Allianz Global Investors

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Inside the volatility roller coaster: patterns, drivers and portfolio implications

In recent years we have frequently observed a striking disconnect between real-world risks and the market's assessment of how much volatility they could trigger in equity markets. Protection costs can sometimes not reflect the underlying market risks (from geopolitical to economic). We examine the structural drivers behind these shifts and outline how investors can leverage these volatility patterns to enhance portfolio resilience and performance.

Eric Boess
Head of Trading

Mikhail Krayzler
Senior Portfolio Manager

Michael Stamos
Head of Global Research and Development, Multi Asset

Key takeaways

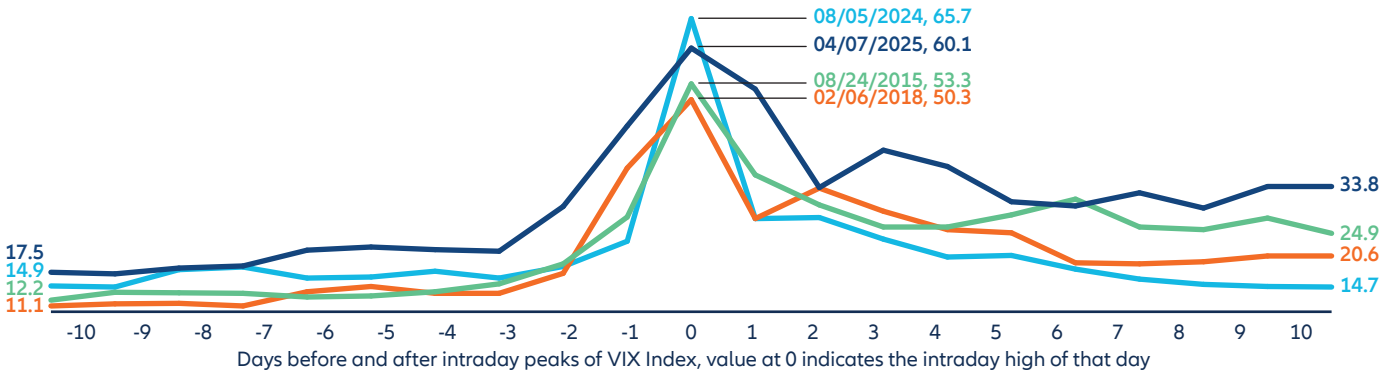
- Option-implied equity index volatility, most notably the VIX Index, have developed a changed pattern of more frequent volatility spikes, posing a challenge to risk managers and investors.
- We identify five structural changes – ranging from new liquidity providers to volatility-targeting programmes – that may drive these new patterns.
- We believe that low volatility does not necessarily mean low risk: beneath the surface, single-stock volatility and low correlations can raise the potential for sudden dislocations.
- Investors may take advantage of these dynamics by employing dynamic hedging strategies, using options and volatility structures to manage their portfolios' equity risk more effectively.

Volatility markets over the past decade have increasingly resembled roller coasters – only far more unpredictable and often extreme. The key difference is in foresight: on a roller coaster, the twists and drops are visible, heightening anticipation. Navigating volatility, by contrast, is more akin to riding Space Mountain – a high-speed coaster that hurtles through sharp turns and steep descents in complete darkness, with little sense of what lies ahead. Even seasoned traders have found themselves with sweaty palms.

Given the elevated levels of volatility during the latest conflict in the Middle East, we thought it would be instructive to analyse other episodes of volatility to consider how investors can leverage these patterns to enhance portfolio resilience and performance.

The pattern of these volatility episodes reflects the dynamic of unpredictability. Events such as the "Flash Crash" (August 2015), "Volmageddon" (February 2018), "Meltdown Monday" (August 2024), and the recent "Liberation Day" (April 2025) all began with relatively low levels of implied volatility (the market's forecast of how much an equity price will likely move in the future). Volatility during these episodes was often below 20 – before it tended to spike almost vertically to 50 or higher, followed by an equally rapid reversal (see Exhibit 1).

Exhibit 1: Pointy peaks: intraday peaks in the VIX Index reflect sharp up and down movement in volatility

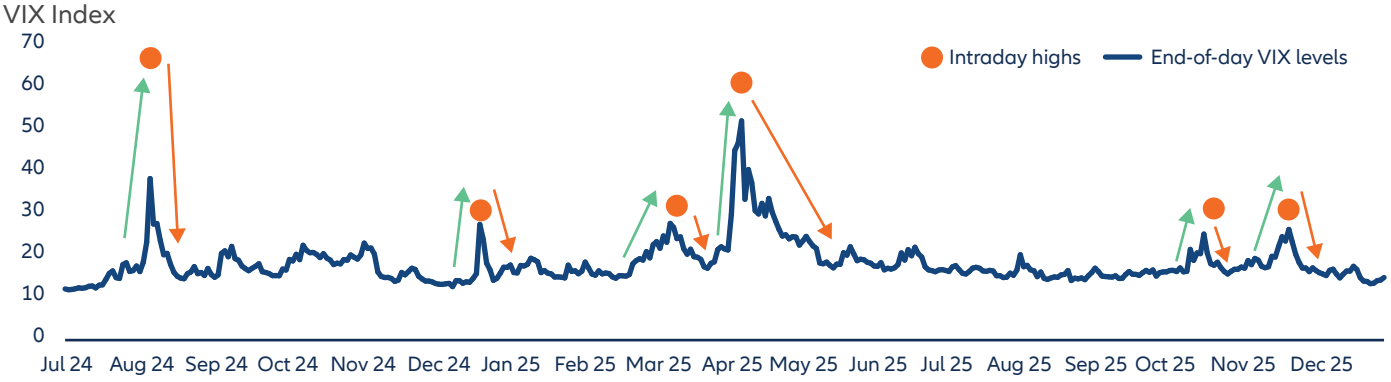


Source: Allianz Global Investors calculations using Cboe Volatility Index data. Data as at 31 December 2025.

"Elevator up and *stairs down*" is the phrase often used to describe volatility behaviour. In more recent years, "elevator up and *elevator down*" may be a more apt description. Volatility spikes now tend to reverse almost as quickly as they appear. While these episodes may look similar in terms of volatility patterns, the underlying drivers often differ, for example, the surge during Volmageddon (February 2018) was triggered by investors scrambling to cover short-volatility trades, with inverse volatility products such as XIV and SVXY losing more than 90% of their assets during the event. In contrast, Meltdown Monday (August 2024) saw inverse volatility products attract their largest inflows in years; the spike was instead driven by a lack of liquidity in out-of-the-money options.

A notable shift has taken place in market behaviour, with volatility spikes becoming far more frequent. In the past, VIX readings close to 50 typically occurred once every three to five years. However, over the last two years we've seen such extremes annually. This increase is also evident when focusing on the speed of volatility surges rather than on absolute levels alone. In our analysis, we examine instances where the VIX rose by more than 50% within a two-week period and reached at least 25, ensuring the exclusion of minor fluctuations. According to our criteria, there have been even six distinct volatility spikes during intraday trading over the past 18 months (see Exhibit 2), where the VIX rose by more than 50% within a two-week period and reached at least 25.

Exhibit 2: Our analysis of intraday levels identified six volatility spikes during the past 18 months



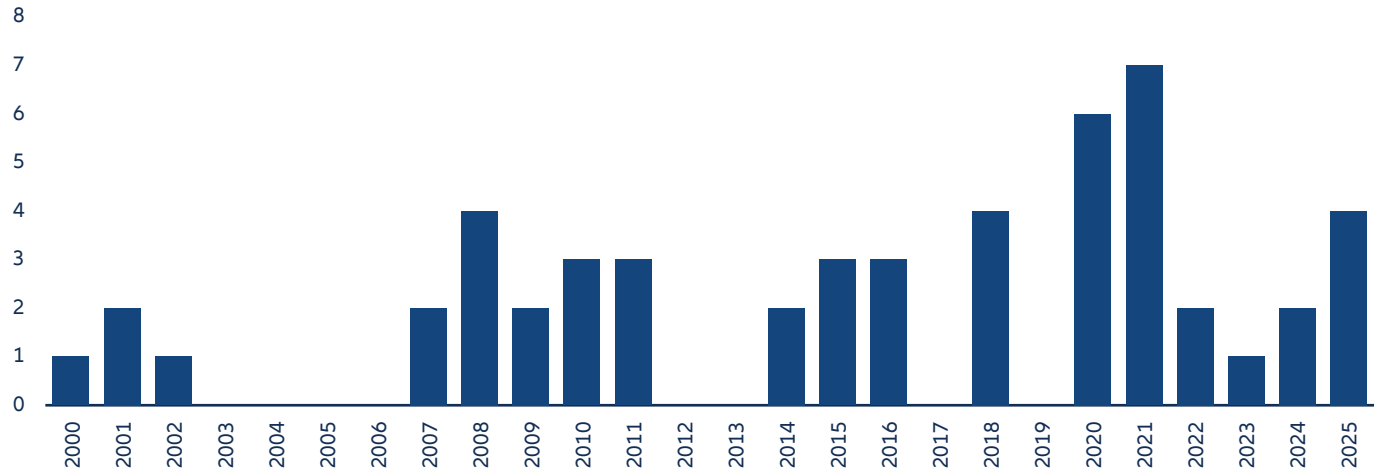
Source: Allianz Global Investors calculations using Cboe Volatility Index data. Data as at 31 December 2025.

The growing "spikiness" of volatility becomes even more evident when viewed over the past quarter century (see Exhibit 3). In the early 2000s, markets could go several years without a single volatility spike. However, 2019 was the last year to not have a single spike.

Equally striking is the accelerating speed at which volatility is subsiding. Over the last three years, a 90% drop from peak volatility has taken just nine days on average – less than half the 25-day norm of the past quarter-century (see Exhibit 4). This new volatility pattern – extended periods of calm punctuated by sudden, short-lived spikes – has puzzled many investors and challenges traditional risk frameworks.

Exhibit 3: Volatility spikes have become more frequent in recent years

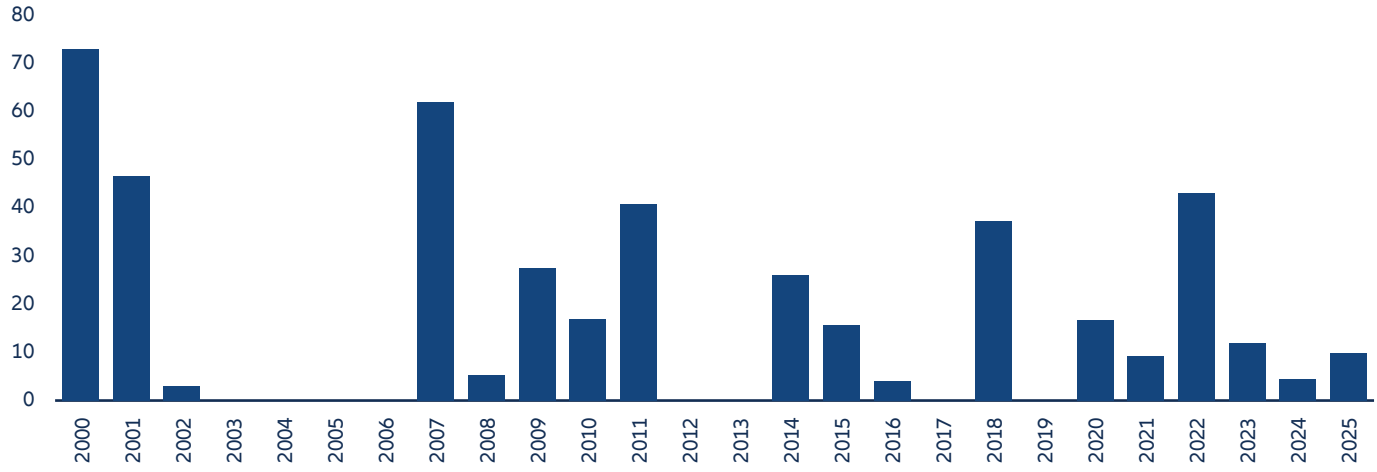
Number of volatility spikes



Source: Allianz Global Investors calculations using Cboe Volatility Index data. Shows the number of times per year that the VIX Index has risen by more than 50% within a two week period while reaching at least 25. Data as at 31 December 2025.

Exhibit 4: Volatility is subsiding more quickly

Average number of days for a 90% reversal



Source: Allianz Global Investors calculations using Cboe Volatility Index data. Shows the number of days it took to revert from a volatility spike, as defined in Exhibit 3. Data as at 31 December 2025.

Digging below the surface of low implied volatility

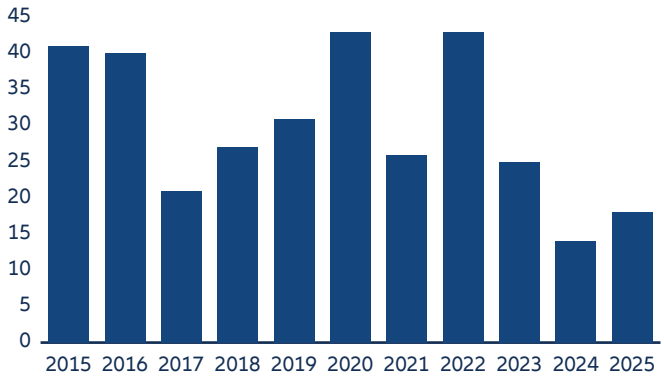
Many investors have become somewhat uneasy about the long stretches of low implied volatility levels. We too had expected that a reckoning may be in store for the economy and markets after the disruptions caused by Covid-19 and the surge in inflation that followed. But as 2023, 2024 and 2025 passed, the global economy remained resilient, and markets shrugged off inflation and hard landing fears. Still, unknown risks linger over artificial intelligence (AI), geopolitical upheaval, climate risk and the apparent rising emergence of populist leaders that can fuel fresh market volatility.

Volatility markets have often appeared complacent about these risks, pricing market protection at historically low levels – as reflected in subdued VIX readings and inexpensive S&P 500 put options. But once external shocks occur – such as the Middle East conflict, the calm is followed by sudden, seemingly out-of-nowhere spikes that often vanish almost as quickly as they appear.

What drives the implied volatility to such low levels in the first place? Looking deeper we find that the main reason for low implied index volatility in recent times is the decline of the implied correlation among single-name stocks (see Exhibit 5). In other words, during these periods, individual stocks are expected to be less in sync with one another in the future. This trend became particularly pronounced after 2022, remained subdued throughout 2023, and reached historically low levels in 2024, as illustrated in Exhibit 5, which shows the Cboe 1-month implied correlation index. This index derives implied correlation from options on the S&P 500 and its top 50 components.

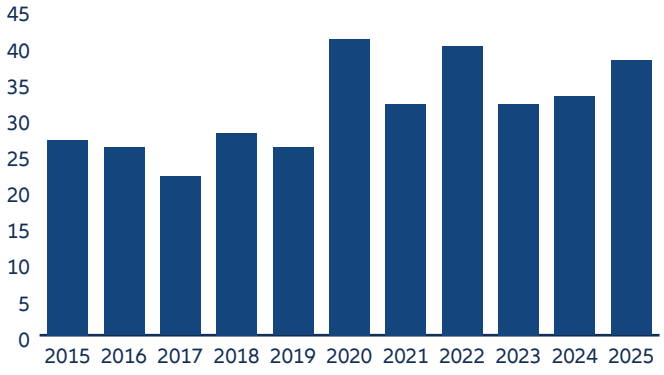
Implied correlation rose during the 2026 Middle East conflict. Before that in 2025, implied correlation was at its lowest level since 2017. But we were cautious about describing the 2025 period as one of low volatility as while index volatility remained low, volatility was elevated around single names (see Exhibit 6). Therefore, we would characterise that period as one of medium volatility paired with unusually low correlation between stocks, making it less surprising that volatility was able to surge so quickly once the conflict erupted.

Exhibit 5: In recent years markets expected stocks to be less in sync than in the past
Average implied correlation of the top 50 S&P 500 on a year-by-year basis



Source: Allianz Global Investors calculations. Cboe Implied Correlation 1M 50 Delta. Data as at 31 December 20251M 50 Delta.

Exhibit 6: Volatility levels for individual stocks have risen in recent years
Average single-name volatility on a year-by-year basis



Source: Allianz Global Investors calculations. Cboe S&P 500 Constituent Volatility Index. Data as at 31 December 2025 Volatility Index.

Five structural shifts behind the "vola coaster" pattern

We would be cautious about interpreting extended periods of low volatility as a sign of a low-risk market. Volatility outbursts can occur abruptly, reinforcing the "vola coaster" pattern described above. To better understand this dynamic, we identify five key factors that help explain why volatility behaves this way.

First structural shift: explosion in options trading and introduction of short-term option maturities

The rapid growth in listed options trading – now regularly over 60 million contracts are traded daily (just on the Cboe) – and the rise of zero day to expiry (0DTE) contracts (recently accounting for over 50% of SPX options volume) has fundamentally altered volatility dynamics. These very short-dated, same-day expiry contracts concentrate gamma risk and hedging demand within the trading session.

When dealers are short gamma (their option book loses with larger underlying moves), they must trade with the direction of the underlying equity market to keep delta hedged – sell into declines and buy into rallies – which amplifies price swings and increases realised volatility. Conversely, when dealers are long gamma, they hedge by trading against the direction to keep delta hedged – so will be buying dips and selling rips (rapid, sharp price increases) – dampening moves and suppressing realised volatility. Given the scale and immediacy of these flows, especially around data releases and event risk – volatility can spike sharply but often subsides quickly once hedging pressure recedes and gamma positioning reverses or eases by the end of a trading day.

The introduction of additional maturities helped improve liquidity and allowed for more tailored solutions in volatility markets, especially for hedging purposes (for example, hedging overnight risk or hedging specific events). The fears from some that these very short-dated maturity options could lead to volatility shocks haven't yet materialised because:

a) a) Flow in these very short-dated options is quite balanced.

b) Most structures traded are spreads rather than outright options, so the remaining risk in the market from these positions is low.

c) Most of these very short-dated options are the so-called 0Dte options, therefore the risk of forced selling after building a position is rather limited, as the options will expire by the end of each trading day.

Should flows become less balanced, trading of outright options increase or liquidity decrease for some exogenous reason, 0Dte may become a bigger risk for larger-than-expected daily moves.

Second structural shift: emergence of new liquidity providers and changes in regulations

A large change in the composition of liquidity providers took place after the 2008 global financial crisis. Reforms including Basel III, the Volcker Rule, and Dodd-Frank significantly limited the risks banks can take on their balance sheet. Tighter capital requirements and restrictions on proprietary trading forced banks to hedge exposures more aggressively and earlier in stress scenarios, reducing the depth of liquidity they traditionally provided to the market.

At the same time, electronic liquidity providers (ELPs) emerged as dominant players in screen-based options market making. These firms operate with lower regulatory burdens, smaller capital bases, and cutting-edge technology that prioritise speed. While ELPs have improved liquidity and tightened bid-ask spreads in normal conditions, they tend to withdraw during stress, causing spreads to widen and VIX to spike faster and higher than pre-crisis norms. At the same time, these firms are typically among the first to resume pricing once the spike subsides, which helps volatility normalise more quickly.

The combined effect of regulatory constraints and structural shifts has made markets more fragile during shocks: volatility spikes are sharper because liquidity evaporates quickly, though these episodes often resolve faster as systematic hedging and liquidity returns to more normal levels.

Third structural shift: Growth in options-based and leveraged ETFs

The popularity of exchange-traded funds (ETFs) has surged in recent years, with the most significant impact on volatility coming from call overwriting strategies (selling a call option on a stock or index that an investor owns) as yield-enhancement tools. Assets in these ETFs have grown from USD 7 billion in 2019 to USD 125 billion by mid-2025, and double that level if we include all options-based strategies.

These flows exert a twofold dampening effect:

1. **Direct:** Systematic selling of upside options – often short-dated – boosts implied volatility supply, compressing index volatility.
2. **Indirect:** Dealers, who are typically long gamma (meaning their delta of option positions increases with price movements in the underlying asset) due to these increased flows, hedge dynamically (buying dips, selling rips), further reducing realised volatility.

The overwriting activity is larger at the index level compared to single names, dampening index-level realised volatility. This skewed level of activity can create a self-reinforcing feedback loop: as volatility declines, more options – often closer to at-the-money strikes (when an option's strike price is the same as the underlying security's market price) – are sold to maintain target yields, which further suppresses volatility both directly and indirectly. However, if the market begins to move lower, this flow may fade, as higher volatility allows systematic strategies to sell further out-of-the-money calls, reducing associated dealer hedging and diminishing the volatility-suppressing mechanism. This can leave the market more vulnerable to volatility spikes.

At the same time, some ETFs have the opposite effect on volatility – most notably leveraged ETFs. These products amplify momentum during large market moves, which can accelerate volatility on days with significant positive or negative returns.

Fourth structural shift: Rise of retail options trading

Retail participation in options markets has surged since just before the Covid-19 pandemic, accelerated by factors such as zero-commission trading, lockdowns, stimulus cheques, and the rise of platforms like Robinhood. This trend was amplified by the popularity of meme stocks and social trading communities.

While retail flows are smaller in notional terms compared to institutional activity, their concentration in short-dated, highly leveraged contracts and specific strikes can distort dealer gamma profiles and local liquidity conditions. The behaviour of retail flows introduces noise and convexity into intraday price action, contributing to sudden volatility bursts around macro events or popular trades.

Retail traders often buy call options to chase upside, which in single names during the meme-stock era led to inverted call skews, when out-of-the-money call options have higher implied volatility than at-the-money put options. As dealers are generally the counterparty, they end up holding short positions in these options, requiring dynamic hedging to stay delta-neutral, meaning the portfolio value remains unchanged when small changes occur in the value of the underlying security. When dealers are short gamma, their hedging – buying into rallies and selling into declines – amplifies moves, creating sharp swings in both directions.

Although retail-driven spikes are often short-lived, they interact with other structural forces to accelerate the speed and intensity of volatility moves.

Fifth structural shift: Growth of volatility-targeting approaches

Volatility-targeting techniques have become a significant force in modern market dynamics, mechanically adjusting equity exposure to maintain a predetermined volatility level – often around 10%. During periods of market calm, when realised volatility is low, such techniques systematically increase equity allocations, reinforcing stability and suppressing volatility. Conversely, when volatility spikes, volatility-targeting strategies rapidly de-risk by selling equities, amplifying the initial move. Once volatility subsides, they re-risk, accelerating the market's return to normal and shortening the lifespan of volatility spikes.

With assets using volatility-targeting approaches now estimated in the hundreds of billions of dollars and embedded across insurance products, mutual funds, and institutional mandates, their pro-cyclical behaviour may have become a structural driver of the "spiky but short-lived" volatility regime of recent years.

Navigating a new volatility regime and portfolio implications

To summarise, the five factors discussed above have altered how market volatility behaves. They have made volatility spikes more frequent and more severe during periods of stress. Higher trading volumes and shorter-dated options may not fully explain how quickly the VIX can move. But their effects become much stronger when combined with tighter banking regulations, greater concentration among market makers, the rapid growth of ETFs (including leveraged products), increased retail participation, and the expansion of volatility-targeting strategies.

Periods of very low volatility should not be interpreted as periods of low market risk. In fact, they often create attractive opportunities to use options and volatility instruments for protection purposes. This is especially important as traditional safe haven assets have become less reliable and bonds increasingly behave like risk assets. Cheap equity index put options can be used for tail-risk hedging, but these strategies need to be actively managed. They must adjust as option prices, implied volatility, and implied correlations change.

Rather than relying on static hedging strategies, investors can use calm market conditions to identify reasonably-priced convex protection – strategies that offer asymmetric payoffs without excessive premiums or ongoing losses. This approach can help build portfolios that are better able to withstand market shocks. Treating volatility as a core part of portfolio construction allows investors to stay invested

in equities during strong market rallies while improving protection against sudden drawdowns.

In our view, effective volatility management requires looking beyond the headline VIX level and considering the full volatility surface. For example, even when the VIX is near historical lows, out-of-the-money put options can still be expensive, creating opportunities to benefit from steep volatility skew. At the same time, long-dated volatility often remains elevated compared to short-dated measures, reflecting ongoing concerns about long-term correlation risk.

The difference between implied and realised volatility – the volatility risk premium – is also important. A wide premium may make volatility-selling strategies attractive, but it also indicates higher hedging costs for investors seeking protection. In addition, dealer positioning matters. When dealers are long gamma, their hedging activity tends to dampen market moves. When they are short gamma, hedging flows can amplify price swings.

Ultimately, these shifting volatility pressures make a dynamic approach essential for investors seeking to remain protected without forfeiting upside.

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