

Scientific Portfolio Market Review

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SciX
An EDHEC Venture

Climate Equity Performance Needs Close Attention

Introduction

A large proportion of climate equity indices have underperformed cap-weighted benchmarks over the past three years. What conclusions might investors draw from potentially disappointing results, and to what extent should these influence portfolio strategy? In this Market Review¹, we examine **forty** indices with climate-oriented branding (low carbon, climate, transition, net-zero, Paris-Aligned Benchmark (PAB), or similar).

- **Relative three-year performance is in the red:** The median U.S. strategy in this sample has delivered a -1.8% relative return per annum versus a cap-weighted benchmark, while the median European index returned -3.1%. The average (mean) relative return in both markets is -3%.

- **Performance dispersion is high** across the sample, showcasing the diversity of today's universe of climate-oriented equity products. We find a gap of more than 6% between top quartile and bottom quartile in both the U.S. and Europe.

- **Idiosyncratic risk was the primary driver of overall underperformance**, contributing more than exposure to any fundamental factor or sector. That said, tilts towards the 'Size' factor did detract from returns, particularly in the U.S. (where mega cap stocks have dominated returns through the period in question), and a directionally "green" exposure to Scientific Portfolio's *Climate Transition* (CT) risk factor² appeared to support performance only in Europe.

While not exhaustive, these findings point to a need for scrutiny. Many global asset owners have sought to reduce carbon emissions and/or improve various climate alignment metrics in public equity portfolios during the decade that has followed the Paris Climate Change Conference. While outperformance may not be among an investor's objectives, stakeholder support has historically been strengthened by evidence suggesting that relative losses (if any) would likely be minimal. Deeper insight can help investors to assess portfolios and consider whether adjustments may be appropriate.

View climate, performance and risk data for your equity portfolio and a wide range of equity strategies on the Scientific Portfolio platform.

Performance Matters

Superior returns, or at the very least market-like returns, used to be a fairly common feature of the marketing agenda for low-carbon or 'climate' equity indices, and indeed for sustainable investment products more broadly. Nowadays, however, there is more widespread acceptance among practitioners that 'low-carbon' investing may well produce lower returns—especially over short-to-medium term periods—depending on market dynamics, with the energy price surge in 2022 providing an apt recent example.

Academic research on equity investments with climate-related objectives has produced mixed conclusions, largely because strategies differ in scope and implementation. Exclusion strategies, such as those divesting from fossil fuel companies, have been a key area of focus. Studies including Plantinga and Scholtens (2021)³ and Guo et al. (2022)⁴ find that removing fossil fuel stocks does not

1 - An earlier climate-related Market Review (Climate exclusions need investor scrutiny) assessed the extent to which sustainability-labelled strategies were aligned with Paris Aligned climate exclusions.

2 - See Bouchet V., Vaucher B. and Herzog B. (2023)

3 - Plantinga, A., & Scholtens, B. (2021). The financial impact of fossil fuel divestment. *Climate Policy*, 21(1), 107-119.

4 - Guo, X., Liang, C., Umar, M., & Mirza, N. (2022). The impact of fossil fuel divestments and energy transitions on mutual funds performance. *Technological Forecasting and Social Change*, 176, 121429.

significantly alter risk-adjusted returns in diversified portfolios. Extending exclusions to high carbon-intensity firms across industries yields similar results, as shown by Jondeau et al. (2025)⁵, provided that sectoral and regional exposures are preserved.

In addition, we note a body of research examining carbon footprint-based strategies, though analysis of this subject is vulnerable to several major obstacles. Difficulties include reliance on certain historic time periods, the diversity of methodologies and strategies (see A Question of Ethics, Scientific Portfolio, 2025), and interpretations of performance. For instance, Birk et al. (2025)⁶ attribute the temporary outperformance of low-carbon funds between 2017 and 2021 to favorable market conditions for low-carbon stocks (their data sample does not cover the energy sector's subsequent rally), concluding that these funds typically underperform passive benchmarks once risk biases are corrected. In contrast, Boermans and Galema (2019)⁷ show that Dutch pension funds' decarbonisation efforts do not negatively affect portfolio performance.

Climate indices and quasi-passive investment strategies are often designed with constraints that are intended to reduce the risk of large losses relative to the benchmark. For example, many products feature rules that keep sector exposures in line with the market (at least to some degree) in order to avoid poor performance driven by over—or under—exposure to certain industries.

Scope of Analysis

The climate and low-carbon equity investment landscape is extremely diverse. It spans index-based products, highly active fundamental discretionary portfolios and everything in-between. Some offer alignment with Paris targets; others seek to reduce emissions to a less ambitious extent. Some are more focused on carbon-related metrics, while others prioritize encouraging transition and/or funding climate solutions. Looking elsewhere, we also find various strategies that happen to have low carbon scores but do not specifically target carbon reduction. For example, 'growth' equity strategies have (incidentally) exhibited low carbon intensity versus market cap benchmarks over the past few years.

For this Review, we looked at [U.S. and Developed Europe climate-oriented labelling indices](#).

Performance and Carbon Intensity: First Glance

The result was a group of 40 strategies: 23 for the U.S., 17 for Developed Europe. Exhibit 1 shows the high-level relative performance data for these cohorts. Average performance is weak (-3.0% mean in both groups, -1.8% median in the U.S., -3.1% median in Europe); even the 75th percentile came in with below-benchmark returns.

Exhibit 1: Relative three-year performance of climate-branded strategies vs. cap-weighted benchmark

	Mean	SD	Min	25%	50%	75%	Max
United States	-3.0%	4.1%	-14.7%	-5.6%	-1.8%	-0.5%	3.0%
Developed Europe	-3.0%	1.5%	-5.4%	-4.5%	-3.1%	-1.8%	-0.4%

Source: Scientific Portfolio. Data from 23 U.S. strategies and 17 European strategies. Returns per annum, three years to end-June 2025, USD terms. Developed Europe (resp. United States) returns shown versus a European (resp. United States) cap-weighted.

5 - Jondeau, E., Mojon, B., & Pereira da Silva, L. A. (2025). Building benchmark portfolios with decreasing carbon footprints. *Journal of Sustainable Finance & Investment*, 1-33.

6 - Birk, K., Rohleder, M., Weh, R., & Wilkens, M. (2025). The Performance of Low-Carbon Equity Funds. Available at SSRN 5160185.

7 - Boermans, M. A., & Galema, R. (2019). Are pension funds actively decarbonizing their portfolios?. *Ecological Economics*, 161, 50-60.

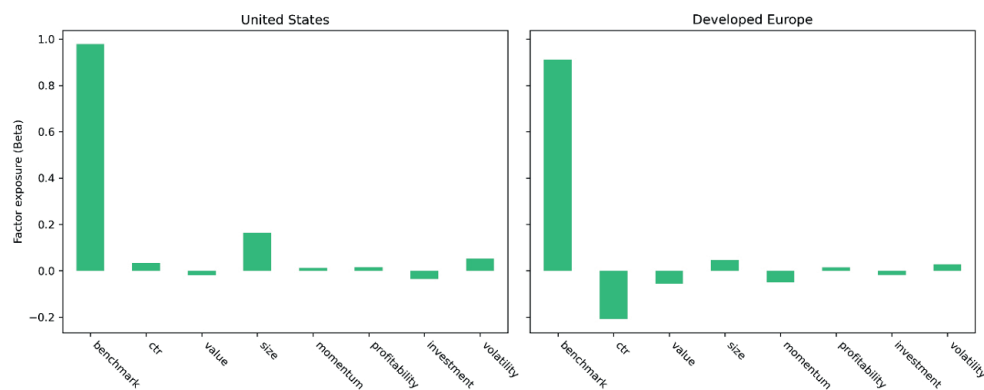
The sample was primarily selected based on product name. Cross-sectional decomposition of carbon intensity data confirms the low-carbon credentials of the strategies under review. Both U.S. and European cohorts delivered, on average, reductions of nearly 60% (on the basis of tCO₂e/M\$) versus regional cap-weighted benchmarks. This low-carbon profile is primarily achieved through stock weighting rather than sector allocation. On average, the U.S. group achieved 73% of that intensity reduction through stock selection and just 27% from sector allocation, while the figures for Europe are even more clear-cut on this point (88% and 12% respectively).⁸

Fundamental Factors, Particularly Size, Detracted from Performance

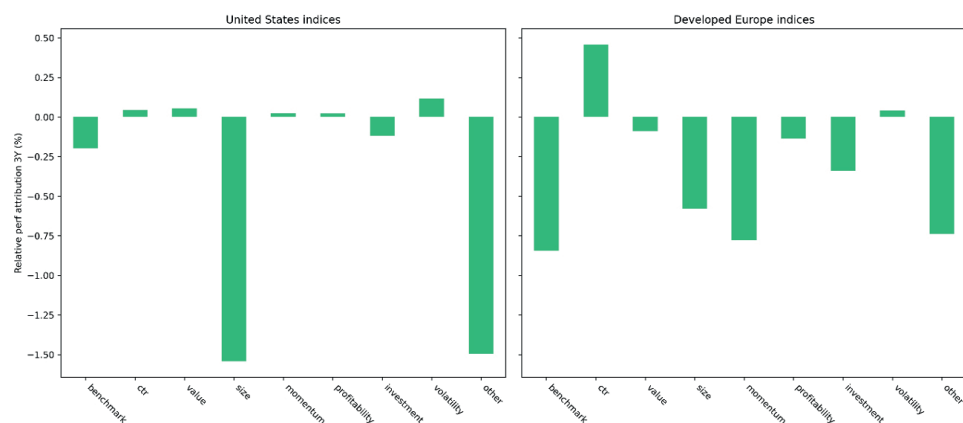
For the most part, these strategies do not—taken as a group—show strong average tilts towards specific fundamental factors such as Value or Profitability. The notable exception is the Size factor: a meaningful average tilt towards smaller stocks, particularly in the U.S., was punished over the three-year period (Exhibit 2).

Exhibit 2: Average factor exposures and relative performance attribution

Average exposures



Relative performance attribution



Source: Scientific Portfolio. Data from 40 strategies used in Exhibit 1. 'ctr' is Scientific Portfolio's Climate Transition (CT) risk factor; the CT risk factor is designed to capture market-based information about climate transition risks. A positive (resp. negative) exposure to the CT risk factor indicates the likelihood of financial losses (resp. gains) in case of an accelerated (versus current market expectations) transition scenario to a low-carbon economy.

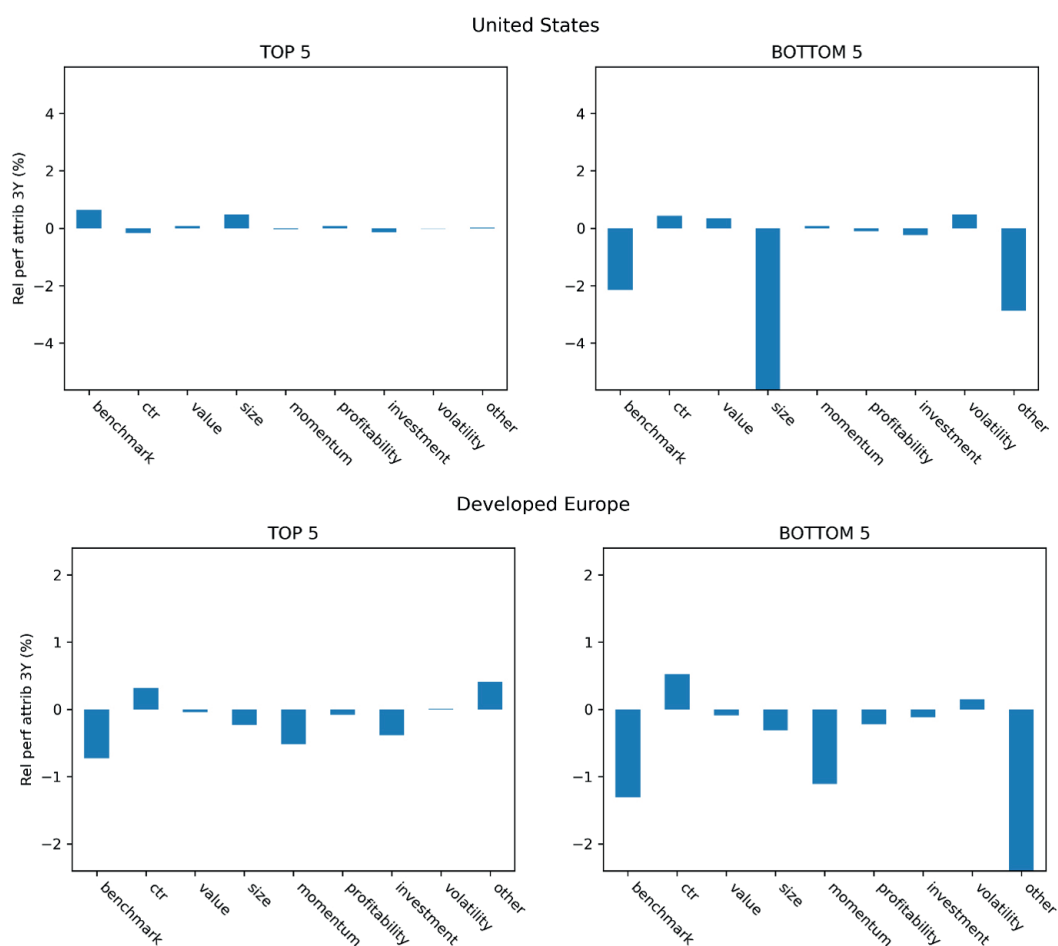
The Size story was also in evidence in Europe, albeit to a lesser extent, with exposure to this factor again detracting from performance. European strategies also saw some underperformance associated

8 - See Appendix and Bouchet (2023)

with under-exposure to the Momentum factor. It's worth noting that negative ("green") average exposure to the Climate Transition (CT) risk factor⁹ was a positive contributor to performance in Europe, although—very interestingly—we do not see this effect in the U.S., which seems intuitively consistent with the difference in materiality and (market) perception of climate transition risk between both regions. Importantly, in both the U.S. and Europe we see a very high attribution to the 'other' category: this residual component indicates the contribution of idiosyncratic risk (discussed later in this article).

Exhibit 1 showed the high dispersion of returns within the sample, with both regions showing a difference of more than 6% between the 25th and 75th percentile strategy. A closer look at the performance attribution of the 'top five' and 'bottom five' performers helps to paint a more detailed picture (Exhibit 3).

Exhibit 3: Relative performance attribution of 'top five' and 'bottom five' performers (fundamental factors)



Source: Scientific Portfolio.

Here, we see that the U.S. top performers have avoided drag related to the Size factor (with higher exposure to the mega cap stocks that have dominated market returns through much of the relevant period) and, in addition, avoided some stock-specific issues that affected the bottom five. The residual risk aspect comes through even more strongly for the bottom five in Europe.

9 - See Bouchet V., Vaucher B. and Herzog B. (2023)

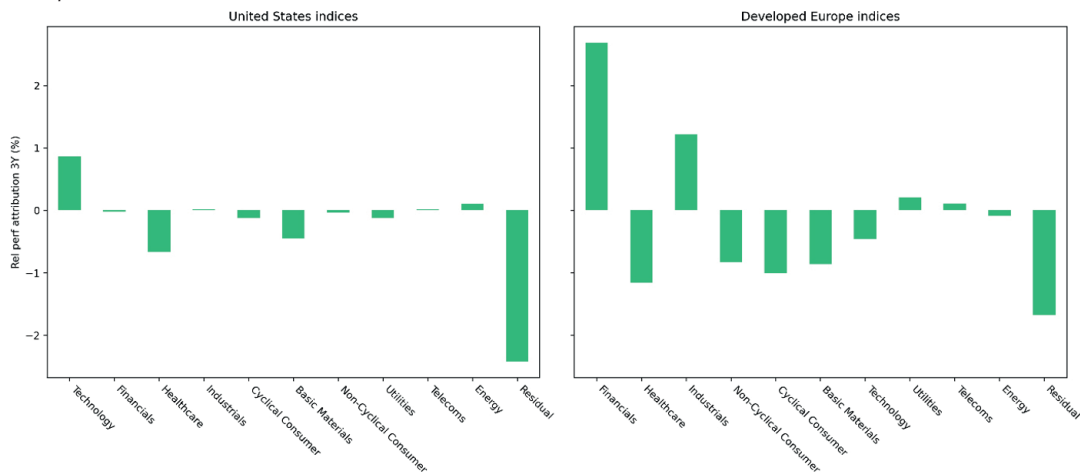
When thinking about recent ‘winners’ and ‘losers,’ it should be mentioned that differences in carbon intensity between the strategies appear to have no relationship with relative performance in the sample period considered.

Readers can reproduce comparable performance attribution analysis for equity strategies/portfolios, on the [Scientific Portfolio](#) platform, as well as cross sectional carbon decomposition and other insights. Illustrative screenshots are shown in the Appendix. Entry-level access is free of charge and can be done through [self-registration](#).

Sector Exposures Influenced ‘Winners and Losers’

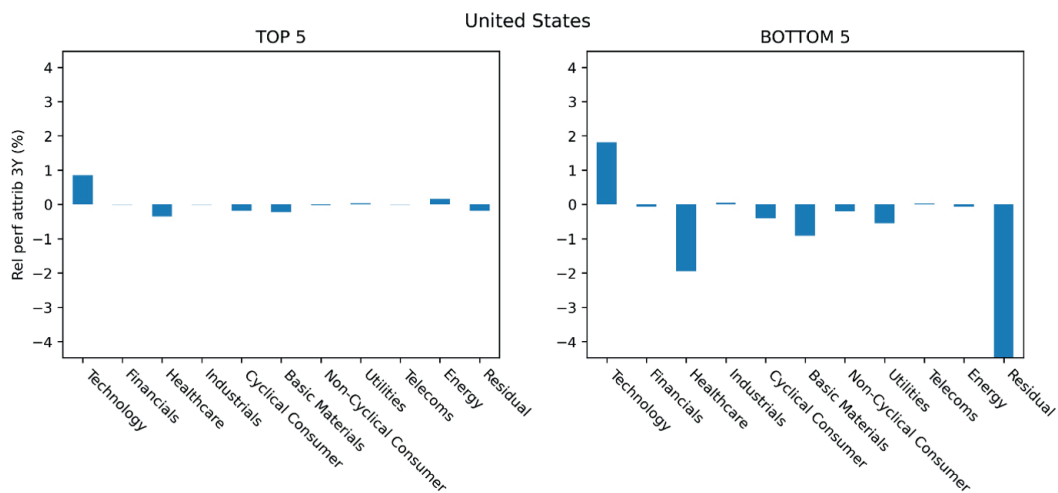
It can also be helpful to look through a sector lens. Exhibits 4 and 5 show performance attribution by sector, first for the ‘average’ across the same samples used above, and then—again—for the top and bottom performers in each market. Relative exposure to the Healthcare sector (often overweight in low-carbon strategies) and Basic Materials (commonly underweight) detracted from performance in both the U.S. and Europe. In Europe, exposure to Financials (generally overweight) was positive for performance.

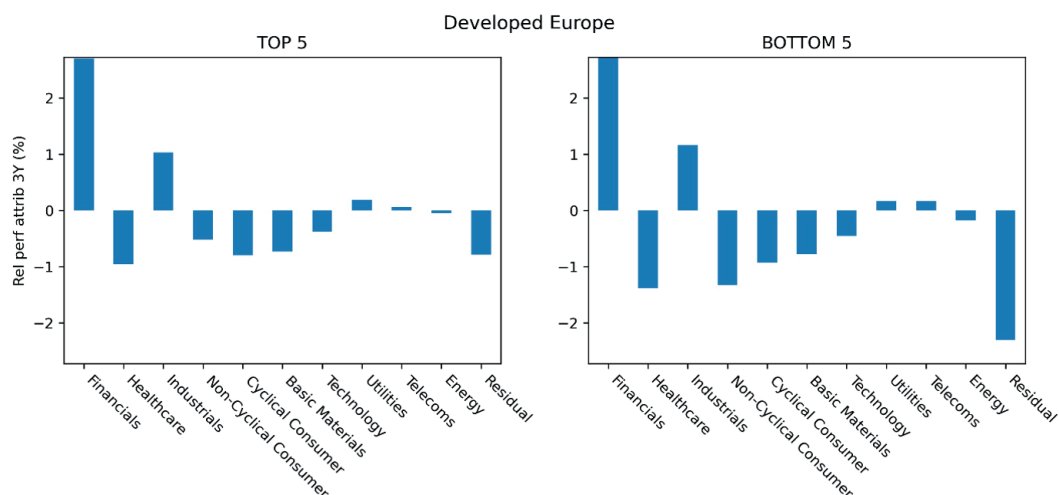
Exhibit 4: Relative performance attribution, sectors



Source: Scientific Portfolio

Exhibit 5: Relative performance attribution of ‘top five’ and ‘bottom five’ performers (sectors)





Source: Scientific Portfolio

Idiosyncratic Risk in Focus

Perhaps one of the most striking takeaways from the charts shown above is the very strong contribution of residual risk ('other'), or idiosyncratic risk, to the performance picture. In other words, systematic factors did not fully explain relative performance over the period. Therefore, it is also necessary to look at stock-specific situations, where weightings are adjusted (relative to a cap-weighted benchmark) in accordance with a given investment strategy (e.g., strict climate- or carbon-related constraints, or sometimes broader sustainability constraints).

Looking more closely at one of the underperforming European indices — the Stoxx Europe 600 Paris-Aligned Benchmark Index — we note that its regulated PAB objective resulted no exposure to Siemens, Rolls-Royce, or Rheinmetall when compared to the cap-weighted benchmark. This partially explained the non-systematic (idiosyncratic) underperformance observed recently (e.g., each of the 3 stocks contributed up to 4-5% of the total idiosyncratic underperformance), given the rally experienced by these stocks over the past year. Conversely, the index benefited (on a relative basis) from its zero exposure to TotalEnergies, which underperformed in the last twelve months.

This illustrates the need for investors to carefully review and control the financial consequences of a climate objective when designing a portfolio. Scientific Portfolio's recent research showed that financial risk deviations caused by climate objectives can often be largely mitigated with appropriate portfolio optimization techniques.

Conclusion: Transparency can Support Continued Confidence

The sample showcased here is not comprehensive, nor do we underestimate the challenges associated with unpicking the performance of 'climate' equity strategies. As noted above, this landscape is very diverse indeed and superficial performance numbers are not necessarily meaningful, especially over modest time periods.

That said, the underperformance observed among rules-based, systematic or quasi-passive climate equity strategies deserves careful consideration. Periods of weak returns have the potential to undermine stakeholder confidence in climate investment allocations and portfolio decarbonization, especially

if the notion of non-concessionary performance played a role (explicitly or implicitly) in decisions to support these measures.

Strong oversight and governance can help to maintain trust, as well as informing sensible adjustments to strategies and/or suppliers. Investors facing performance concerns within climate or low-carbon portfolios can identify drivers of below-benchmark returns, while ongoing monitoring can help to pre-empt issues going forward.

This article contains data from the Scientific Portfolio platform. Users can access analytics to conduct analyses of available funds and upload their own equity portfolios to examine performance and exposures. Entry-level access is free of charge, via self-registration.

Access the 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.

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