and α and β the alpha and beta of the portfolio compared to the benchmark. Low volatility portfolios are characterized by a beta well below 1 and a positive expected alpha which reflects their long-term added value. However, the alpha does not come in a smooth, steady return stream. Instead, it involves a considerable amount of uncertainty. Using data from real-life low volatility strategies, we can estimate that the alpha is associated with a volatility of about 6% on an annualized basis.⁵ This alpha volatility can be interpreted as the tracking error of low volatility strategies adjusted for the beta difference.⁶

We can illustrate this with a simple numerical example. Suppose the market goes down 20%. Then, the expected return for a low volatility portfolio with a beta of 0.7 and an expected alpha of 2% equals: $0.7 \times -20\% + 2\% = -12\%$. However, an alpha volatility of 6% implies that the 95% confidence interval around this expected outcome ranges from -24% to 0% ($= -12\% \pm 2 \times 6\%$).⁷ Thus, the portfolio may fall by even less than anticipated, but it may also decline by more than expected. **Due to its alpha volatility, the portfolio can even be hit just as hard as the market, or harder.** Unfortunately, low absolute portfolio volatility is inseparable from high alpha volatility.

Figure 1 | Simulated illustration of the impact of alpha volatility on Low Volatility performance



Source: Robeco Quantitative Research

The effects of alpha volatility are illustrated in Figure 1 using a Monte Carlo simulation. The black diagonal line reflects the benchmark return and the grey line represents the expected return of a portfolio with a beta of 0.7 and no alpha. The dots depict 2,500 simulated portfolio returns assuming an expected alpha of 2% and taking into account the effects of 6% alpha volatility. The blue dots denote positive alphas, the orange dots negative alphas but with some downside protection, and the purple dots negative alphas with no downside protection. The key takeaway is that alpha volatility results in a wide dispersion of possible outcomes. Crucially, a low volatility strategy may even underperform in down markets.

⁵ This estimate is based on long-term data for the Robeco Global Conservative Equities strategy and the MSCI World Minimum Volatility index, both in EUR.

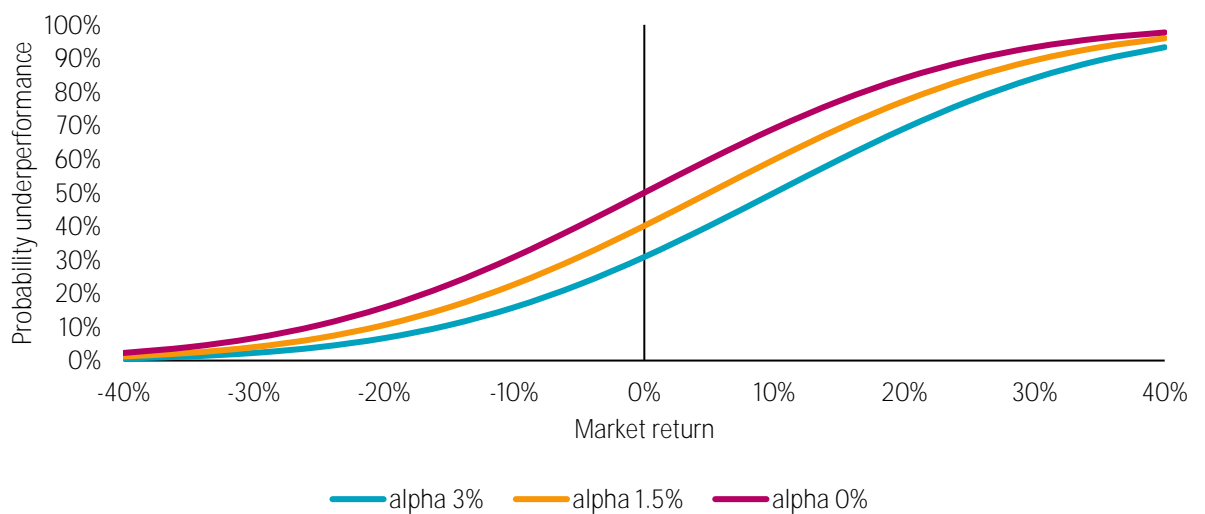
⁶ Our approach is a slight departure from the academic convention to define alpha as merely the average beta-adjusted return difference, while the remaining volatility is referred to as 'residual volatility'.

⁷ This is assuming normally distributed returns. In reality, return distributions often exhibit 'fat tails', meaning that extreme returns occur more frequently than with a normal distribution. With fat tails the dispersion in outcomes becomes even wider. See also: Van Vliet, P., 2015. "Tail risk in low-volatility strategies." Robeco article.

Figure 2 summarizes how alpha volatility affects the probability of underperformance for a typical low volatility strategy, at different market return levels and assumed average alpha. The main insight is that although low volatility strategies typically provide the expected protection during market downturns, there is always a non-negligible probability that they do not. Many low volatility investors got a nasty surprise when they experienced this for the first time in the first quarter of 2020, and understandably so. Statistically, however, it is well within the range of possible outcomes. And sooner or later it will happen again.

The important point, however, is that this does not invalidate low volatility investing. This tail risk is inherently present in low volatility strategies. Without alpha volatility, low volatility investing would just be too good to be true, with a 100% downside protection rate accompanied by a positive alpha.

Figure 2 | Estimated probability of underperformance for a Low Volatility strategy



Source: Robeco Quantitative Research

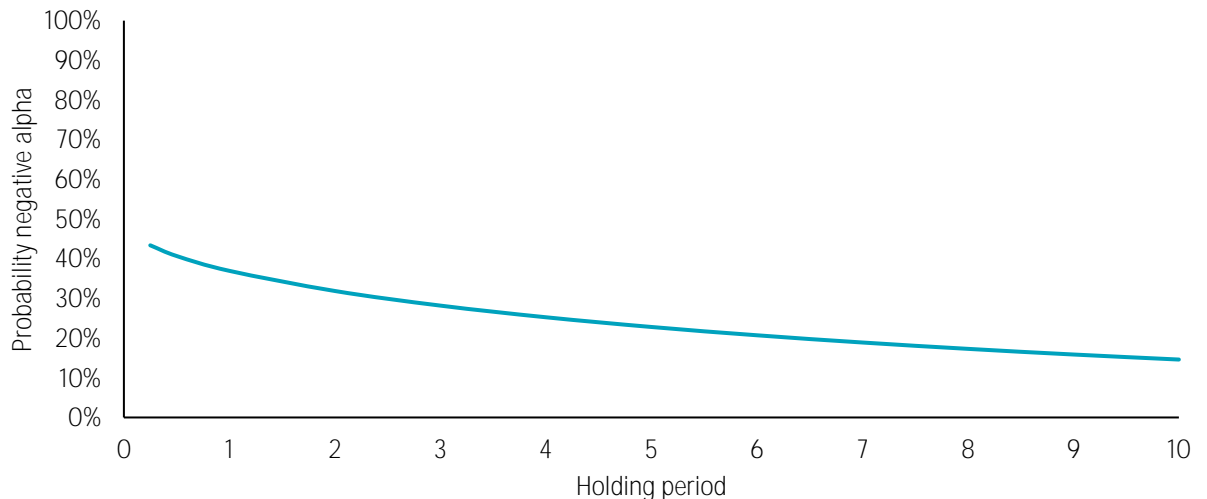
The graphs also help explain another counterintuitive result, specifically that **low volatility strategies can outperform when the market delivers double-digit positive returns**. We observe that even if the market goes up 40%, low volatility strategies still offer a 10% to 20% probability of beating the market, something which few would probably expect. Therefore, low volatility strategies cannot only surprise negatively, by underperforming in a down market, they can also surprise positively, by outperforming in an up market.⁸

The consequences of alpha volatility are far-reaching. Figure 3 shows the probability of a negative realized alpha over different holding periods, for a low volatility strategy with 2% average annual alpha and 6% annualized alpha volatility. For very short investment horizons, the probability of a negative alpha is close to 50%. This probability steadily declines with longer horizons, but only at a slow pace. With a four-year holding period, there is still a 25% probability of a negative alpha. Even with a 10-year holding period, this probability is still 15%. In fact, the investment horizon needs to be extended to 25 years to get the probability of a negative alpha down to 5%. And even at a horizon of 50 years, there is still a 1% probability of a negative realized alpha.

Thus, **harvesting the low volatility premium requires extreme patience at times**. Note that this finding does not specifically pertain to the low volatility premium, but that it holds for premiums in general. For instance, similar results can be obtained for the equity risk premium and for other factor premiums as well.

⁸ See: Blitz, D., and van Vliet, P., 2014. "Low volatility investing: Expect the unexpected", Robeco white paper. In this paper, we showed that low volatility investors should be prepared for this kind of unexpected outcomes using 85 years of historical data.

Figure 3 | Probability of a negative alpha for a Low Volatility strategy at various horizons



Source: Robeco Quantitative Research

The recent rise of the retail investor

The existence of a low volatility anomaly implies that, on average, low-risk stocks are underpriced, while high-risk ones are overpriced. In other words, investors tend to overpay for riskier stocks and underpay for safer ones.⁹ For professional investors, the key issue is that they are lured away from safer stocks towards riskier ones due to the pressure to beat benchmarks and peers. If every investor is focused on relative performance, the equilibrium outcome is a flat relation between risk and return.¹⁰ Individual investors appear to be attracted to riskier stocks for different reasons, most notably their resemblance to lottery tickets. A key supporting factor is the widespread presence of leverage constraints, which prevent investors from simply leveraging up a position in low-risk stocks to any desired risk level.

Were these drivers to weaken or even disappear, then the low volatility premium might shrink or even vanish in the future. So, let's review the key explanations. First, the regulatory and practical obstacles that prevent investors from leveraging up a portfolio of low volatility stocks have not been removed or relaxed. So, that catalyst is still present. Second, professional investors are still operating in a relative performance environment. Benchmarking remains universally present and managers continue to get hired after good relative performance and fired after bad relative returns. Third, we would have probably dismissed the relevance of individual investors until recently, as their role in financial markets has been steadily marginalized by professional investors. However, the individual investor appears to be making a comeback. Recent studies shed light on their behavior and it seems that individual investors are still prone to the same biases, which help to create and sustain the low volatility anomaly.

Recent research examines the performance and trading behavior of investors using the commission-free Robinhood trading app.¹¹ The Robinhood brokerage has a mission to 'democratize' finance by simplifying investing and trading for investors. The platform has 13 million users, with an average age of just 31 years old, many of whom are novice investors. This study finds that these investors exhibit strong herding behavior, with a preference for buying risky, attention-grabbing stocks. The top equities purchased each day experience average return reversals of 5% over the subsequent month. This is clearly the kind of individual investor behavior that leads to the low volatility anomaly.

⁹ Blitz, D., Falkenstein, E., and van Vliet, P., 2014. "Explanations for the volatility effect: An overview based on the CAPM assumptions." *Journal of Portfolio Management* 40(3), 61-76.

¹⁰ Falkenstein, E., 2009. "Risk and return in general: Theory and evidence." SSRN working paper, no. 1420356.

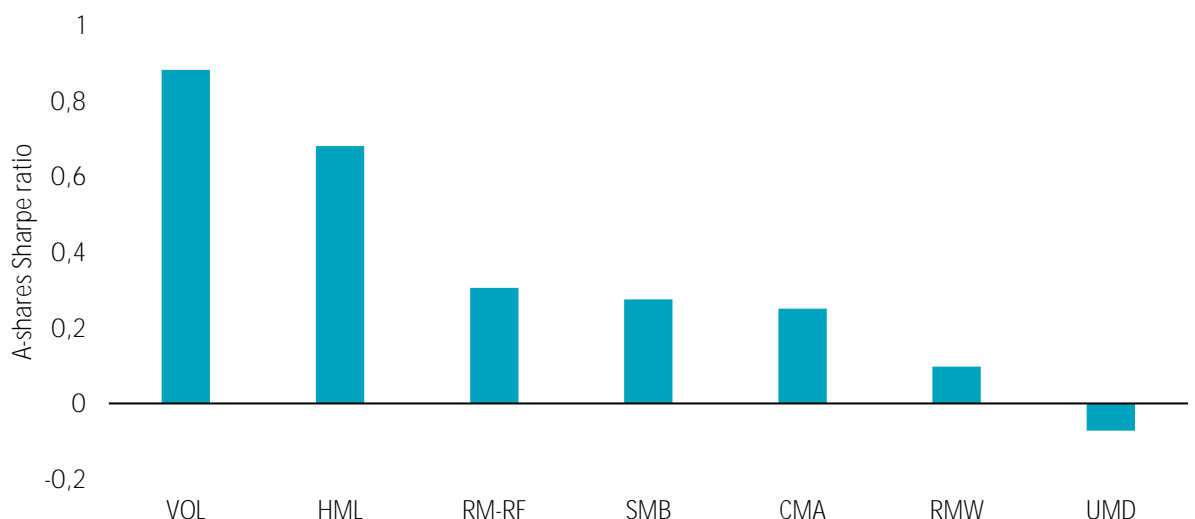
¹¹ See: Barber, B., Huang, X., Odean, T., and Schwarz, C., 2020. "Attention induced trading and returns: Evidence from Robinhood users." SSRN working paper, no. 3715077.

Exchange-traded funds (ETFs) is another innovation that has been massively embraced by individual investors. The original objective of ETFs was to follow broad, passive portfolios at low costs. As competition became more intense, issuers started offering specialized ETFs that track niche portfolios and charge high fees. A recent study examines such specialized ETFs and finds that they hold stocks with characteristics that are appealing to retail and sentiment-driven investors, such as high recent performance, media exposure and sentiment.¹² After their launch, such funds are found to perform poorly, as the hype around them vanishes, delivering negative risk-adjusted returns. The researchers conclude that financial innovation in the ETF space follows two paths: broad-based products that cater to cost-conscious investors and expensive specialized ETFs that compete for the attention of unsophisticated investors. The latter is again typical of the kind of behavior that supports the low volatility anomaly.

In another interesting new paper, researchers take a very original approach towards finding priced factors in the stock market.¹³ Instead of using the characteristics of stocks, they consider the socio-demographic characteristics of the individual investors who own them. They find strong evidence for a 'mature-minus-young' factor and a 'high wealth-minus-low wealth' factor. These factors are found to span the classic Fama-French factors, size, value, investment, profitability and momentum. The tilts of investor portfolios towards the new factors are driven by wealth, indebtedness, macroeconomic exposure, age, gender, education and investment experience. In particular, the young and less wealthy tend to prefer risky stocks, which is typical lottery-ticket behavior. Wisdom appears to come with age and experience, as the mature and affluent investors tend to prefer less risky, quality stocks.

At Robeco, we recently examined the low volatility effect in the local Chinese stock market, which offers a rare opportunity for what we believe to be a true independent out-of-sample test. Moreover, it is a market that is heavily dominated by individual investors. In our research, we uncover the **presence of a strong low volatility effect in the Chinese A-share market**.¹⁴ As shown in Figure 4, the VOL factor delivers an even higher risk-adjusted return, over the 2000-2018 sample period, than all the traditional academic factors: market (RM-RF), size (SMB), value (HML), profitability (RMW), investment (CMA), and momentum (UMD). Thus, the low volatility effect passes this out-of-sample test, on a new market, with large retail investor participation.

Figure 4 | Sharpe ratios of factor portfolios in the Chinese A-share market



Source: Blitz, D., Hanauer, M., and van Vliet, P., 2021. [“The volatility effect in China”](#) Journal of Asset Management, forthcoming.

¹² See: Ben-David, I., Franzoni, F., Kim, B., and Moussawi, R., 2021. “Competition for attention in the ETF space.” SSRN working paper, no. 3765063.

¹³ Betermier, S., Calvet, L., Knüpfer, S., and Kvaerner, J., 2021. “What do the portfolios of individual investors reveal about the cross-section of equity returns?” SSRN working paper, no. 3795690.

¹⁴ See: Blitz, D., Hanauer, M., and van Vliet, P., 2021. [“The volatility effect in China”](#) Journal of Asset Management, forthcoming.

The low volatility anomaly also appears to be strongly present in other new markets. A study examines whether crowdlending provides investors with returns consistent with the level of risk borne.¹⁵ Peer-to-peer crowdlending is a novel technology that has emerged in recent years as an innovative way to finance new ventures and small companies. Examining over 3,000 loans, mediated on 68 European platforms, it finds clear evidence of a low-risk anomaly as returns on crowdfunded loans are inversely related to riskiness.

Another study relates the low-risk anomaly to the favorite-longshot bias in sports betting markets, where returns for betting on riskier 'longshots' are lower than betting on 'favorites'.¹⁶ Using data from basketball and football games from SportsInsights.com, the researchers find empirical evidence for the favorite-longshot bias. This is a typical example of preferences for lottery-ticket payoffs.

Altogether, we conclude that the fundamental drivers for the low volatility effect remain intact. In particular, the recent rise of the retail investor is more likely to strengthen than to weaken the anomaly, as these investors are particularly prone to the kind of behavioral biases which cause risky assets to become overpriced. Various recent studies provide empirical support for this notion. The flip side of this coin is that rallies of risky stocks will continue to prevail. Low volatility investors will, therefore, need to endure these in order to harvest the low volatility premium in the long run.

The interest rate environment

For 40 years, low volatility strategies were able to benefit from the favorable environment offered by steadily falling interest rates. But now that interest rates have reached zero, or even negative levels, this tailwind is likely gone for the foreseeable future. Thus, can low volatility strategies still deliver in a world with structurally low rates, or if rates were to start rising again? In other words, has the macroeconomic environment turned against low volatility investing?

Numerous studies have established that low volatility stocks exhibit bond-like properties. Falling interest rates provide some tailwinds, while rising rates tend to be a headwind.¹⁷ This sensitivity to interest rate changes is an attractive feature for liability-driven investors, such as pension funds and insurance companies, because low volatility stocks provide a (partial) hedge for their liabilities. In our research, we estimated that low volatility stocks have a beta relative to bonds of about 0.3, which implies that a low volatility portfolio with an equity beta of 0.7 behaves roughly like a portfolio comprising 70% regular equities and 30% bonds, at least in the short run.¹⁸

The bond beta allows us to assess the potential adverse impact of rising interest rates. The worst nightmare of bond investors is a 1994-like scenario. During this 'annus horribilis', 10-year Treasury yields rose by 200 basis points and average bond returns were about -10%. With a bond beta of 0.3, low volatility strategies would take an expected hit of -3% ($= -10\% \times 0.3$) in such a scenario.

Taken at face value, this is quite a sizable blow. However, compared to the regular alpha volatility of about 6% per annum, it corresponds to a one-time minus 0.5 sigma event, which is not particularly extreme. In other words, even in a worst-case interest rate-rising scenario, the negative impact on low volatility strategies is small in comparison to the regular variation of low volatility alphas. Therefore, **the impact of interest rate changes is essentially a second-order effect**, that is typically overwhelmed by the influence of other factors on the performance of low volatility strategies at all times. This is illustrated in Figure 5. Concerns over a possible increase in interest rates in the coming years should therefore not be a reason to aggressively divest from low volatility equities.

There is also the alternate, and arguably more likely, scenario that interest rates will remain low for many years. Would this be an environment that favors low volatility names, or would other types of stocks benefit more from a sustained very low cost of debt capital? History suggests that low interest rates are not necessarily problematic for low volatility stocks. In

¹⁵ See: Adhami, S., Gianfrate, G., Johan, S., 2019. "Risks and returns in crowdlending." SSRN working paper, no. 3345874.

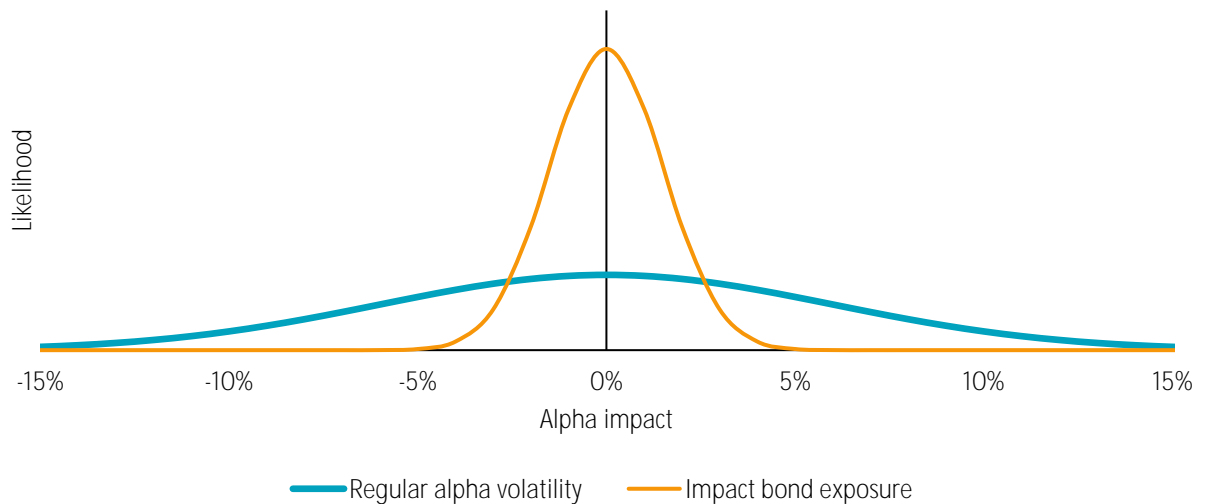
¹⁶ See: Moskowitz, T., and Vasudevan, K., 2020. "What can betting markets tell us about investor preferences and beliefs? Implications for low risk anomalies." Working paper, available at <https://kvasudevan.com>

¹⁷ See: Baker, M., and Wurgler, J., 2012. "Comovement and predictability relationships between bonds and the cross-section of stocks." Review of Asset Pricing Studies 2(1), 57-87; De Franco, C., Monnier, B. and Rulik, K., 2017. "Interest rate exposure of volatility portfolios." Journal of Index Investing 8(2), 53-67; and Blitz, D., 2020. "The risk-free asset implied by the market: Medium-term bonds instead of short-term bills." Journal of Portfolio Management 46(8), 120-132.

¹⁸ Blitz, D., van der Grient, G., and van Vliet, P., 2014. "[Interest rate risk in low volatility strategies](#)", Robeco white paper.

one of our studies, we found that the VOL factor was able to deliver solid returns in the US during the 1940s and 1950s, when interest rates were structurally low.¹⁹

Figure 5 | Impact of bond exposure versus regular alpha variation on the performance of a Low Volatility strategy



Source: Robeco Quantitative Research

Instead of merely comparing low volatility stocks with other equities, the bigger picture should also be taken into consideration. With interest rates at or below zero in numerous developed market countries, risk-free bonds in these regions have also become return-free (or low return) assets. For example, an investor who buys and holds a 10-year government bond with a yield of -0.5% to maturity locks in a guaranteed loss of 5% (= 0.5% x 10). Institutional investors, such as pension funds, have sizable allocations to bonds, which are potentially no longer helping but actually undermining their ability to pay pensions in the future. By investing in these low or negative-yielding bonds, pension money is no longer used for better pensions, but to subsidize bond issuers, such as governments.

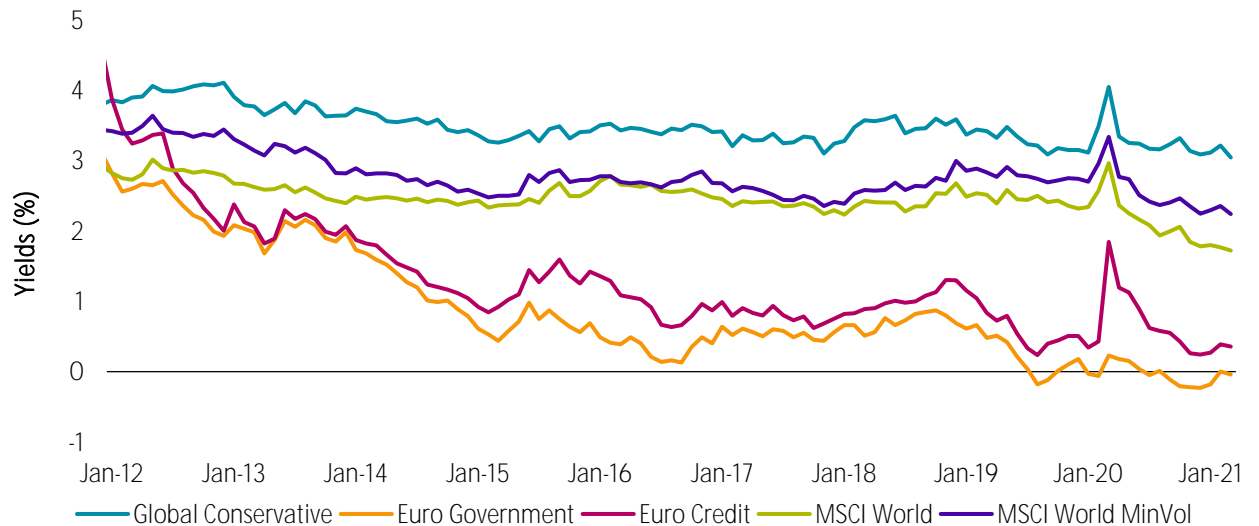
Without return-generating assets, the entire capital-funded pension system may even find itself at risk of being replaced by a pay-as-you-go transfer system. The current system only remains viable if the capital invested is able to earn a decent return. With numerous bonds having become non-yielding assets, investors need to find other return-generating investments. Equities are the most obvious alternative, but the problem with this asset class is that it is risky. If a pension fund liquidates its allocation to bonds and goes all in on equities, it will be confronted with much higher volatility. Thus, equities are needed for return, but volatility must be contained somehow. This makes low volatility stocks a potential sweet spot, that would allow investors to divest from bonds as much as possible, while minimizing the increase in portfolio volatility.

Figure 6 shows that while interest rates have decreased, the Global Conservative Equities strategy's yield has remained stable at around 3% to 4%. As a result, **the yield gap has become increasingly favorable for low volatility investing**. Assuming that the strategy's yield continues to be stable over the next 10 years, it will distribute over 30% in dividend income alone. Compared to our earlier example of a guaranteed loss of about 5% from investing in bonds yielding -0.5% and holding them to maturity, the low volatility strategy offers a cumulative income advantage of over 35%. In other words, as long as stock prices do not fall by more than 35% within the next ten years, Global Conservative Equities will likely turn out to be a better investment.²⁰ Those are pretty good odds. Thus, we believe now, more than ever, is an opportune time to invest in low volatility stocks.

¹⁹ See: Blitz, D., van Vliet, P., and Baltussen, G., 2020. "The volatility effect revisited." Journal of Portfolio Management 46(2), 45-63.

²⁰ Investors also hold bonds to match the interest rate sensitivity of their liabilities. The main risk that is introduced by replacing bonds with low volatility stocks is missing out on possible further increases in bond prices in case interest rates go down even further. However, this risk could be hedged with a derivatives overlay, such as interest rate swaps.

Figure 6 | Yield of Robeco Global Conservative Equities versus various stock and bond indices



Source: Robeco Quantitative Research

Another reason to be bullish on low volatility strategies is that they tend to bounce back after periods of underperformance. This argument is discussed extensively in a recent Robeco paper.²¹ Altogether, all traffic lights appear to have turned green for low volatility investing.

Conclusion

We reviewed the case for low volatility investing and discussed frequently voiced concerns. We argued that the ‘short exuberance’ and ‘short junk’ nature of the style explains why low volatility strategies experience occasional periods of underperformance. This includes the most recent period which was characterized by richly valued growth stocks becoming even more expensive.

We also explained that low volatility strategies are associated with significant alpha volatility. This helps us to understand why they do not always provide downside protection in down markets, but also why they are able to outperform in strong bull markets sometimes. We then argued that the rise of the retail investor could help to sustain the low volatility anomaly in the future.

Finally, we discussed the interest rate environment. We showed that although rising rates would trigger headwinds, rate hikes – even extreme increases – still only have second order effects on low volatility performance compared to the regular variation in their returns. We also contended that sustained low rates make low volatility stocks an attractive substitute for bonds in the asset mix, as they provide much needed income, while materially curtailing portfolio volatility at the same time.

²¹ See: Van Vliet, P., 2020. “[Has low volatility investing lost its mojo?](#)”, Robeco article.

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