Scientific Portfolio Market Review

March 2026

ScientificPortfolio
Premium Indexing & Analytics — An EDHEC Venture

Backward-looking Risk Analyses Are Creating 'Blind-Spots' for Equity Investors

Introduction

In today's challenging environment of geopolitical upheaval, trade uncertainty and heightened exposure to certain technology themes, are investors' equity portfolio risk analyses up to the task? Do practitioners have a clear view of unwanted exposures, correlations, or the reward that one might anticipate for taking a given amount of risk?

Despite the existence of high-quality solutions for modelling equity portfolio risks, the operational burdens associated with more comprehensive tools have left many investors relying on simpler, less data-intensive approaches. These provide insight but create backward-looking blind-spots and biases. This Market Review revisits the importance of robust risk modelling by examining two popular indices—the S&P 500 and the STOXX Europe 600—to see whether 'point-in-time' portfolio risks and exposures based on holdings at end-2025 were materially different from standard 'historical' statistics. We find:

- **Point-in-time analysis of the S&P 500 uncovers higher exposure to market beta and certain sectors (particularly Technology)** than a historical analysis would reveal, as well as short exposure to certain fundamental (style) factors. As a result, S&P 500's volatility calculated on the last three years of historical returns is **underestimated** by 2.2% compared to a point-in-time forward-looking volatility. A similar analysis for STOXX Europe 600 leads to a 3.9% underestimation of risk.
- **Moreover, the point-in-time factor profile for both the S&P 500 and the STOXX Europe 600 implies a reduction in simulated (out of sample) long-term average returns** by approximately 1.1% and 0.8% p.a. respectively. A reduction is also observed in *risk-adjusted* long-term average returns.
- **Extreme risk needs its own analysis**. Despite the higher level of volatility, the point-in-time extreme risk estimate is not materially different from its historical counterpart. This is consistent with our previous study showing that extreme risk levels can be **decoupled** from day to day risk.

Since Scientific Portfolio's risk model is used for this analysis, we also briefly outline how it seeks to square the circle of *resource-light risk modelling*, potentially democratizing best practice by - for example - finding ways to deliver key benefits of cross-sectional analysis without the onerous data requirements that would typically be involved.

Risk Modelling and the Implementation Gap

In *theory*, equity portfolio risk modelling has long-since reached a high standard. The academic literature surrounding this subject is extensive and commercial providers have created sophisticated tools to analyze both historical and fundamental exposures. While by no means perfect, these methods enable investors to gain a detailed understanding of risk exposures, expected performance, potential drawdowns and more.

In *practice*, however, many institutional and individual investors that employ externally managed equity funds are unable to access existing best practice in a cost-effective manner. High-quality tools such as Barra require vast amounts of data relating to the stocks in the portfolio, creating a burden on resources—both workload and financial expense - that many are simply unable to tolerate. The alternative (and often-used) path involves employing simpler and cheaper analytical methods.

There are three types of risk model: statistical, time-series and cross-sectional.

Exhibit 1: Types of risk factor model used by academics and practitioners

	Pros	Cons
Statistical factor model	• Good for analyzing risk factor exposures, strong explanatory power • Parsimonious, low factor overlap • Good for portfolio optimization	• 'Black box': lack of real-world interpretation (e.g. economic view on risk/return drivers) • Does not intuitively suggest real-world actions to take
Fundamental time-series model	• Better at analyzing risk than predicting returns • Intuitive construction • Data-light: requires only historical prices of stocks.	• Cannot incorporate additional factors (industries, countries) in order to avoid overlap, which limits explanatory power
Fundamental cross-sectional model	• Better at predicting returns than analyzing risk • Can include additional factors (industries, countries), though can be prone to overspecification	• Less intuitive construction (factors are implied from fundamental characteristics) • Data-heavy: requires access to fundamental company data

Source: Scientific Portfolio

Statistical models only require price data, which is easily available, and are mathematically well-suited for tasks such as portfolio optimization. They do not, however, provide investors with actionable insights since the betas do not carry any intuitive financial interpretation. **Fundamental time-series models** are also straightforward from a data perspective (historical prices) and will be highly familiar from extensive academic literature. Time series factor returns represent the behavior of stocks that are sensitive to a particular factor in a real-world portfolio[1]. These models provide useful and implementable insights but have notable shortcomings, including a lack of precision and a limit to the number of factors that can be used (low overlap is important for avoiding unhelpful collinearities).

Finally, **fundamental cross-sectional models**, where cross-sectional betas relate to observable firm characteristics (such as market capitalization, book-to-market ratio and so forth), may deliver greater explanatory and predictive power for individual stock returns and can incorporate a far broader range of factors (including sector and region) but typically require far more data on the relevant companies. Scientific Portfolio's own approach, set out in a recent paper (*Where betas meet the cross-section: a new type of risk model for equity portfolios*, Vaucher, B., Bagnara, M., 2026, Journal of Risk), seeks to deliver many of the benefits of cross-sectional models but with the low data requirements of a time-series model. The key difference versus conventional cross-sectional analysis is that, instead of using fundamental characteristics, the model uses exposure to fundamental time-series factors. Indeed, this solution could be seen as a hybrid of time-series and cross-sectional methodologies. It allows for the inclusion of a wide variety of factors (fundamental, industry, region) and has been demonstrated to exhibit a high degree of precision (i.e., risk explanatory power).

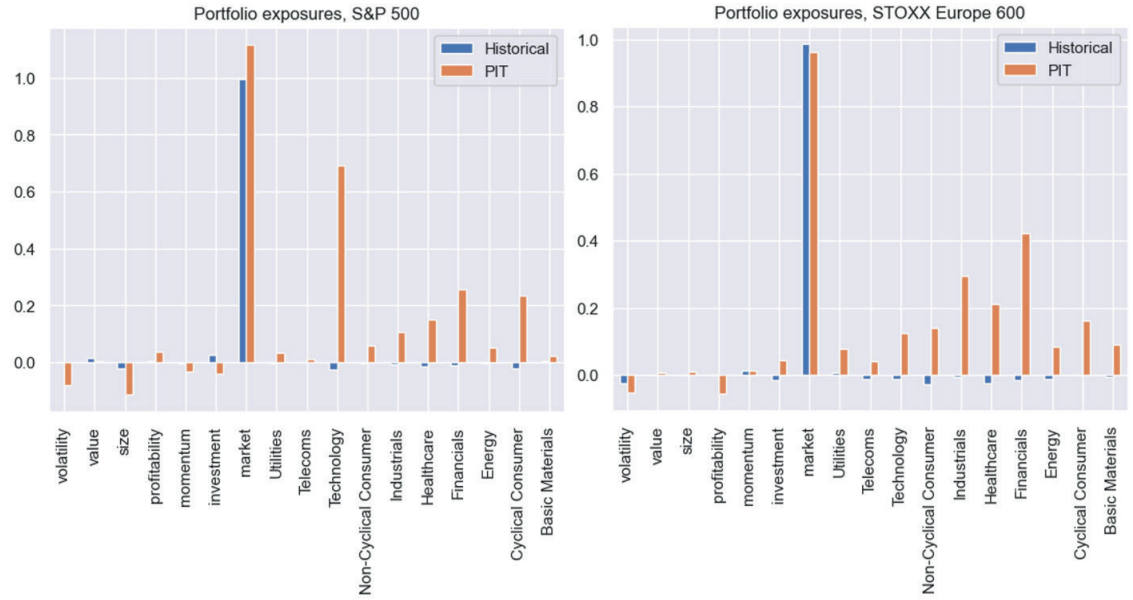
1 - The seven generally accepted fundamental equity factors (based on the academic literature) are market, value, size, momentum, low volatility, profitability and investment.

Analyzing Portfolios: 'Point-in-Time' Versus 'Historical' Perspectives

A point-in-time analysis of an equity portfolio based on its current holdings, set alongside a historical analysis, clearly illustrates the importance of considering a forward-looking view. The differences between them arise from two sources: the components of the index, since the companies within it change over time, and the weighting of those stocks. The same analysis can, of course, be applied to any equity index or fund via the Scientific Portfolio platform.

If we look at portfolio exposures for the S&P 500 at end-2025 (Exhibit 2), the historical five-year view essentially shows a near-perfect beta to the market factor and negligible betas to other factors. This is to be expected for a market cap-weighted index: if one were conducting this analysis using an active equity fund then the picture would, of course, be very different. When we turn to the *point-in-time analysis*, however, we find dramatic contrasts.

Exhibit 2: Portfolio exposures, S&P 500 (LHS) and STOXX Europe 600 (RHS)



Source: Scientific Portfolio, to December 31st 2025. Indices: S&P 500 (TRI) USD, STOXX Europe 600 (TRI) USD. Each index is proxied by a liquid index-tracking ETF that uses physical replication and maintains a low tracking error. Portfolio exposures obtained with five years of data, following Scientific Portfolio's estimation procedure[2]. "Historical": characteristics are computed using the portfolio as a single time series. "PIT": freezes holdings at 31st December 2025, and the portfolio exposures are computed from the stock-level exposures.

As shown in Exhibit 2, the point-in-time analysis for the S&P 500 exhibits **higher beta** (exposure to market of 1.1), far more exposure to **Technology** due to heightened concentration, and more exposure to certain other industries such as Financials and Cyclical Consumer. Indeed, if we recreate the 'tariff beta' analysis explored in a previous Market Review, we would find that tariff beta would be almost zero for the historical view but 1.06 for the point-in-time view. We can also observe negative intensity for **fundamental factors** (volatility, size, momentum, investment).

The STOXX Europe 600 tells a complementary story: although overall market beta is *not* elevated for the point-in-time data in this case, we do again see substantially higher exposure to certain industries (**Financials**, **Industrials** and **Healthcare** being most prominent) and a larger tariff beta (0.67 for PIT, almost zero for historical).

2 - See **Vaucher and Bagnara** (2026)

Differences in factor exposures translate into differences in risk estimates: volatility may be quite different when viewed through a forward-looking point-in-time lens. For the S&P 500, for example, the annualized three-year volatility to end-December 2025 is 15.32%, while the point-in-time volatility is substantially larger at 17.52%. Meanwhile, for the STOXX Europe 600, volatility rises from 15.01% (three-year) to 18.93% (point-in-time). In other words, the historical perspective may lead us to underestimate risk over the coming period.

Going one step further, point-in-time factor exposures help produce a simulated long-term track record for each index; each alternative track record represents the historical performance that the index would have achieved by maintaining (at all times) a systematic risk profile identical to its current point-in-time factor risk profile. These simulated track records (going back to 1970 and 1984 respectively for S&P 500 and STOXX Europe 600) may then be used to produce more forward-looking estimates of long-term average returns and long-term volatility. Results of Scientific Portfolio's simulations feature are shown in Exhibit 3: the portfolio factor exposures held by each index today would have generated a lower average performance (and a lower risk-adjusted performance).

Exhibit 3: Long-term annualized returns and volatility, S&P 500 and STOXX Europe 600

	S&P 500		STOXX Europe 600	
	Historical %	PIT %	Historical %	PIT %
Annualized returns	11.35%	10.24%	9.69%	8.92%
Annualized volatility	17.17%	19.05%	18.75%	17.84%

Source: Scientific Portfolio, 1970 (respectively 1984) to end-December 2025 for S&P 500 (respectively for STOXX Europe 600).

Put simply, these datapoints illustrate how investors solely using backward-looking analytics may tend to overestimate key metrics (such as Sharpe Ratios) that are used in portfolio optimization. The challenge is compounded when we consider conditional risk and return simulations – the average volatility and performance in specific market regimes. Such metrics provide another alternative perspective on the expected behavior of the indices. Interestingly, as shown in Exhibit 4, the point-in-time version of the S&P 500 index (based on holdings of the index at end-2025) would have been markedly **less resilient in a 'size factor: down' regime** (a regime that has largely prevailed in the last three years and that is characterized by the underperformance of small caps vs large caps) than historical index data suggests: performance -6.33% PIT versus -4.99% historical, volatility 20.28% PIT versus 18.24% historical.

This result is somewhat surprising given the slightly *negative* Size bias observed in Exhibit 2; it is likely explained by the behavior of all the *other* factors in the 'size factor:down" regime and by their aggregate impact on the point-in-time portfolio's performance, a reminder that scenario/regime-based analyses should be conducted on a holistic and multifactorial basis.

Exhibit 4: Annualized returns and volatility in specific regimes, S&P 500

	Annualized returns		Annualized volatility	
	Historical %	PIT %	Historical %	PIT %
Size factor: down (36% of last 3 years)	-4.99%	-6.33%	18.24%	20.28%

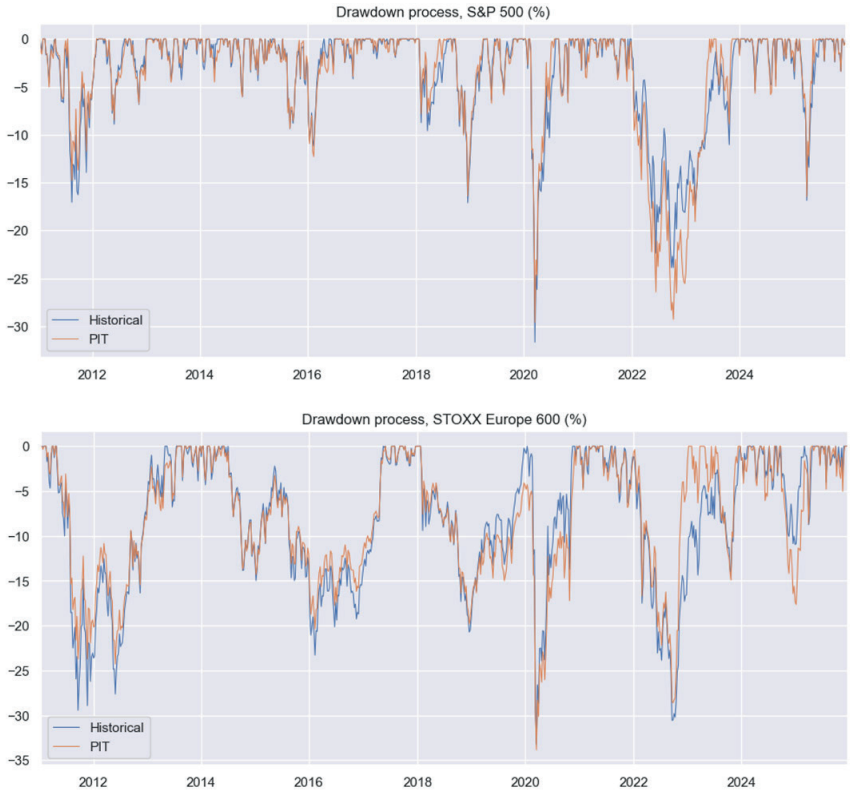
Source: Scientific Portfolio, 1970 to end-December 2025

A Closer Look at Risk and 'Extreme Risk'

CvaR assessments and maximum drawdowns are also of critical interest to both institutional and individual investors in the current environment. Indeed, our **most-read Market Review of 2025** focused on the topic of **extreme risk metrics** in the context of the drawdowns that were precipitated by the US government's tariff announcements. Despite the differences observed earlier in terms of volatility and factor exposures, the extreme risk analysis presented below does not indicate any large discrepancy between a point-in-time estimate and a standard historical one. First we look at **drawdowns** over a fifteen-year period (Exhibit 5); the maximum drawdown on a historical basis for the S&P 500 was -31.66%, compared to a maximum drawdown on a point-in-time basis (based on holdings at end-2025) of -29.83%. Similarly, the **95% CVaR** for the S&P 500 was 5.28% (point-in-time) versus 5.67% (historical), while the CvaR for the STOXX 600 Europe was 6.07% (PIT) versus 6.54% (historical).

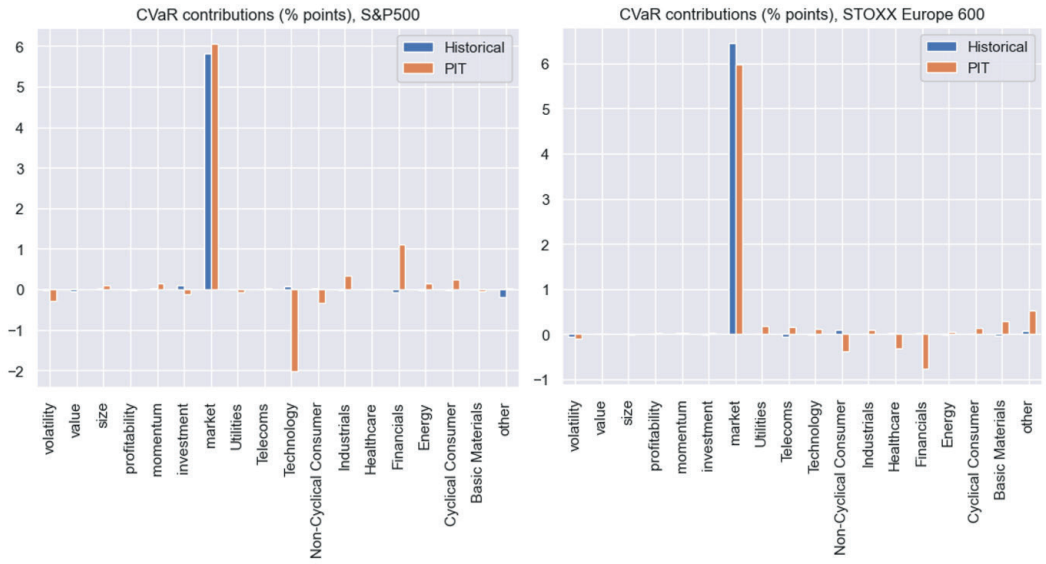
The decoupling observed between volatility on the one hand and CvaR (or maximum drawdown) on the other hand should not surprise investors: our 2025 Market Review focused on extreme risks showed that the latter could be mitigated *while controlling* for the level of day-to-day risk. In other words, extreme risks deserve their own dedicated analysis: they can be measured and managed independently of standard risk indicators (e.g., volatility and tracking error).

Exhibit 5: Drawdown process, S&P 500 and STOXX Europe 600



Source: Scientific Portfolio, 2011-2025

Exhibit 6: CvaR contributions (% points), S&P 500 (LHS) and STOXX Europe 600 (RHS)



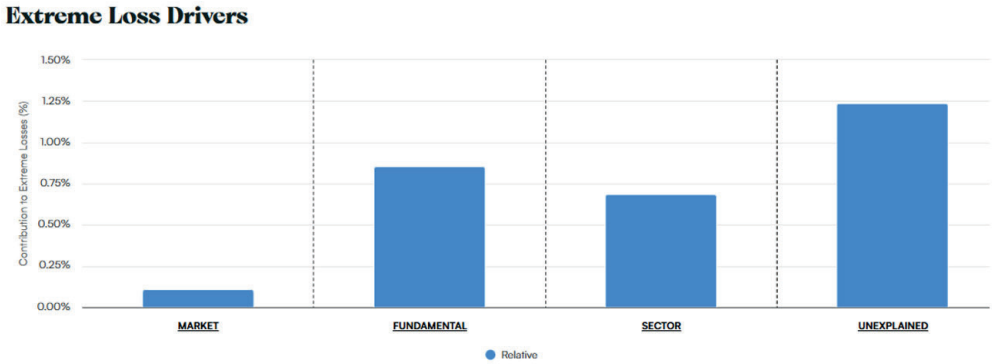
Source: Scientific Portfolio. Decomposition of extreme risk is explained here: Extreme Losses - Methodology Guide. The differences between historical and point-in-time are driven by the different portfolio exposures.

Takeaway: Risk Modelling May Need Closer Attention

Equity investors should handle equity risk modelling with care amid current market conditions, with a keen eye on the potentially elevated risks and lower expected returns that could well be masked by simpler, fully backward-looking equity portfolio analyses.

Importantly, we do not believe that data-intensive methodologies are necessary in order to gain greater clarity on exposures to a broad range of factors and expected return-to-risk profiles: the most important advantages of cross-sectional analysis do not, in our view, require extensive company-level information but can instead be delivered using easily-obtainable data on historical prices and current holdings.

Exhibit 8: Screenshots from Scientific Portfolio platform



Source: Scientific Portfolio platform.

*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.*

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.

https://scientificportfolio.com/

ScientificPortfolio
Premium Indexing & Analytics — An EDHEC Venture