Fidelity INVESTMENTS

Understanding volatility in portfolios

Putting risk in context

Why volatility needs a portfolio lens

Volatility is widely recognized as a primary indicator of investment risk. It condenses a series of returns into a single measure of risk, allowing investors to compare funds across different categories and strategies. On its own, a higher volatility number signals greater risk, while a lower number signals less risk.

Yet many investors do not hold a single fund in isolation. They hold diversified portfolios, which include multiple funds, stocks, bonds, cash allocations and other investment vehicles, and in which the contribution of each component to overall portfolio volatility depends not only on each investment's individual volatility but also on how it interacts with the other holdings. For this reason, volatility at the fund level should always be considered in the broader context of portfolio construction, where the objective is combining holdings in a way that creates the right blend of outcomes for the investor's needs.

Volatility in isolation vs. volatility in context

Volatility is informative but incomplete when applied only at the fund level. Two funds may differ significantly in their return profiles, but their effect on a portfolio cannot be assessed without considering their interaction with other assets.

The volatility of a portfolio is not simply the weighted average of its components. Instead, it depends on three key factors:

THE VOLATILITY OF EACH HOLDING

THE RELATIVE WEIGHT OF EACH HOLDING

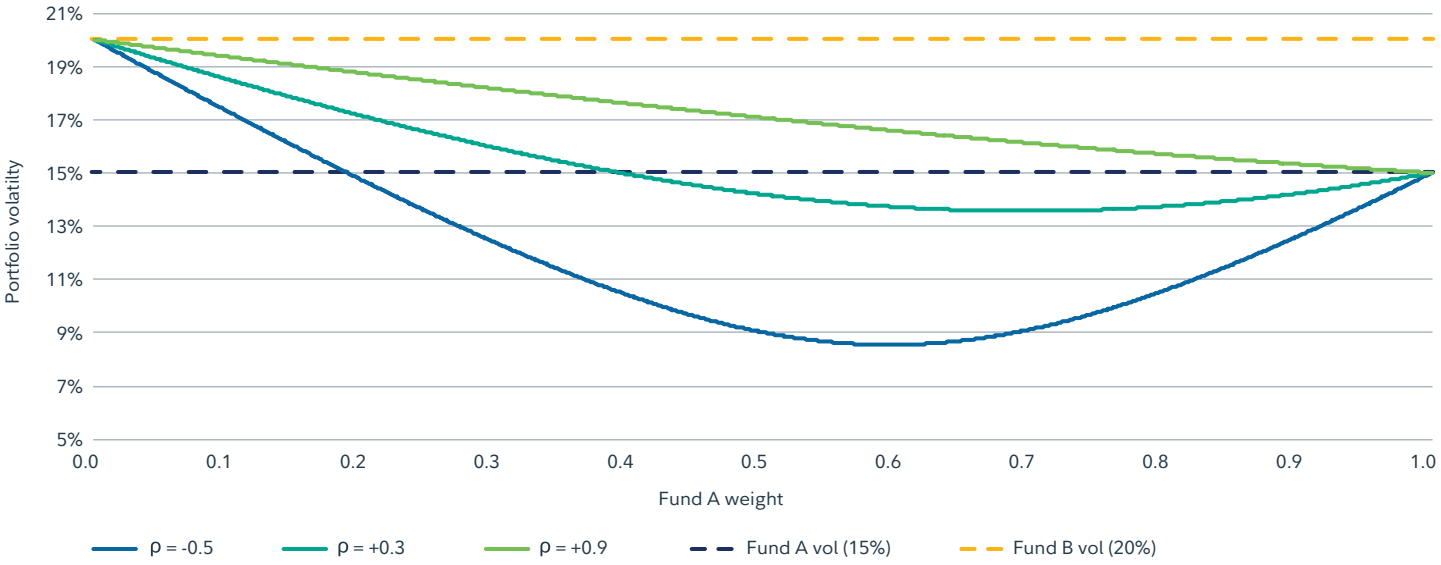
THE DEGREE OF CORRELATION BETWEEN HOLDINGS

A fund with relatively high volatility can lower overall portfolio volatility if it has a low or negative correlation with the rest of the holdings in a portfolio. Conversely, a low-volatility fund that is highly correlated with other holdings may provide minimal diversification benefit.

The implication is straightforward: fund-level volatility is meaningful, but the critical measure is its contribution to total portfolio risk. Ultimately, the focus is less about any single number and more about ensuring each investment plays its role in a mix that serves the investor's overall objectives.

The chart below shows how portfolio volatility changes when combining two volatile funds across different correlation levels. The horizontal axis represents the weight allocated to Fund A, with the remaining weight being allocated to Fund B, while the vertical axis shows the resulting portfolio volatility. The three curves correspond to different correlations (ρ) between the funds: +0.9, +0.3, and -0.5.

Chart 1: Two volatile funds can provide lower portfolio volatility through diversification.



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Three key insights emerge:

- When correlation is high (+0.9), the portfolio volatility remains close to the weighted average of the two funds: diversification benefits are limited.
- As correlation declines (+0.3, and then –0.5), the curves dip significantly below the volatility of either fund on its own, illustrating how diversification can reduce risk.
- The most pronounced effect occurs when correlation is negative: the two funds partially offset each other's returns, which creates a portfolio with materially lower volatility than either standalone fund.

Diversification is often described as "not putting all your eggs in one basket," but the mechanics are more precise. True diversification arises when assets do not move in perfect tandem.

If two holdings are highly correlated, combining them produces little reduction in risk. If they are imperfectly correlated, one can offset the returns of the other, reducing overall portfolio volatility. This principle explains why adding a fund with higher standalone volatility to a portfolio can still reduce portfolio risk. What matters is not only the fund's own risk profile, but also how its returns behave relative to the rest of the portfolio.

Expanding the definition of volatility

Standard deviation is the most widely used measure of volatility, but it is not the only way to capture risk. Other measures highlight additional dimensions:

- **Downside deviation:** Focuses on negative returns, isolating risk that matters most to loss-averse investors.
- **Beta:** Measures sensitivity to overall market movements. A high-volatility fund with a low beta may not significantly increase market risk.
- **Tracking error:** Measures returns relative to a benchmark. High tracking error indicates differentiated returns, which can be a source of diversification.
- **Value at risk (VaR):** Estimates the potential loss over a specified time horizon with a given chance of occurring, highlighting tail risks. For example, a 95% one-day VaR of 2% means the portfolio is expected to lose no more than 2% on 19 out of 20 days (95% of the time).
- **Downside capture ratio:** Measures how a fund performs relative to a benchmark in periods when the benchmark is negative.

- **Upside capture ratio:** Measures how a fund performs relative to a benchmark in periods when the benchmark is positive.
- **Maximum drawdown:** Records the largest peak-to-trough loss, illustrating the scale of historical declines.
- **Sharpe ratio:** Relates return above a risk-free return to total volatility, capturing efficiency.
- **Sortino ratio:** Similar to the Sharpe ratio, but uses downside deviation instead of total volatility, refining the focus on downside risk.

These metrics provide a more complete understanding of how a fund contributes to portfolio risk. A fund may appear volatile according to its standard deviation, but its drawdown profile, beta or risk-adjusted return measures may indicate that it plays a stabilizing or efficient role when viewed in context.

Table 1: Contrasting risk and return characteristics

	Standard deviation	Sharpe ratio	Maximum drawdown
Fund A	15%	0.5	-20%
Fund B	20%	0.8	-12%

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The table above compares the volatility and risk-adjusted characteristics of two funds. At first glance, Fund A appears less volatile, with a lower standard deviation. However, when additional metrics are considered, a different picture emerges.

- Fund B, despite having higher volatility, demonstrates a stronger risk-adjusted return profile, as highlighted by the superior Sharpe ratio, indicating better compensation for the risk taken.
- The maximum drawdown measure also shows that Fund B has experienced shallower peak-to-trough declines than Fund A, suggesting greater resilience in adverse markets.
- In this context, Fund B's higher risk should not be interpreted as purely negative; rather, it reflects a profile that may add value to a diversified portfolio through better risk-adjusted outcomes.

This comparison underscores the importance of evaluating standard deviation alongside complementary metrics. Looking at standard deviation in isolation can be incomplete, whereas integrating drawdown history and risk-adjusted returns provides a more accurate assessment of a fund's overall contribution to portfolio risk and performance.

Volatility in the framework of portfolio construction

While volatility is an important characteristic at the individual fund level, its practical relevance emerges most clearly within the discipline of portfolio construction, where the task is to put together the right investments, in the right proportions, for the right investor. The task of building portfolios involves allocating capital across asset classes, geographies and strategies with the objective of achieving an optimal balance between risk and return. In this framework, volatility is not an endpoint but an input.

How each fund adds to risk

One way to judge a fund's role in a portfolio is by looking at how much it adds to overall risk. A fund with high volatility might not increase risk if it moves differently from other holdings. By contrast, a fund that looks stable on its own may not reduce risk if it tends to move in the same direction as the portfolio's biggest exposures. This highlights that portfolio design is not about individual datapoints but about combining investments thoughtfully so that the mix of strategies works in harmony with an investor's overall goals.

When volatility measures rise together

Sometimes volatility increases across many areas at once. Whole sectors, regions or strategies can all become more volatile during periods of market stress. When this happens, correlations rise and diversification benefits shrink. That is why it is important to watch for concentration risks: portfolios that seem well diversified in calm times may hold assets that move the same way when markets are under pressure.

Using different measures of volatility

Looking at volatility in several ways gives a clearer picture of a fund's role. Standard deviation is a starting point, but measures such as downside deviation, beta and drawdowns reveal more about how a fund behaves in both good and bad markets.

For example:

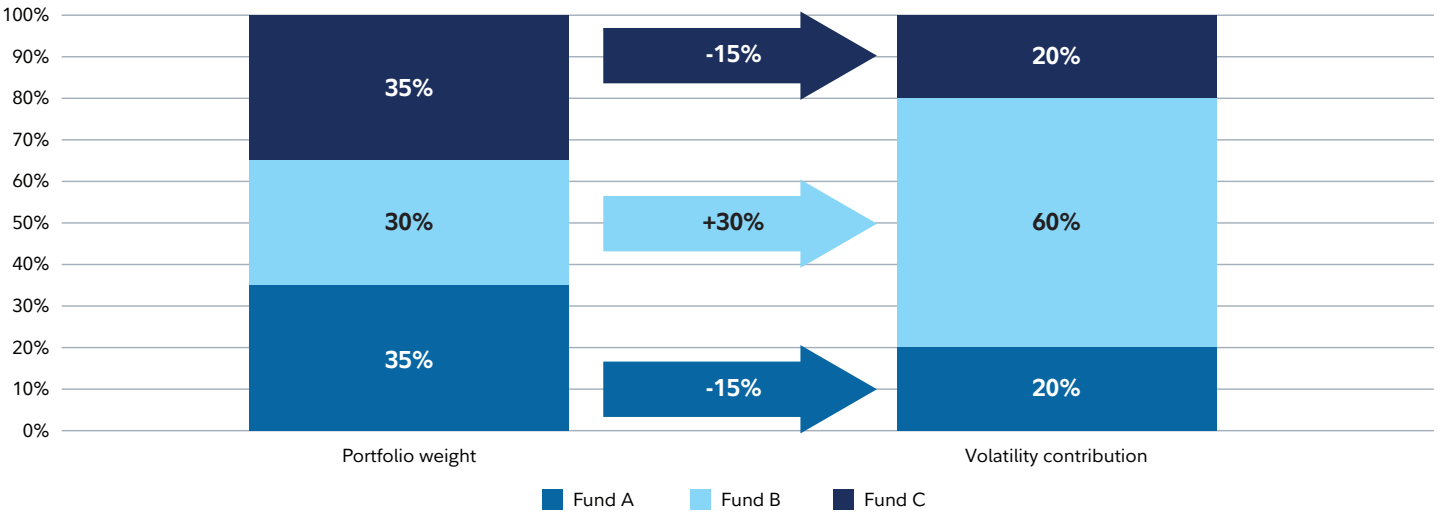
- A fund with high volatility but low beta may help diversify equity market risk.
- Two funds with the same volatility may differ in source – one driven by currencies, the other by equities – leading to very different diversification effects.

By viewing volatility through multiple measures rather than a single number, investors can build allocations that hold up better across different environments.

The chart below compares portfolio weights with portfolio risk contribution for three funds.

- The left bar shows how capital is allocated across Fund A, Fund B and Fund C. This example reflects 35%, 30% and 35% allocations to Funds A, B and C, respectively.
- The right bar shows each fund's share of total portfolio volatility. Here, the contributions differ from the weights, because volatility is shaped not only by position size but also by each fund's own risk and correlation with the others.

Chart 2: Portfolio/fund risk contribution by fund



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Two insights stand out:

1. Disproportionate risk contributions. Fund B's weight and its portfolio risk contribution diverge. Although its portfolio weight is less than the others, it accounts for a larger share of portfolio risk.
2. Diversification effect. Fund A and Fund C contribute less to portfolio risk than their weights suggest, indicating that their own volatilities may be lower and/or their returns are less correlated with the other funds.

The comparison highlights an important point: portfolio weights alone do not reveal how risk is distributed. A fund with a modest weighting can dominate risk if it is volatile and highly correlated with the rest of the portfolio, while another with a larger weighting may contribute less risk if its behaviour offsets other holdings.

Key takeaways

Volatility measures can be useful, but they are not the destination, they are signposts. On their own, they don't reveal how a portfolio is positioned or how resilient it may be in different environments. What truly matters is how those measures fit into the bigger picture: how each fund interacts with the others and whether the overall mix reflects the needs of the investor.

- **Volatility is only part of the picture.** No single statistic can capture portfolio risk; metrics must be viewed in relation to one another and to the investor's objectives.
- **Interactions shape outcomes.** The way funds combine, through diversification, correlations and balance, ultimately determines the risk of the portfolio.
- **Portfolio alignment is the goal.** The task is building portfolios in which each solution plays its part, creating the right mix to serve the needs of the investor.

Looking to gain deeper insights into how your portfolios are positioned for risk and return? Understanding volatility in context is just one step toward building stronger, more resilient portfolios. To explore these ideas further and discuss how they may apply to your investments, please contact your Fidelity representative.

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