Scientific Portfolio Market Review

March 2025

Scientific Portfolio
An EDHEC Venture

The Concentration Conundrum: A Closer Look at US Equity Performance

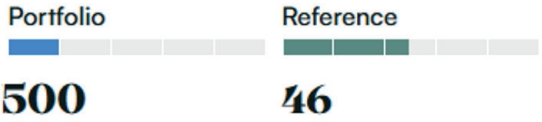
Investors in US equities face a paradox. The market has recently reached historic levels of industry concentration — a characteristic often associated with *future expected underperformance*.[1] Yet the large cap technology stocks that now dominate indices exhibit a high-beta profile, which would typically (all else being equal) suggest *stronger expected returns*.[2] In addition, 'stock-specific' idiosyncratic risk has significantly increased, while factor exposures in today's market differ significantly from historical patterns, following an extended period of underperformance for academically established premia such as *Size and Value*; these developments have created performance obstacles and raised questions over the need for strategic change.

With all of these challenges in mind, we cannot ignore today's broader environment, particularly the heightened risk of market correction. Difficult conditions call for vigilance. Investors can scrutinize the concentration, factor and sector exposures of equity portfolios directly, not only to explain recent performance but to determine whether changes may now be required.

Concentration and its Implications

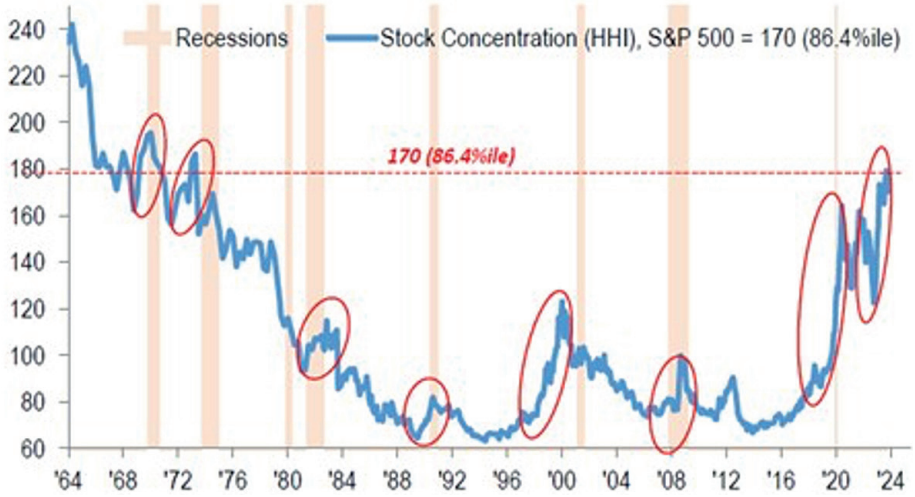
Market concentration has reached historical highs, with the S&P 500's effective number of stocks falling to 46[3] (11 times more concentrated than an equal-weight portfolio), implying an HHI (Herfindahl-Hirschman Index) of 217. This is an HHI level not seen since the 1960s when the largest companies in the index included AT&T, General Motors, Standard Oil, IBM and Texaco. This raises concerns about diversification, future returns and potential systemic risks.

Exhibit 1: Effective number of stocks, S&P 500 Equal Weight (left) and S&P (right)



Source: Scientific Portfolio platform, February 2025.

Exhibit 2: Historical HHI (concentration) of the S&P 500 index

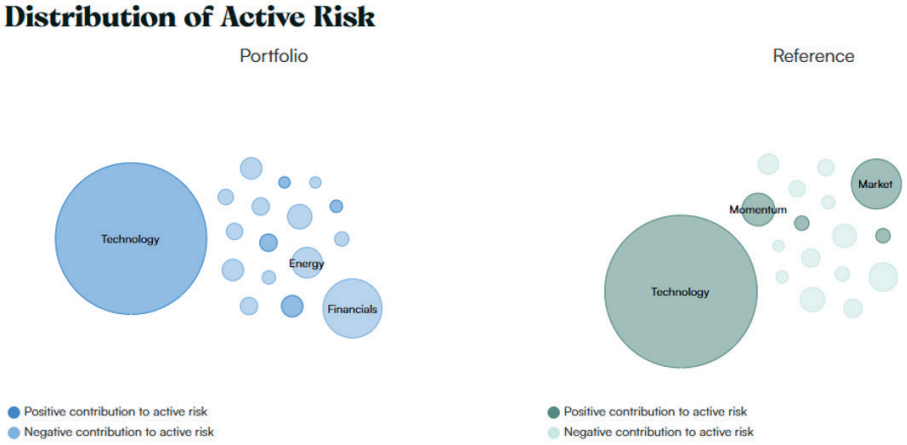


Source: JP Morgan. Data through Jan. 31, 2024.

1 - See Hou and Robinson (2006).
2 - Even if not necessarily as strong as mechanically implied by the (higher) beta; see for example Frazzini and Pedersen (2014).
3 - The Effective number of stocks (as we define it) is equal to 10,000 / HHI. Conversely, HHI = 10,000 / Effective number of stocks.

The trend towards higher stock-level concentration is chiefly driven by the remarkable success of technology firms, whose market dominance has grown significantly over the past decade. Companies like Microsoft, Apple, Nvidia, and Alphabet have amassed market capitalizations exceeding $1 trillion each, collectively comprising more than 25% of the S&P 500. Stock-level concentration has also led to heightened sector-level and risk-based concentration (point-in-time active risk distribution is shown in Exhibit 3).

Exhibit 3: Point-in-time distribution of active risk contributions: S&P 500 (left) and Nasdaq 100 (right)



Source: Scientific Portfolio platform.

Indeed, Exhibit 3 shows that the S&P 500's point-in-time (i.e., ex-ante) active risk is primarily driven by the Technology factor, causing its systematic risk profile to bear a striking resemblance to that of the Nasdaq 100. A high level of risk-based concentration has been shown to be associated with high levels of extreme risk.[4] For example, Scientific Portfolio's risk model[5] indicates that the large Technology bias has so far overall acted as a strong *risk mitigant* against other exposures (see also the "safe haven" effect highlighted in Exhibit 9), but this in turn creates a strong dependency on the future behavior of Technology stocks in a severe market downturn. For example, were the risk mitigation effect to disappear, the 2% CVaR[6] of the S&P 500 would increase by close to 50%.

Such concentration also poses dilemmas. Academic literature, such as the work of Hou & Robinson (2006), suggests that increasing industry concentration reduces expected returns, even after accounting for factors such as size, value and momentum: declining competition can reduce the pressure to innovate, potentially producing stagnation. However, the concentrated names today are high-beta stocks – a characteristic associated with higher expected returns as well as higher risk.

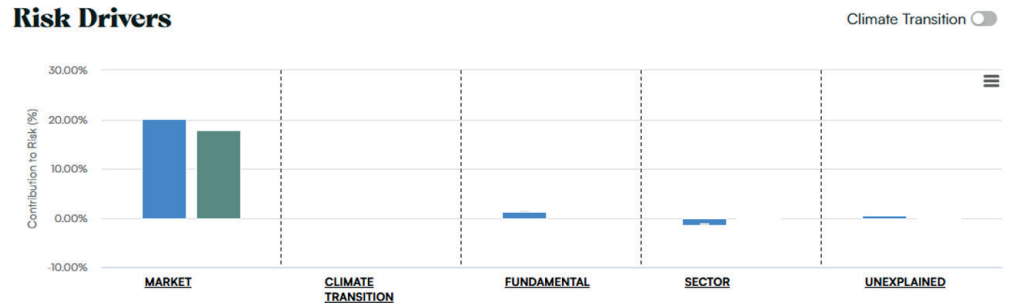
Living with Elevated idiosyncratic Risk and Volatility

Importantly, market concentration has led to concentration of idiosyncratic risks – stock-specific risk, unexplained by systematic factors. This means overall performance could become highly dependent on the behavior of a limited number of stocks. For example, despite some individual well-publicized successes, the specific/idiosyncratic performance of individual stocks has, overall, represented a drag on the performance of the Nasdaq 100 (an index that has historically been concentrated) relative to the S&P 500 over the past three years (see Exhibit 10 in Appendix).

4 - See Herzog, Jones and Safaee (2023)
5 - Visit our Knowledge Center for more details
6 - Conditional Value at Risk, a.k.a. expected shortfall, a measure of extreme risk derived from the weighted average of the losses experienced in tail scenarios.

By monitoring stocks with a high concentration of idiosyncratic risk, investors may be able to uncover 'alpha stocks': those that are likely to represent the primary source of relative return (positive or negative) in the portfolio. In a recent headline-grabbing example, NVIDIA stock declined by 17% following an announcement by Chinese AI startup DeepSeek. Yet if we look at the S&P 500 three days beforehand, we can see that NVIDIA was already the largest contributor to idiosyncratic risk in the index, representing 50% of the total (22bps of 44bps). To place this number on context, NVIDIA's contribution at that time was equal to the sum of idiosyncratic contributions from AAPL, TSLA, AMZN and META (Exhibit 4).

Exhibit 4: Point-in-time risk drivers of S&P 500 at 24th January 2025 (above) and idiosyncratic risk contribution of specific stocks (below).

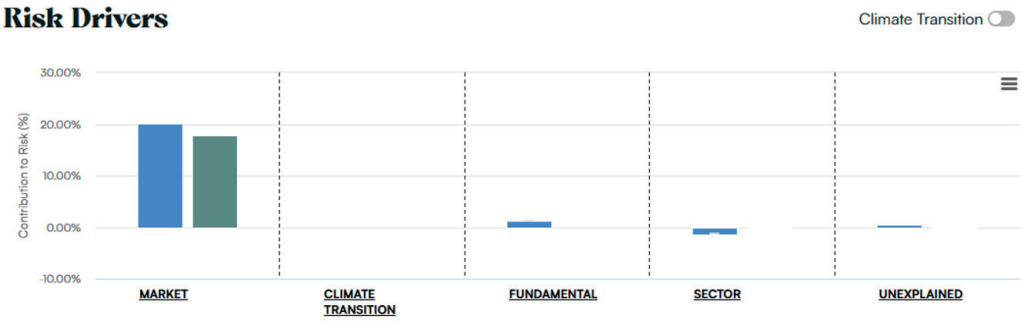


Name	Weight	Contribution	Sector	Country
NVIDIA Corporation	6.82%	0.22%	Technology	United States
Apple Inc.	7.71%	0.07%	Technology	United States
Tesla, Inc.	2.36%	0.07%	Cyclical Consumer	United States
Amazon.Com, Inc.	4.19%	0.04%	Cyclical Consumer	United States
Meta Platforms, Inc.	2.61%	0.04%	Technology	United States

Source: Scientific Portfolio platform. For each stock, we can also compute the ratio of its idiosyncratic risk contribution over its weight in the portfolio, i.e., a normalized "idiosyncratic intensity" of the stock: NVIDIA is 3.23% (=0.22%/6.82%), AAPL 0.91%, TSLA 2.97%, AMZN 0.95%, META 1.53%.

In a related theme, concentration has also evidently been accompanied by heighted volatility. This can be viewed as the result of a concentration into higher beta stocks (when we look at the S&P 500 Equal Weight Index, for example, we do not see this effect). Yet greater volatility in periods of market concentration should surprise no one: historical precedent suggests that concentrated market structures often produce this characteristic, with the dot com boom representing an apt example. In Exhibit 5, to illustrate the state of the market, we can see current elevation of point-in-time volatility for the S&P 500 versus three-year levels.

Exhibit 5: Point-in-time volatility of S&P 500 at February 2025 (blue) versus 3-year historical volatility (green).



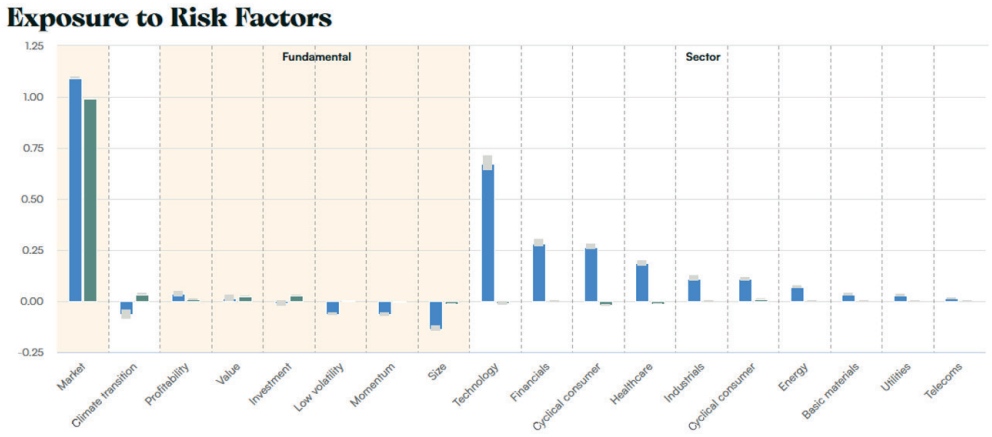
Source: Scientific Portfolio platform, February 2025. The total volatility of the point-in-time (blue) S&P 500 is 20.3%, while the index's 3-year historical volatility (green) is 17.8%.

Factor Exposures: Cause for Concern?

Factor investing has faced headwinds in recent years. Traditional factors such as size and value have underperformed, while momentum and growth factors have benefited (and, as noted, idiosyncratic risks have increased). This has, among other things, contributed to the underperformance of many actively managed strategies versus the market. When we examine the current profile of the S&P 500 versus its three-year profile, we observe that current risk factor exposures are now meaningfully different versus their recent historical levels (Exhibit 6).

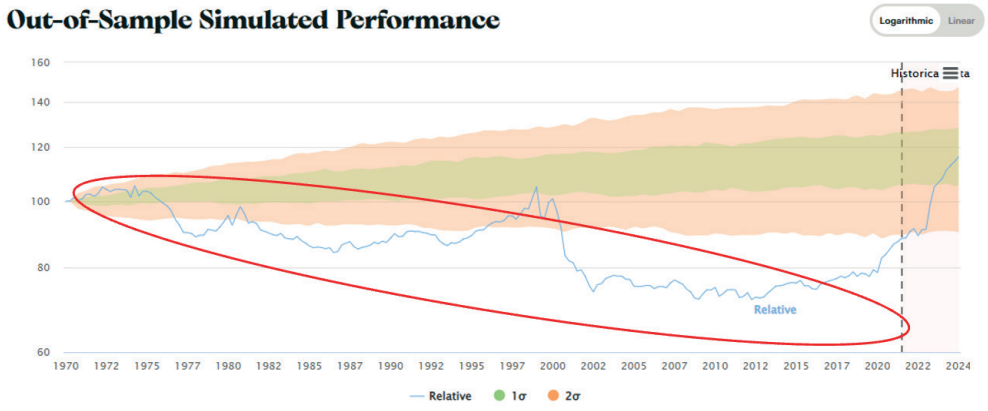
Should forward-thinking investors be concerned by this shift in factor exposures? If we were to construct a portfolio with today's S&P 500 factor profile and apply it to the past, it would of course have outperformed through 2020-2024. However, it would have underperformed significantly over the 1970-2020 period (Exhibit 7). In other words, if factor performance reverts to historical norms then investors would face material headwinds in passive portfolios.

Exhibit 6: Current risk factor exposures of the S&P 500 (blue) versus three-year exposures (green).



Source: Scientific Portfolio platform, February 2025. Current (blue) exposures are derived from the index's present holdings. Three-year (green) exposures are derived from historical returns.

Exhibit 7: Simulated performance for S&P 500, maintaining current (February 2025) risk factor exposures, relative to the historical performance of S&P 500.



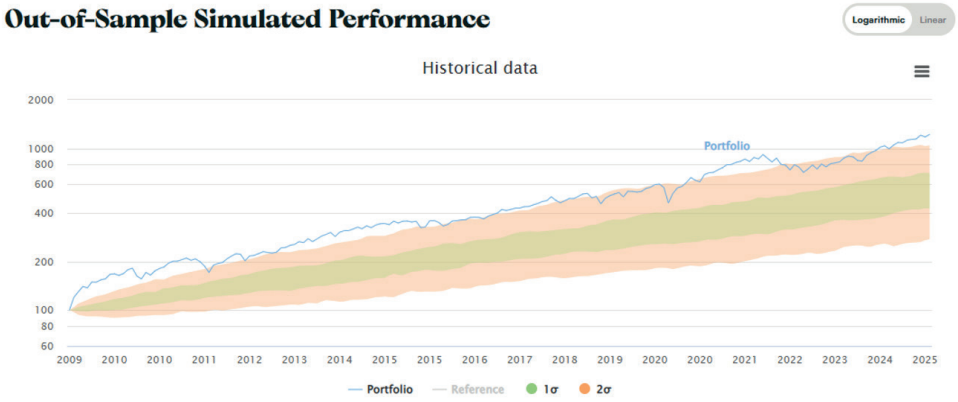
Source: Scientific Portfolio platform. The blue line represents a long-dated performance track record that combines i) the historically simulated track record obtained by projecting the current risk factor exposure in the past until 1970, and ii) the actual historical track record. The performance to the right of the dashed vertical line is historical, while the performance to the left of the dashed line is simulated. The 1σ and 2σ envelopes represent respectively 68% and 95% of the alternative track records that could have plausibly occurred based on the long-term distribution of returns inferred from the long-dated performance track record (dating back to 1970).

Corrections in Focus

With these issues in mind, investors face a decision: should active steps be taken to mitigate concentration or not, and—if so—what form should these take? It is a difficult question, but one that cannot be answered without consideration of the current market and macroeconomic climate.

The past decade has seen significant equity market outperformance, with the S&P 500 delivering annualized total returns of approximately 13%. Indeed, the period following the Global Financial Crisis (GFC) witnessed the longest equity bull run in US stock market history. From a statistical standpoint, Exhibit 8 below puts this specific period into a longer-term perspective; it compares the S&P 500's historical track record since the GFC with a set of alternative trajectories simulated in accordance with the distribution of returns observed since 1970. The position of the historical track record towards the top of (and at times slightly outside of) the 2σ long-term envelope quantifies the exceptional nature of the post-GFC performance. In comparison, the same analysis conducted for the Nasdaq 100 index (see Exhibit 11 in Appendix) unsurprisingly points towards a statistical outlier event in regard to the index's long-term behavior.

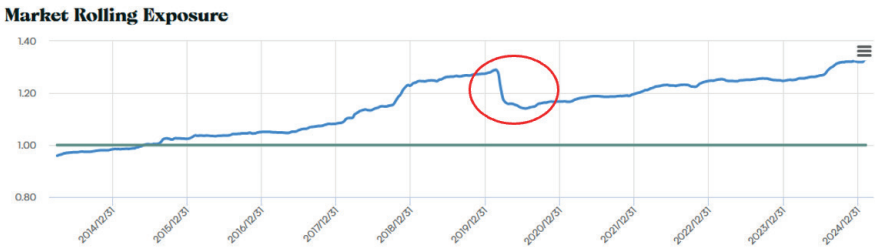
Exhibit 8: Performance of the S&P 500 (blue) since the Global Financial Crisis, alongside the corresponding simulated 1σ and 2σ long-term envelopes.



Source: Scientific Portfolio platform. The blue line represents the historical performance of the index. The 1σ and 2σ long-term envelopes represent respectively 68% and 95% of the alternative track records that could have plausibly occurred based on the long-term distribution of returns inferred from the long-dated performance track record (dating back to 1970).

From a fundamental standpoint, with valuations stretched and geopolitical risks escalating, the probability of a correction has increased. The market decline of 2020 saw technology stocks act as a buffer due to lockdown-driven demand for digital services (Exhibit 9 illustrates the sharp reduction in the market beta of the technology sector at this time). In contrast, the correction of 2022 did not exhibit this same safe-haven dynamic.

Exhibit 9: Market beta of the S&P Technology Sector Index.



Source: Scientific Portfolio platform.

Indeed, far from providing a safe haven, there are some arguments to be made that technology stocks could be more vulnerable to correction. Some reasons for this are market-based: they exhibit a high-beta profile and, like other growth-sensitive stocks, are often considered to carry greater sensitivity to interest rates (now likely to be 'higher-for-longer' with inflation proving persistent). A long-term empirical analysis of equity returns focused on severe macroeconomic regimes[7] also shows that technology stocks have historically been more vulnerable to a widening of corporate credit spreads (see also Exhibit 12 in Appendix), a scenario deemed more likely by a recent Moody's research report.[8]

Current valuations have been bolstered by expectations for Artificial Intelligence – a space where US companies face growing pressure from Chinese competitors. ESG practitioners are scrutinizing the sector's carbon intensity, data privacy concerns and governance practices. Regulatory and political risks introduce further uncertainty: these have been highlighted by an altered US political scene, where technology sector leaders are seeking to play a more influential role.

Conclusion: Time to Examine Exposures

There is no easy answer to the questions created by today's unusual market conditions. Investors can, however, seek clearer picture of current portfolio exposures and recent performance, give consideration to alternative approaches, and interrogate the approaches being taken by external asset managers with these challenges in mind.

*Data from the Scientific Portfolio platform. Users can access analytics to conduct analyses of available indices and upload **their own equity portfolios** to examine performance and exposures.*

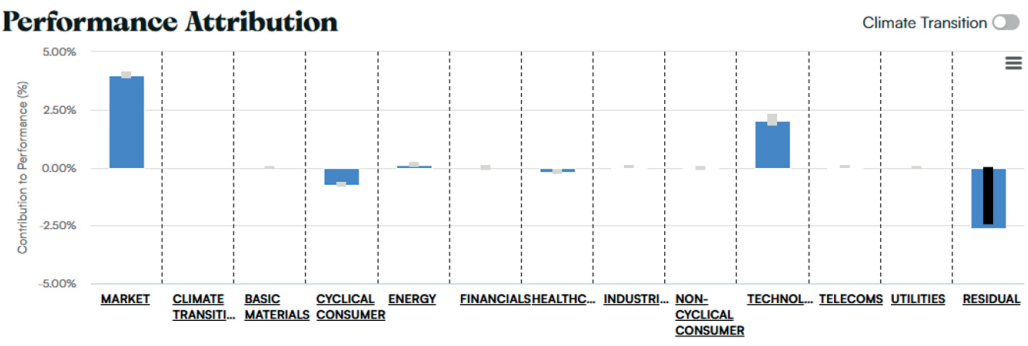
Access the Scientific Portfolio Platform

Appendix

The Nasdaq 100's recent three-year outperformance (~2.5% per annum over the S&P 500) has been driven largely by market beta and a bias towards the Technology sector rather than idiosyncratic performance: removing technology from the Nasdaq 100 largely erases its relative gains. In fact, Exhibit 10 below shows that, overall, the idiosyncratic contribution represented a *drag* on the relative performance of the Nasdaq 100 with respect to the S&P 500. We note that this negative performance contribution is significantly larger in the Nasdaq 100 Equal Weight index, which is consistent with the presence of a few (well-publicized) individual successes at the top that tend to skew the results.

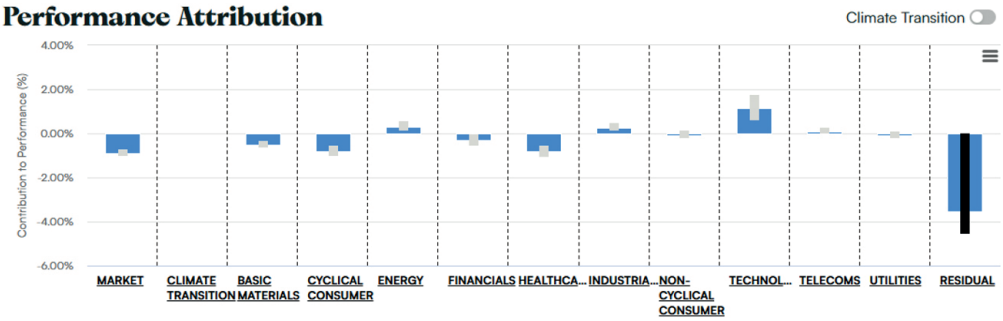
Exhibit 10: Three-year relative performance of Nasdaq 100 indices (main index, ex-Tech, Tech and Equal Weight) with respect to the S&P 500.

Nasdaq 100 Index



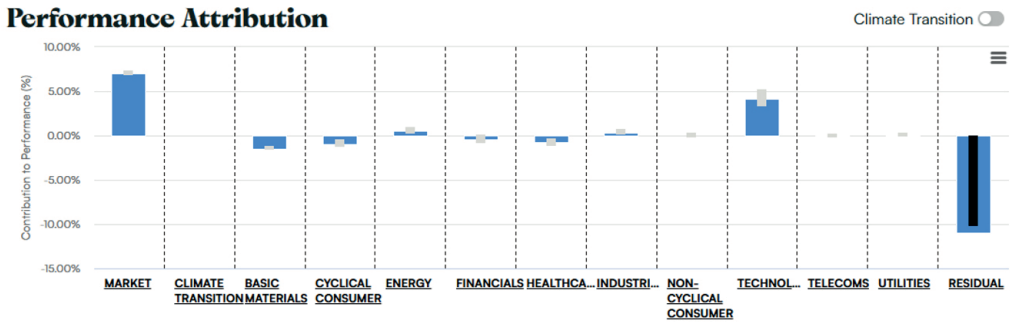
7 - See Bagnara and Vaucher (2025)
8 - Report available on Moody's website

Nasdaq 100 ex-Tech Sector Index



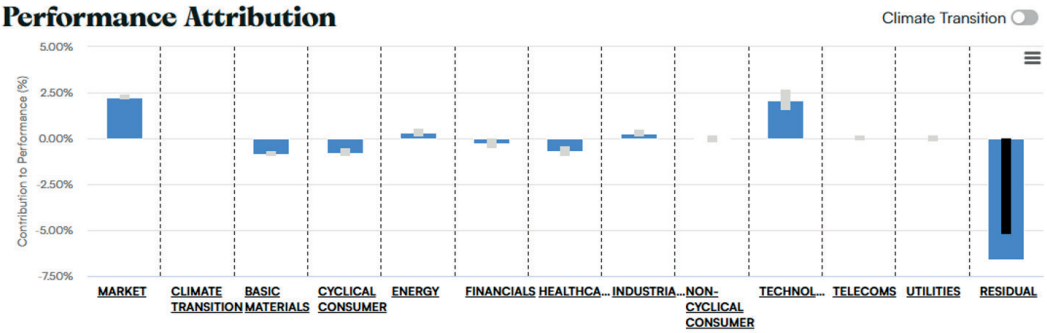
Note: The Nasdaq 100 ex-Tech Sector Index is equally weighted.

Nasdaq 100 Technology Sector Index



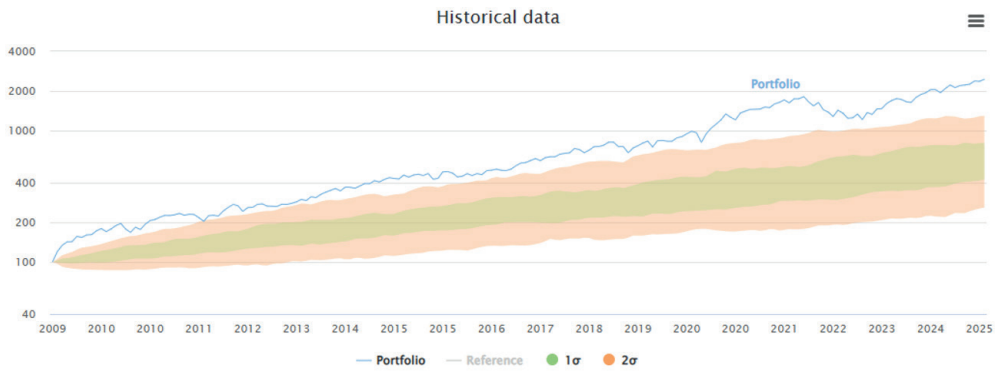
Note: The Nasdaq 100 Technology Sector Index is equally weighted.

Nasdaq 100 Equal Weight Index



Source: Scientific Portfolio platform.

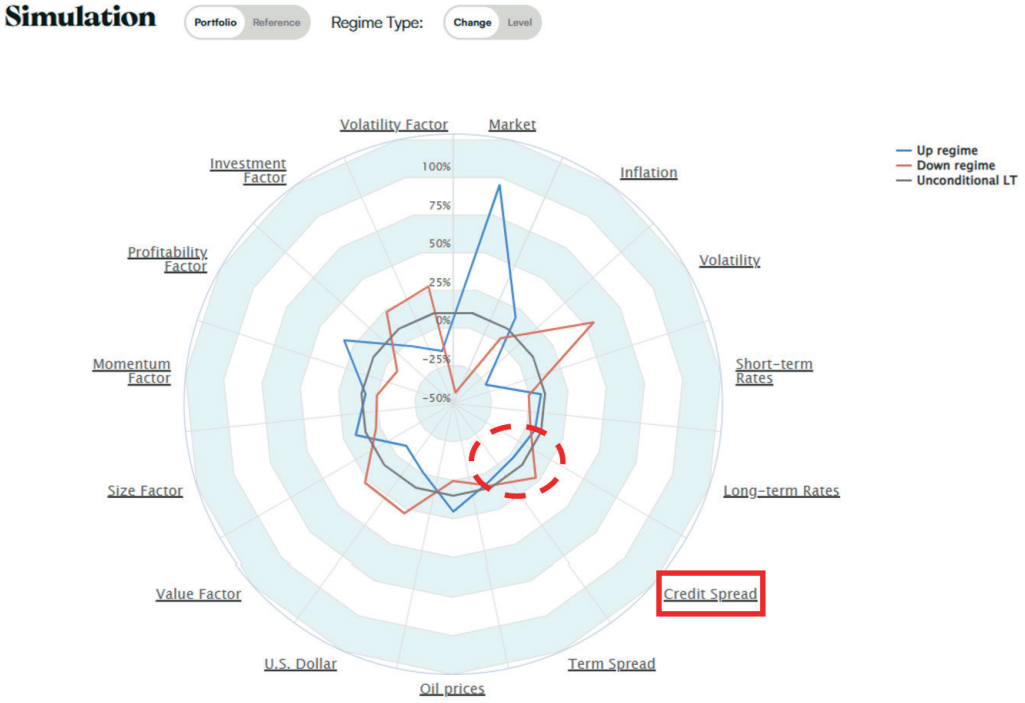
Exhibit 11: Performance of the Nasdaq 100 index since the Global Financial Crisis, alongside the corresponding simulated 1σ and 2σ long-term envelopes.



Source: Scientific Portfolio platform.

Historically, the risk profile of US technology stocks (represented by the S&P Technology Select Sector index) has caused their average annualized returns to decline by approximately -7.4% (respectively increase by approximately +12.2%) during a sharp widening (respectively tightening) of corporate credit spreads. The 19.6% (=12.2% + 7.4%) gap in average returns materially exceeds the same gap calculated for the S&P 500 Ex-Information Technology index (11.5%), highlighting the vulnerability of technology stocks in severe credit shocks.

Exhibit 12: Average annualized returns of the S&P Technology Select Sector index conditional upon a severe widening or severe tightening of US corporate credit spreads.



Credit Spread Regime Details

Performance | Risks

Name	Portfolio	Reference
Return Conditional On Regime UP	2.57%	6.85%
Return Conditional On Regime DOWN	22.15%	18.30%
Unconditional Return	9.99%	10.89%
Probability For Return To Differ In Regime UP Vs. Unconditional	70.14%	45.54%
Probability For Return To Differ In Regime DOWN Vs. Unconditional	91.89%	78.58%

Source: Scientific Portfolio platform.

About Scientific Portfolio

Scientific Portfolio is the latest commercial venture incubated within the research ecosystem of EDHEC Business School (EDHEC), one of the world's leading business schools.

Scientific Portfolio has assembled a team with a broad range of expertise and backgrounds, including financial engineering, computer science, sustainable and climate finance, and institutional portfolio and risk management. It proudly carries EDHEC's impactful academic heritage and aspires to provide investors with the technology they need to independently analyse and construct equity portfolios from both a financial and extra-financial perspective.

To achieve this, it offers investors three sources of value through its portfolio analysis & construction platform:

- Helping investors to analyse their equity portfolios, identify actionable insights and enhance portfolios with allocation functionalities. Indeed, Scientific Portfolio likes to promote portfolio analysis as a means to the concrete goal of building portfolios that are both more efficient and better aligned with their investment objectives.
- Providing investors with an integrated framework where financial and extra-financial (ESG) considerations are jointly captured in analysis and portfolio construction. The ability to incorporate ESG-related insights in the portfolio allocation process is now a common requirement among many investors.
- Giving investors access to a Knowledge Centre catering to all types of learners and providing guidance through the portfolio analysis and construction process. This aligns with Scientific Portfolio's commitment to remaining connected with its academic roots and bridging the gap between investors and academia.

https://scientificportfolio.com/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