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# The Red Thread

Diversification Edition: The art of understanding asset  
correlations

Year-end 2024 | UBS Asset Management



UBS

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# Introduction



**Barry Gill**  
Head of Investments,  
UBS Asset Management

## To diversify, or not diversify?

The relevance of this question has arguably never been greater. Diversification is central tenet of investment theory; from Markowitz, to Sharpe, to Scholes, Black and Merton, measuring and pricing risk cannot be done without factoring in diversification. Yet, as the saying goes, "In theory, theory and practice are the same. In practice, they are not."

At first glance, few would argue against the logic of diversification: 'Spread your risk', 'think in bets'. The reality is more complex though.

**As Warren Buffett famously said,**

"Diversification is a protection against ignorance. ... [It] makes very little sense for those who know what they're doing."

The psychological temptation to jettison portfolio diversity when only a handful of technology stocks would have served well, as would a decision by US investor to stay domestic, is huge. And not just for private investors. Style drift happens in equity portfolios as periods of underperformance drag on and the pressure to chase returns mount – even the most robust investment processes, philosophies and egos are susceptible.

This publication is dedicated to exploring the tough realities of understanding and achieving diversification. We interview Professor Paul Marsh, an academic with singular access to market returns data stretching back over 100 years. He offers insights gleaned from crunching correlation data over the last 25 years.

Correlations between assets are dynamic. In "The non-linearity of diversification," Michele Gambera, Fatomata Konteh, and Gianluca Oderda analyze and discuss correlations behavior over time and look for trends in certain economic and market scenarios.

In "Searching for active needles in indexing haystacks," Ian McIntosh reflects on the challenging environment for stockpickers over the last few years. "The beauty of indexing" has Boriana Iordanova acknowledging some of the limitations of market cap weighted indexes: she makes a strong case for combining factor indexes together to create respectable risk-adjusted outcomes.

Alternatives are rightly touted as an important portfolio diversifier – though not without risks. In "Diversifying the diversifier," Daniel Edelman & Edo Rulli explain how, through the Three Rs of diversification – replication, risk reduction, and representation – multi-managers can broaden access, and capture distinctive market traits. "The evolving role of private equity," by Markus Benzler and James Pilkington, looks at whether private equity really can offer diversification, or if it is all just a mark-to-market illusion.

Finally, we take a step out of the pure capital markets lens and look at diversification in the real world. "Comparative and competitive advantages," from Max Castelli and Lucy Thomas, explores the delicate trade-offs faced when trying to optimize supply chains, along with the complex interplay between geopolitics and sustainability.

As always, I hope you enjoy reading this edition and welcome any feedback for improvements or future topics.

A stylized, handwritten signature in black ink, consisting of a series of loops and a long, sweeping tail.

**Barry Gill**  
Head of Investments,  
UBS Asset Management

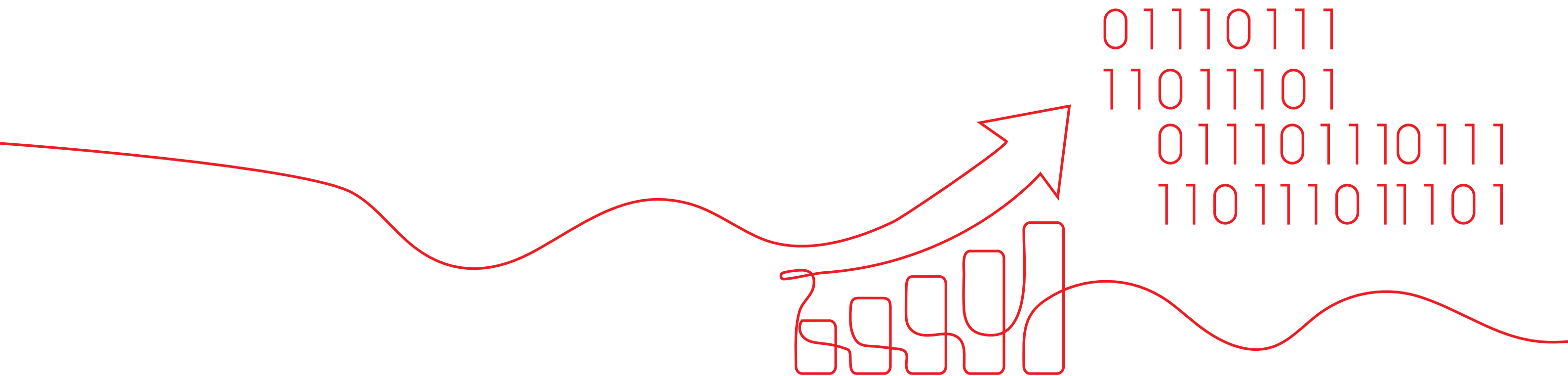


# A brief history of diversification

An interview with  
Professor Paul Marsh



**Paul Marsh**  
Emeritus Professor  
of Finance at the  
London Business School



Given his experience and access to one of the most impressive databases of asset class returns, we interviewed Paul Marsh to find out his views on diversification and asset correlation trends.

Every year for the last 25 years, finance academics Paul Marsh, Mike Staunton and Elroy Dimson have cleared their diaries, loaded up reams of asset class data, and started analyzing and writing. The result has become an annual market returns bible that industry practitioners far and wide use to inform their thinking and asset allocation calls. Originating in partnership with Credit Suisse, the final report is now known as the UBS Global Investment Returns Yearbook.

We decided to ask Paul Marsh what diversification lessons he has gleaned from such rigorous and disciplined annual research over the years.

### Can you provide a brief history of financial diversification?

The intuition that diversification reduces risk goes back centuries. The expression “don’t put all your eggs in one basket” can be traced back to a quote from Don Quixote in 1605 but may have been commonplace before then.

The scientific measurement of diversification has a shorter history. Just over seventy years ago, Harry Markowitz (1952) published Portfolio Selection, which laid the foundations of modern portfolio theory and won him a Nobel Prize. He showed that a portfolio’s risk is not defined by the average riskiness of its individual assets, but by the extent to which the returns on those assets are correlated or move together.

Stocks or assets whose returns tend to be negatively correlated with each other are the most valuable diversifiers, but they tend to be the exception. Those with zero or low correlations are also good diversifiers. However, as long as assets’ returns are less than perfectly correlated (i.e., a correlation below one), then diversification can reduce risk.

Markowitz demonstrated that diversification reduces risk so that investors can earn the same return with lower risk, or a higher return for the same risk. He argued that “diversification is the only free lunch in finance.” Investors were urged to diversify across stocks, countries and asset classes.

The benefits of global diversification were demonstrated by a French academic, Bruno Solnik who published an influential article 50 years ago entitled, “Why not diversify internationally rather than domestically.” At that time, cross-border investment was the exception rather than the rule.

This had not always been the case. At the start of the 20th century there was extensive cross-border investment. Over the 20th century, there was a U-shaped pattern of globalization, with international investment commonplace in both 1900 and 2000. During the period in between, from the First World War through to the 1970s, many barriers and costs inhibited cross-border investment.

Since the 1970s, those barriers and costs have been progressively swept aside. Following the 1971 breakdown of the Bretton Woods system of fixed exchange rates, most major currencies have floated freely, removing the risk of sudden large devaluations. While investors still face exchange rate risk, currency, interest rate and equity market risk can now all be hedged cheaply. Barriers to international capital movement have been substantially dismantled. Information is rapidly and widely available and in ever greater volume. Accounting, tax, governance, trading and issuance systems are being harmonized. Low-fee passive vehicles including ETFs abound, facilitating cheap global diversification.





## In terms of equities, what is an optimal number of stocks to hold in order to achieve effective levels of diversification?

Almost every finance textbook contains a chart plotting risk (measured by the standard deviation of the portfolio) against the number of stocks held, and showing how rapidly diversification across individual stocks reduces risk. Conventional wisdom is that a small number of stocks – say 10 to 20 – is sufficient to provide market-mimicking returns. In the 2022 Yearbook, we showed that while these charts are correct, they are misleading. That is because they focus on the portfolio's standard deviation, rather than its residual risk or tracking error. Many more stocks are needed to create a well-diversified portfolio that tracks or mimics the market. For the US market, even with 100 stocks, we showed that the tracking error is still 3.3% per annum.

This does not detract from the fact that diversification across stocks is a highly effective way of reducing risk. In most countries, the risk of a well-diversified equity portfolio – say of an index fund for that country – is around half that of a typical individual stock.

## What do you make of Henrik Bessembinder's research which finds that only a small minority of stocks drive market returns over time – and that the majority of stocks perform worse than cash? What, if anything, does this tell us about active vs. passive investing?

Bessembinder's research is interesting and persuasive. In an initial paper published in 2018, he shows that the majority of US stocks (57.4%) have had lifetime buy-and hold returns below that on Treasury bills. Since 1926, the best-performing 4% of companies explain the net gain for the entire US stock market. In a subsequent paper published in 2021, he examined some 64,000 stocks from 42 countries and showed the same pattern held for non-US stocks.

This is caused by the strong positive skewness in individual stock returns. The nice thing about investing in a stock is that you can't lose more than 100%. However, you can achieve returns of well over 100%, or even 1000% or more. This positive skew in returns means that the average

return on a portfolio of stocks is well above the median return. The positive premium over bills that we observe for overall stock markets is driven by very large returns for relatively few stocks.

There is much evidence that individual/private investors typically hold concentrated portfolios containing relatively few stocks. Bessimbinder's results imply that the average individual with a concentrated portfolio is thus likely to receive less than the return on the overall market.

What does this tell us about active vs. passive investing? Both camps claim it supports their case. Active managers argue that their skills are needed to find the relatively few stocks that really make a difference. Passive managers argue that you need a highly diversified portfolio that tracks the market in order to harvest the market risk premium. Both are correct, but the choice between active and passive hinges on whether the active managers have the requisite skills to find those big winners and can outperform on an after fee basis.

## Is global diversification always a good idea?

Solnik showed that you can reduce risk by diversifying across countries. He urged investors around the world, particularly US investors, to diversify globally. However, although before the event global diversification always seems like a good idea, it does not necessarily have a good outcome.

In the 2022 Yearbook, we compared domestic vs. global investment for investors in 32 countries from 1974 – the date of Solnik's paper – onwards. For each country, we examined the increase in the Sharpe ratio (reward to risk ratio) from investing in the world index, compared with investing domestically in the investor's home market.

Global investment led to higher Sharpe ratios than domestic investment in the vast majority of countries. However, there were a few exceptions, and one of these was the world's largest and most important market, the US. US investors would have been better off staying at home. With hindsight, following Solnik's advice would have proven a costly mistake.

For a US investor, domestic investment beat global investment for two reasons. First, US equities performed exceptionally well. Over this period, US stocks beat non-US stocks by around 2% per year. My co-authors and I have

documented this continuing outperformance of US equities and describe it as a case of 'American exceptionalism.'

Second, global diversification failed to lower volatility for US investors. The US equity market was among the world's least volatile, as its size, scope and breadth offered a high level of diversification. Over this period, the average volatility of non-US countries in the world index was almost double that of the US market. US investors had less to gain from risk reduction than their foreign counterparts.

This is a cautionary tale. It is a reminder that investing is subject to considerable uncertainty. Good investment decisions, based on sensible criteria, can sometimes have disappointing outcomes.

Prospectively, and without the benefit of hindsight, the case for global diversification remains compelling. Our advice to investors from all countries, including the US, is that they should diversify globally. We believe this is very likely to reduce risk and increase the Sharpe ratio, but it is important to recognize that this is not guaranteed.

## How have correlations and hence the benefits of global diversification changed over time?

In the 2022 Yearbook, we looked at how the average correlation between the returns on all pairs of countries had changed over the period since 1970. We found that the average correlation between developed markets more than doubled from 0.37 in the early 1970s to 0.75 in the most recent period examined. The corresponding increase for emerging markets was from a very low base of 0.05 to 0.49.

These increases have coincided with, and been driven by, the removal of barriers, and by the increased globalization of economies and markets. Ironically, with correlations now at a higher level unmatched in the past, this has reduced the potential gains from diversification.

Despite this, some sources still cite quite high potential gains, based perhaps on old data or unrealistic assumptions. Our estimates suggest that investors around the world can now expect a more modest, but still useful level of risk reduction from global diversification.



Much is made of the 60:40 equity bond portfolio. What lessons can we draw from your datasets and decades of research into asset prices in terms of stock-bond diversification?

There is nothing magic about the 60/40 portfolio. The appropriate mix will differ across investors, depending on their investment objectives and risk preferences. However, holding both stocks and bond does provide substantial risk reduction. We show in the Yearbook that the downside risk of a blended stock/bond portfolio is substantially lower than that of an all-equity, or even an all-bond portfolio.

There are two reasons for this. First, bonds are less volatile than equities. Second, bonds are imperfectly correlated with stocks. For example, measured over the entire 20th century, the correlation between US stocks and bonds was just 0.19. This positive, but low correlation, provided good scope for diversification between stocks and bonds.

Negative correlations are even better. Over the period from 2000-21, the US stock-bond correlation was  $-0.29$ , which was highly unusual by historical standards. The US was not alone: a stock-bond correlations were negative in most major world markets over this period. This negative correlation meant that stocks and bonds served as a hedge for each other, enabling investors to increase stock allocations while still satisfying a portfolio risk budget.

All good things come to an end. By the start of 2022, we had entered a different environment. Inflation had risen. Monetary policy had shifted from ultra-loose to an interest rate hiking cycle. Real interest rates were now rising sharply, rather than falling. As we said at the time in the Yearbook, “we therefore do not recommend placing reliance on a continuation of negative stock-bond correlations.” Indeed, in 2022, stocks and bonds plunged together, resulting in a drawdown for a 60/40 equity-bond portfolio of more than 30%.

This was a timely reminder that diversification should be thought of as a long-run strategy. In the short run, especially during crises, it can let investors down. However, while negative stock-bond correlations may be a feature of the past, looking ahead, we expect, based on history, that the stock-bond correlation will remain low. If so, it clearly continues to make sense for investors to diversify across stocks and bonds.

You just mentioned that diversification fails when investors need it most, i.e., in times of crisis. What can we learn from history here?

There is extensive evidence from multiple researchers that correlations between stocks and between countries tend to rise quite sharply during times of crisis – everything tends to fall at the same time – thereby making diversification less effective. The most recent examples are the Global Financial Crisis, COVID-19 and the bear market in 2022.

The cost of elevated correlations depends on their duration. There is evidence that the higher correlations arising from crises are quite short-lived. The extent to which domestic and international diversification can fail investors in a crisis is thus limited to quite short intervals, and then they matter only if they coincide with the timing of realizations where the investor is effectively a forced seller. For long-term investors, the enhanced correlations are of less consequence.

To hedge, or not to hedge? Do you have a view on currency hedging?

Hedging exchange risk appears attractive as it reduces one element of the risk of cross-border investment. However, it is not that simple, and the investor’s time horizon also matters. In the short run, exchange rates can vary greatly, and the changes are impactful. While hedging exchange rate risk reduces short-term volatility, our research for the

Yearbook has found that its benefits have shrunk in more recent periods. For equity investments, the risk reduction from hedging equities is less than half that obtainable from global diversification.

For long-term investors, hedging is less necessary and may even be counterproductive. Our research shows that although currencies have been volatile, over the long run, parity changes were largely responding to relative inflation rates. This means that long-term investors are already protected to some extent from currency risk.

Conceptually, hedging involves taking a short position in foreign interest rates and a long position in the investor’s domestic interest rate. While helping to hedge short-term currency risk, this introduces a new form of risk and source of volatility, namely taking a position in real interest rates at home vs. abroad. Our research has found that, over longer horizons, hedging can, on average, lead to an increase in the overall volatility of real returns and thus prove counterproductive.

Is there anything interesting you have realized about diversification that we have not touched on here?

There are just two issues that I’d like to mention. First, there is the question of increasing stock market concentration. The outstanding historical performance of US stocks has led to the US dominating world markets, with US equities now accounting for more than 60% of the world’s investable free-float capitalization. At the same time, many

stock markets around the world have themselves become more concentrated. The largest three US stocks now make up 16% of the market’s value, while the top ten account for 29%. This is the highest level of concentration since 1966. This increased concentration provides new challenges for investors seeking to diversify domestically and globally.

Second, diversification should not be seen as a goal in its own right, to be pursued at all costs. The ultimate aim is good risk-adjusted performance, and viewed from that perspective, it is possible to be overdiversified.

Overdiversification occurs when an investor or fund manager has information or insights that are not being fully exploited because the portfolio is too diversified. You cannot beat the market by holding it. To beat the market, you need the skill to generate alpha – sometimes known as excess return or abnormal return or return above the benchmark. Assuming you have such skill, you need to take large-enough positions to exploit it. Otherwise, diversification becomes ‘diworsification’.







# The non-linearity of diversification

Correlation analysis in times of market stress



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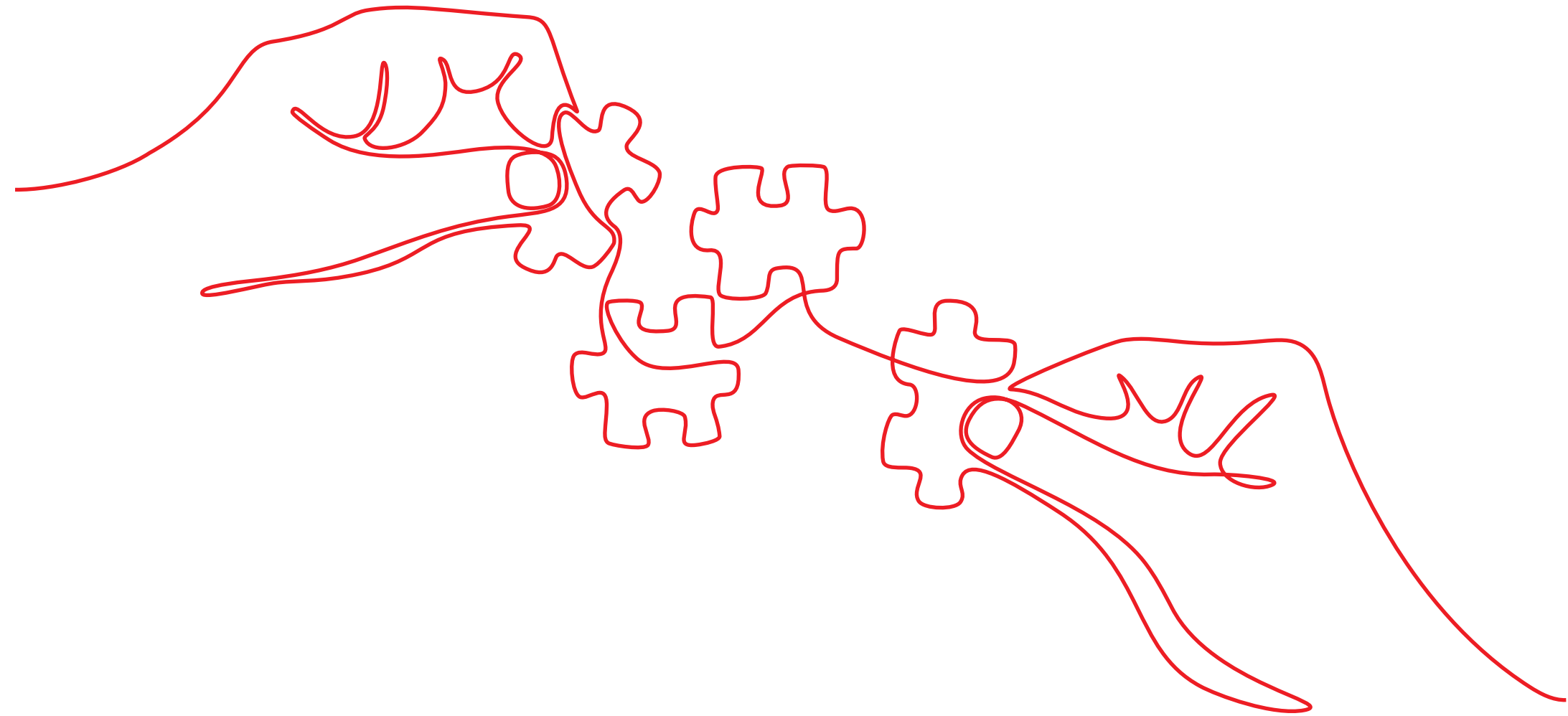


**Fatomata Konteh**  
Investment  
Solutions Specialist



**Gianluca Oderda**  
PhD, CFA, CAIA,  
FRM, CQF,  
Portfolio Manager,  
Active Multi-Asset





Correlations between asset classes are not static. Michele Gambera, Fatomata Konteh, and Gianluca Oderda analyze the relationship between various assets, particularly during times of elevated inflation and market stress, to assess which assets are useful diversifiers and in what scenarios.

Diversification is the beating heart of any multi-asset portfolio. Assets that have low or negative correlation move in different directions and can help smooth overall returns; one part of a portfolio offsets and provides ballast against others. Understanding correlations is therefore essential.

From 1950 to 2000, US Treasuries were positively correlated with equities – only for that to flip negative for the next 20 years. Triggered by a return to inflation and a move to ‘normal’ rates levels, the relationship has turned positive again. Stocks and bonds no longer offset each other as much.

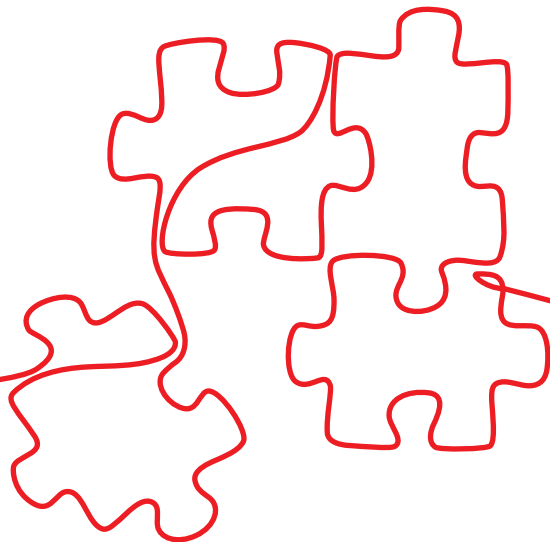
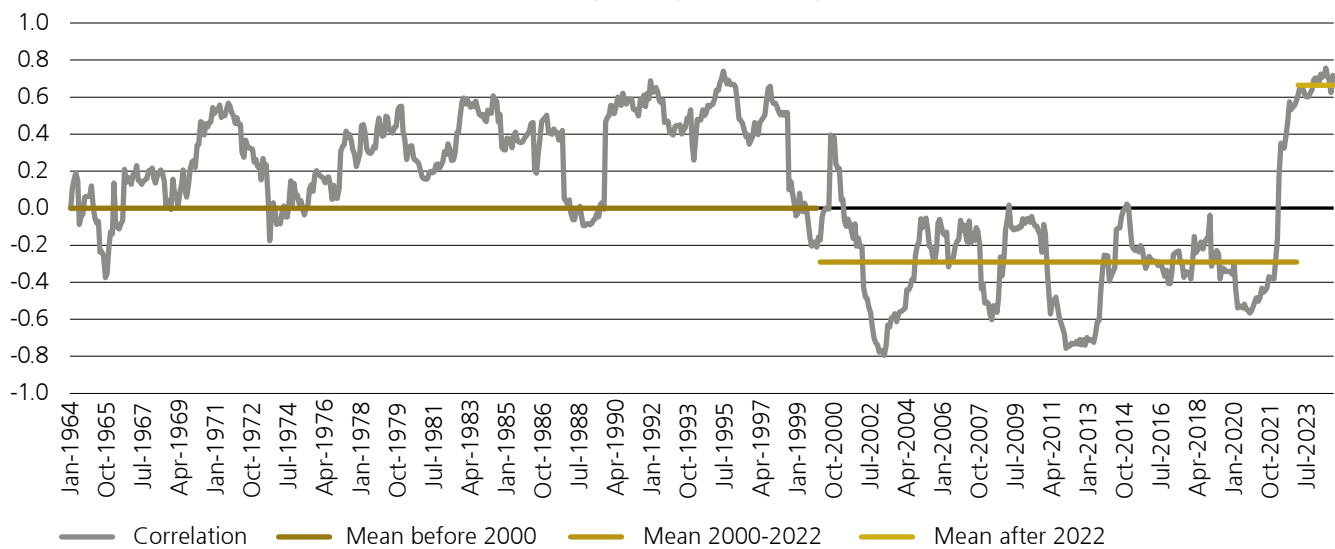


Figure 1: Two-year correlation between stocks and bonds

24-month correlation between S&P 500 and Bloomberg Barclays US Treasury Index



Source: UBS Asset Management; Bloomberg and Standard & Poor's. Monthly data 1964-2024.

A number of questions flow from this. Is there something about the current regime that means historical correlation relationships will continue to break down? If so, what does this mean for asset allocation? And is achieving natural diversification going to get harder?

In the case of the latter, there are many reasons to believe it might be. From rising geopolitical tensions, extreme US debt levels, demographic reversals with structural implications for higher inflation, and the move to a more multi-polar world order (one perhaps less reliant on the US dollar), there are several seismic shifts happening.

Before conjecturing on what this might mean for portfolio diversification and while also acknowledging that the past is not prologue, we crunched the data in search of asset correlations lessons at various stages of the market cycle. The results confirm that the relationship between 'risk assets' and 'safe assets' is not linear.<sup>1</sup>

<sup>1</sup> When two asset classes move independently from one another, we see the observations scattered like a cloud. When the dots scatter along a straight line, we say they have positive correlation if the line is sloping up, and negative if it slopes down. The statistic of correlation will be close to zero in case of independence, close to +1 in case the dots in the upward sloping line are near the line, and close to -1 if the dots are all near a downward sloping line. If, however, the dots seem to follow a curve, the correlation statistic will not be very informative.





Non-linear correlations

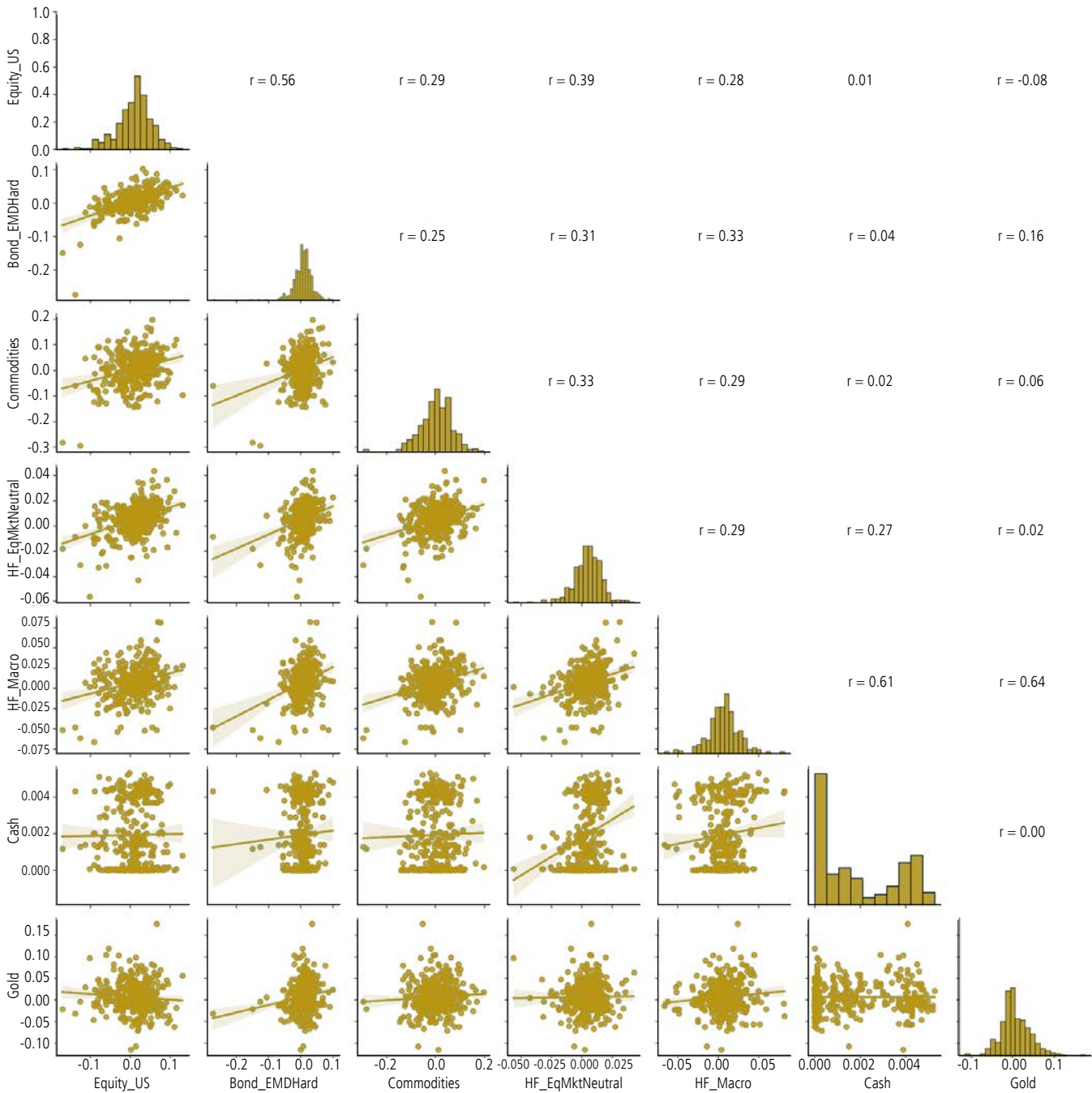
We analyzed monthly data for a variety of indexes in listed assets between August 1994 and September 2024; for robustness, we also looked at the wider range of index returns at the weekly data frequency, although for a shorter period due to data limitations.<sup>2</sup>

The following illustration shows the behavior of the asset classes in our sample. The top-left chart, a histogram,

shows the distribution of the first asset class (namely, US equities). The chart below it, a scatterplot, shows the returns of US equities (horizontal axis) against developed market equities excluding the US. Clearly, the two indexes tend to move together, with positive correlation. In fact, in the mirror-opposite cell of the matrix, we see  $r=0.84$ , meaning that the correlation between the two asset classes is 84%. We organized the charts in two panels, 2a and 2b, for readability.



Figure 2a: Asset class correlations



Source: UBS Asset Management; the charts are based on monthly data December 1994-September 2024 for the following total return indexes in USD: US equity: MSCI USA : Gross Index; Developed ex US Government: FTSE Non-USD Government Bond Index, USD Hedged; Emerging Bonds Hard Currency: JPM EMBI Global Index; Commodities: S&P GSCI; HF Equity Market Neutral: Credit Suisse Hedge Equity Market Neutral Index; HF Macro: Credit Suisse Hedge Global Macro Index; Cash: FTSE US 3-month Treasury Bill Index

<sup>2</sup> US data was used for our sample, but we expect the lessons to hold for all countries since we use global data for several asset classes.



Figure 2a has plenty of unusual patterns. The bottom line represents gold (vertical axis). Gold seems to have little correlation with the other asset classes, and indeed its scatterplots look like clouds, with no pattern emerging. This suggests that gold prices move independently from returns to the other asset classes, and therefore may be a candidate for diversification.<sup>3</sup>

The following line is cash. Cash has different regimes, as confirmed by the histogram at the right-hand side of the bottom row. It shows a bimodal distribution – i.e., a histogram where there are two peaks (left for loose money, right for tight money), and a valley (intermediate monetary conditions, which do not appear to have happened frequently in the last 30 years).

The row of charts above cash represents macro hedge funds (alternative strategies focused on macroeconomic themes and taking concentrated bets on specific markets). The purpose of these strategies is to produce returns without material correlation to the markets in the long term and the results imply they do a pretty good job on average.<sup>4</sup> The same is true for equity market neutral strategies which buy and sell similar stocks if one is expected to go up and the other down.

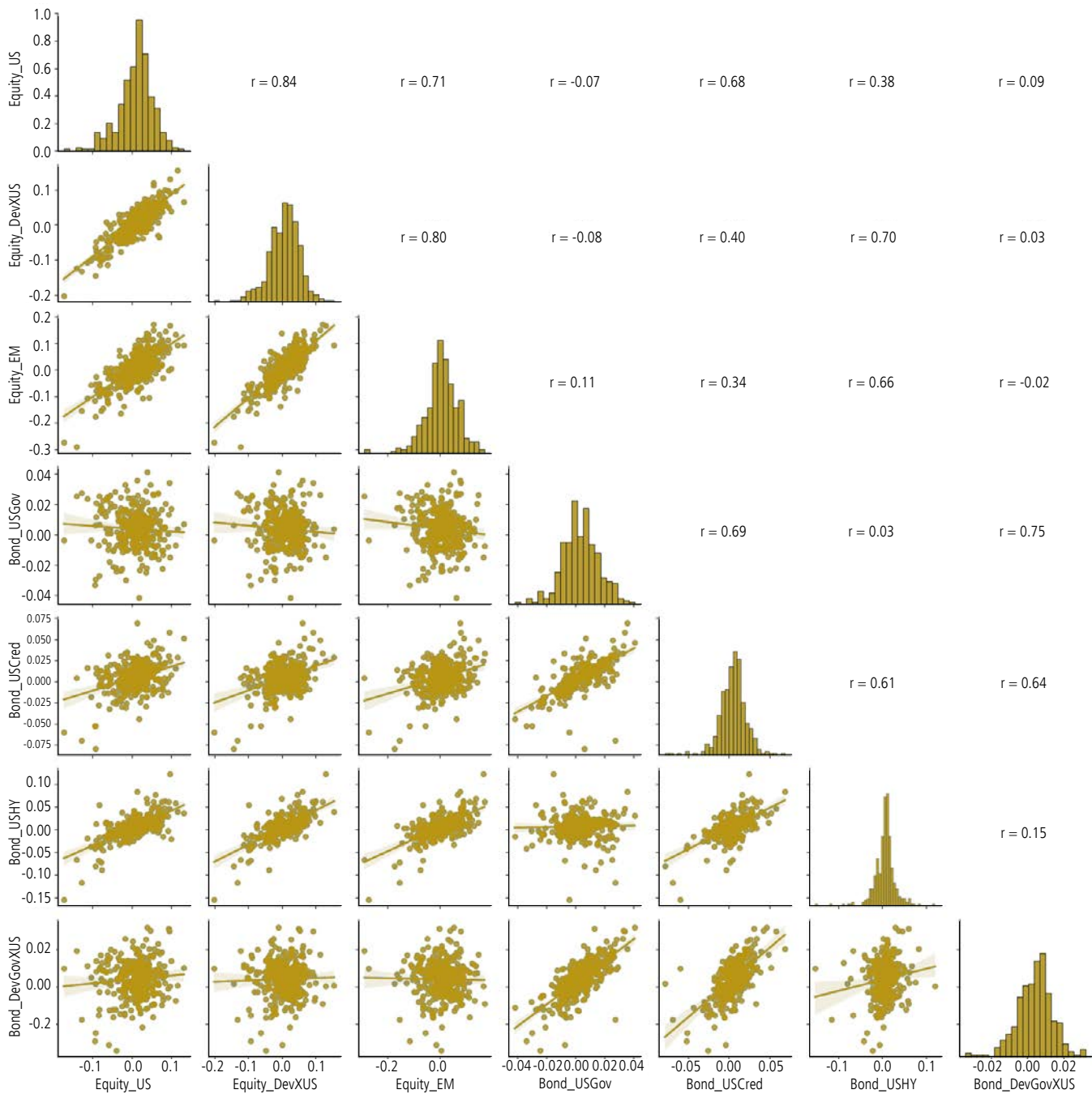
With commodities, the left-most scatterplot depicts commodities vs. US equities, showing that when equity markets go down (horizontal axis) commodity prices often seem to dampen the fall. However, observing the scale of the vertical axis as well as the histogram to the right, we notice that more than half of the monthly returns to commodities during our sample period were negative. This suggests that, while commodities are a diversifier, a passive buy-and-hold commodity allocation would have lost money over the last 30 years.

Emerging market debt (EMD) denominated in hard currency is on the following row. The histogram is noticeably narrow, indicating low volatility. The beta of the regression line for the scatterplot in the first column is also positive, showing that EMD returns were positive on average when US equity returns were positive, and vice versa. It is therefore hardly surprising that EMD is seen by the market as a risky asset.

Figure 2b is like 2a in the sense that the first row shows US equities, but the remaining assets are new. Let us look at them, again starting from the bottom row, showing developed government bonds excluding the US, which appear to have little correlation to risk assets. Credit, high-yield and investment-grade bonds specifically, are clearly risk assets with a positive correlation to stocks. US government bonds show a slightly negative correlation to risk assets during the last 30 years, and therefore have worked as mitigators of market volatility.

To complete the chart, we have equities from emerging markets and from developed markets excluding the US, which both have a strong positive correlation to the US stock market, showing the existence of a global business cycle.

Figure 2b: Asset class correlations



Source: UBS Asset Management; the charts are based on monthly data December 1994-September 2024 for the following total return indexes in USD: US equity: MSCI USA : Gross Index; Developed ex US: MSCI EAFE Gross Index; Emerging equity: MSCI EM (EMERGING MARKETS) Gross Index; US Government: FTSE US Broad Government / Government Sponsored Bond Index; US Credit: FTSE US Broad Investment Grade Credit Bond Index; US High Yield: FTSE US High Yield Market Index .

3 For reasons of brevity, we will not consider gold in our statistical analysis in the rest of this paper, since we already have the broader asset class of commodities represented.

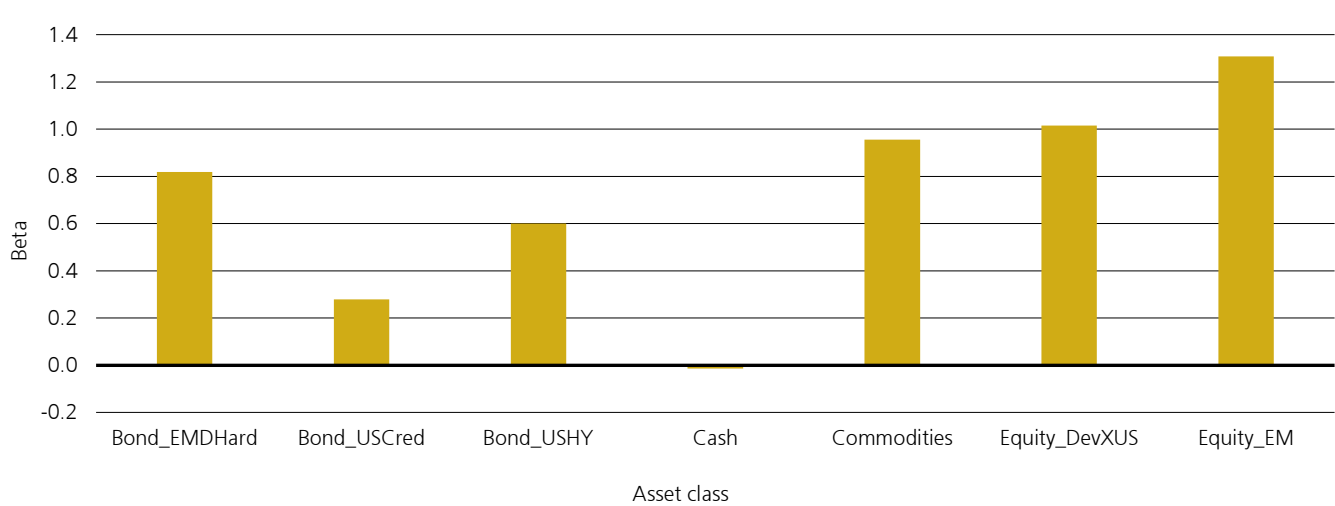
4 The research in this paper is based on indexes. It is not possible to invest in indexes directly.



Segments of market performance

By segmenting our sample to only consider months where equity performance was particularly negative, we can now look at responses in different market conditions.<sup>5</sup>

Figure 3: Betas of univariate regressions when US stocks are in the bottom 2.5 percentiles of their returns’ distribution



Source: UBS Asset Management. The bars show the slopes (betas) of regressions where the index mentioned in the chart is the dependent variable and US Equity returns are the regressor using monthly data December 1994-September 2024. Of the 11 series in the sample, we only report the betas that are statistically significant at the 5% confidence level using Newey-West robust standard errors. Therefore, the betas for US Government Bonds and Non-US Developed Government Bonds as well of the two hedge fund asset classes are not significantly different from zero (which is good in terms of diversification).

For the chart above, we only consider months in our sample that were in the bottom 2.5% of the distribution – i.e., when the stock market did worse than 97.5% of the cases. All betas are positive except for that of cash, which is negative but close to zero. This indicates that when stocks fell dramatically in the last 30 years or so, cash tended to remain stable. The only other asset class with a small beta is US credit (investment grade) bonds, a relatively safe asset during market panics.<sup>6</sup>

As Figure 3 shows, both US and non-US government bonds (typically a good refuge during market panics) and hedge funds stand out as these zero-correlation strategies during market routs.

Repeating the exercise with different percentiles offers similar results.<sup>7</sup> However, the beta for US government

bonds goes from zero to negative. This suggests the hedging effect may be more substantial for government bonds when the stock market fall is less extreme.

The analysis carried out shows clear diversification benefits in multi-asset portfolios.<sup>8</sup> However, when stock market losses are severe, correlations between assets do appear to increase, muting the benefits of correlation in a traditional portfolio. Alternative asset classes such as hedge funds may help government bonds in achieving diversification benefits.

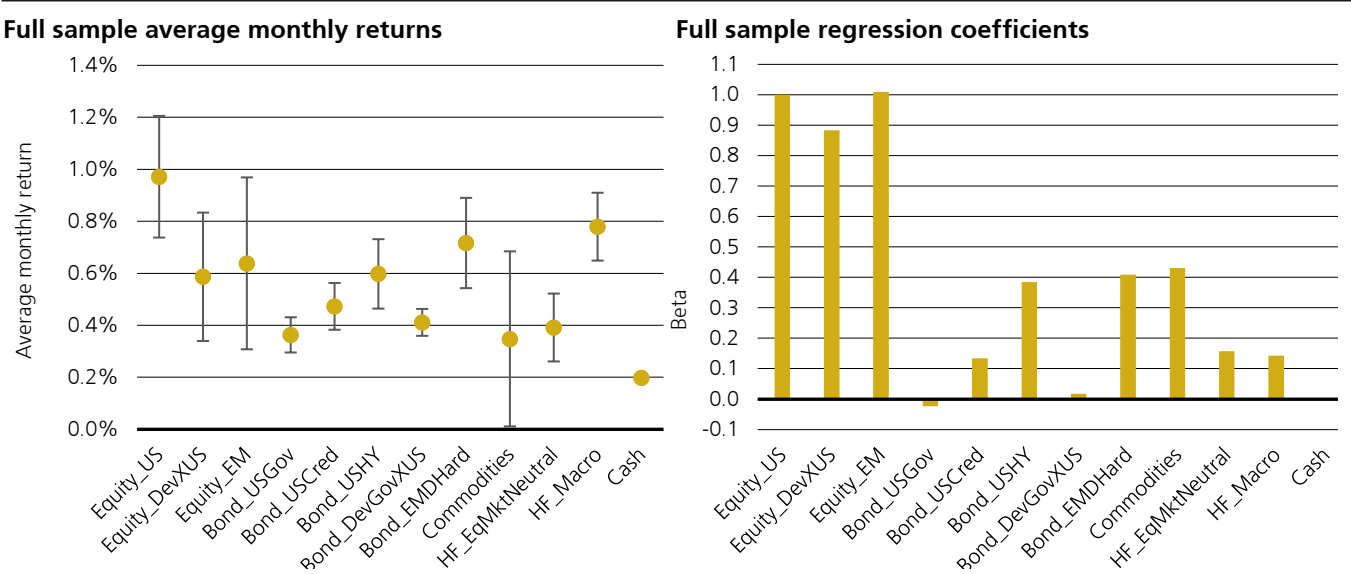
Importantly, illiquid asset classes such as direct real estate and private equity were excluded from the analysis. This is because their returns are generally quarterly and based on appraisals rather than on market transactions, making a proper statistical comparison impossible.

Inflation effects

The behavior of asset class correlations in different inflation regimes also matters. Inflation serves as both a barometer of economic health and a catalyst for market dynamics. In particular, we analyzed economic environments characterized by extreme inflation, since ordinary correlation patterns between asset classes are generally expected to break down.

As a proxy for inflation, we used the year-over-year changes of the United States Consumer Price Index for Urban Consumers (without seasonal adjustment and available as a monthly time series). Once again, we segment the data into quantiles.

Figure 4: Asset class betas vs. US equities in all inflation environments



Source: UBS Asset Management. The left-hand side panel shows the average monthly return for the asset classes, with the ranges indicating plus or minus one standard deviation of the monthly returns. The right-hand side chart shows the beta to US equity, analogous to Figure 5 but not excluding non-statistically-significant regressions for the sake of clarity.

On the left-hand side, we display the average monthly return of each asset class with its average quadratic error (one standard deviation of the mean). On average, independent of the inflation environment, all asset classes but commodities deliver a positive risk premium over cash.

On the right-hand side, the beta vs. US equities is positive and quite large for most risky assets. Cash and US government bonds represent the exception. Government bonds in foreign currencies display a small, yet slightly

positive correlation to US equities, most probably coming from foreign currency risk exposures and global inflation cycles.

Next, we analyze asset class returns in the quantile corresponding to the 10% highest inflation environments – i.e., year-over-year changes of US Urban Consumers CPI higher than 4.13%. In such situations, the picture changes quite dramatically.

5 Figure 3 shows the betas (slopes) of the regression lines for the different asset classes at the 2.5 percentile point. We repeated the same also for the fifth percentile (sample of only when the MSCI USA returned -8% or less) and so on, with similar results, which we do not report for brevity.

6 We had 12 asset classes in Figure 2, and only 7 in Figure 3: where did the remaining five go? One, US equity, is the regressor in the analysis, and therefore has a beta of 1 to it self, which is trivial. For ease of exposition, from now on we do not include variables that are estimated to have a beta not significantly different from zero using a robust (Newey-West) t statistic. This means that if an asset class is not included in the chart, they are a good diversifier as their correlation with risk assets is zero.

6 Given the similarity in conclusions, for brevity we have not included the full analysis here.

7 Confirmed in our study of weekly data for a shorter period.

Figure 5: Asset class betas vs. US equities in the 10% highest inflation environments



Source: UBS Asset Management. See footnote to Figure 4 for more information. This chart was produced only using the subset of months where inflation was in the top decile of the sample.

The chart on the left-hand side shows average monthly returns becoming strongly negative for equity indexes. Riskier fixed income assets – such as US credit, US high yield and emerging market hard currency bonds – also show negative average monthly returns. Even ‘safe-haven’ assets, such as US government bonds, provide only a limited degree of diversification as they often have negative returns.

Asset class betas to US equities are again positive and quite large for most risky assets. Interestingly, defensive government bond assets become positive. Therefore, based on the assumption that government bonds should provide diversification to riskier asset classes, traditional multi-asset solutions will most probably encounter performance problems in high inflation environments.

All is not lost, however: Figure 5 clearly shows that cash and alternative asset classes might provide diversification benefits. Average monthly returns are positive for cash, commodities, and two of the hedge fund styles designed to act as ‘crisis hedge’ providers.

More specifically, commodities do seem to provide some hedge against inflation, whereas their beta vs. US equities decreases. However, the variability of average monthly return is the highest among all asset classes; the hedge therefore may not be as reliable and the effects on portfolio volatility may not be ideal.

The equity market neutral hedge fund style groups long/short portfolios with little market exposure, aiming to generate return mainly by taking idiosyncratic risk (as explained earlier). The second hedge fund style with diversification potential is the macro style, which groups strategies taking long or short positions in different equity, fixed income, currency and commodity markets, mainly with derivative securities, trying to profit from the economic and political outlook for different regions and countries. These strategies appear to provide good diversification.

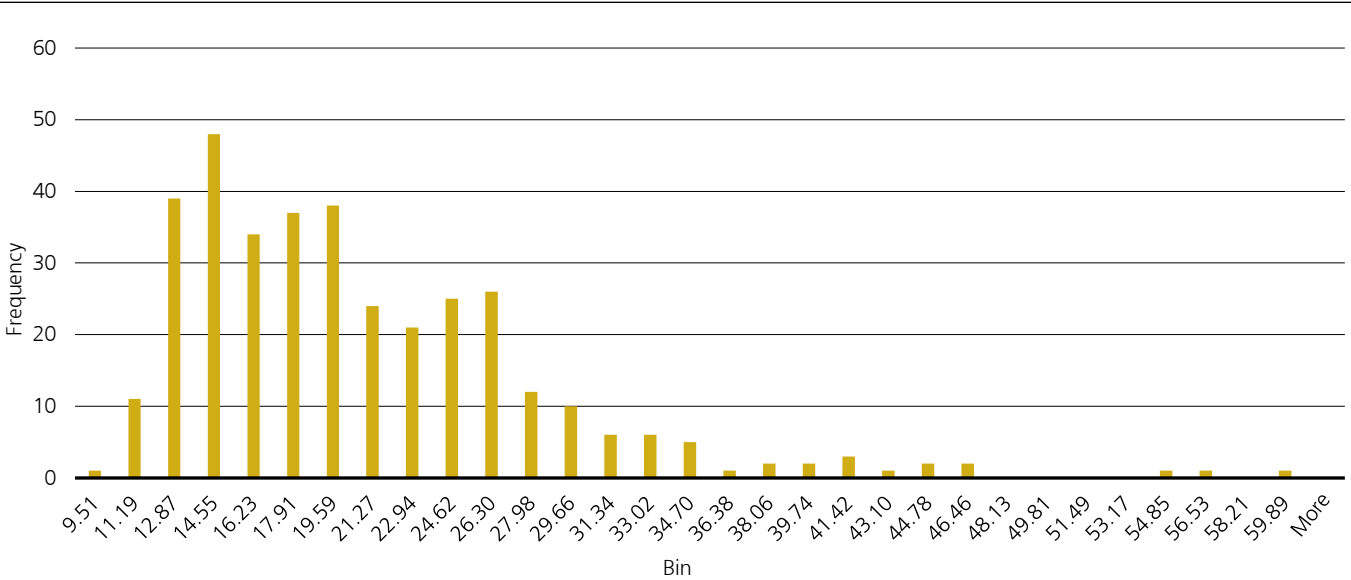
The findings already discussed for the 10% highest inflation environment hold true for the 5% and the 2.5% equivalents.<sup>9</sup>

9 Given the similarity in conclusions, for brevity we have not included the full analysis here.

## Volatility effects

Another variable which influences asset class correlations is implied volatility, the volatility used in option pricing models, such as the Black-Scholes model.<sup>10</sup> Figure 6 shows the historical distribution of VIX levels.<sup>11</sup> We can see that the VIX level distribution is skewed to the right, with historical median at 18.33, and average at 20.06.

Figure 6: Historical VIX level distribution



Source: UBS Asset Management and Chicago Board of Options Exchange. Sample: VIX spot price, end-of-month data from December 1994 to September 2024.

We look at the behavior of asset class correlations in different implied volatility regimes, keeping in mind the results earlier. First, we analyze asset class returns in the quantile corresponding to the 10% highest US equity implied volatility levels.<sup>12</sup>

10 Implied volatility indicates how the market views where volatility should be in the future, and differs from realized volatility, which is backward looking.

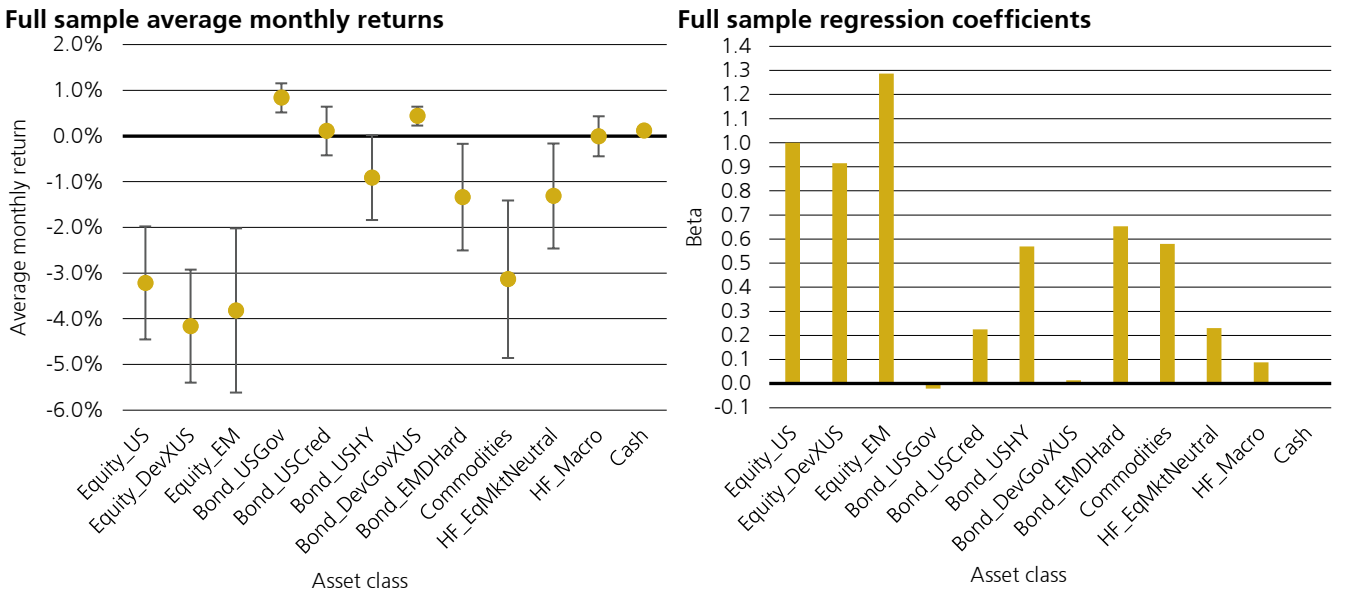
11 The most recognized measure of implied volatility is represented by the VIX Index, which measures constant 30-day expected annualized volatility of the US stock market, derived from real-time, mid-quote prices of S&P 500 Index call and put options.

12 Meaning VIX index levels higher than 28.99.





Figure 7: Asset class betas vs. US equities in the 10% highest US equity implied volatility environments



Source: UBS Asset Management. This chart is similar to Figure 5, but instead of inflation it looks at the top decile of spot VIX prices. The left-hand side panel shows the average monthly return for the asset classes, with the ranges indicating plus or minus one standard deviation of the monthly returns. The right-hand side chart shows the beta to US equity.

The diversification properties of government bonds continue to hold in high volatility regimes. Conversely, when volatility increases, the betas to US equities of most asset classes increase significantly. The exceptions are cash, US government bonds, foreign government bonds and the macro hedge fund style.

Equity market neutral hedge funds appear to suffer in high volatility regimes, with a sharply increasing beta to US equities. This might happen because certain types of equity market neutral strategies, such as statistical arbitrage strategies, aim to identify pairs of correlated stocks and

take opposing positions based on their historical relationship – and in high implied-volatility regimes such relationships tend to break.

When we analyzed asset class returns in the 5% and 2.5% quantiles, the findings already discussed for the 10% highest inflation environment were mostly confirmed.<sup>13</sup> However, when implied volatility levels become extreme, even the macro hedge fund style stops providing protection. The only ‘safe havens’ in this situation are cash and government bonds.<sup>14</sup>

<sup>13</sup> This equates to VIX index levels higher than 33.65 and 40.17.  
<sup>14</sup> The VIX Index is traded via futures and provides precious information concerning how the market sees the evolution of 30-day expected volatility for the US stock market at future maturities. In our analysis, we used the VIX spot price, but using futures prices may be informative as well and may be a topic for further research.



# The future of diversification

Past performance is no guarantee of future results, yet past performance is all we can analyze, and it would be illogical not to. Both inflation and implied volatility clearly influence the behavior of asset class correlations, especially during extreme market conditions. Our observations indicate that in environments characterized by high inflation and elevated volatility, diversification – the primary rationale behind multi-asset strategies – is not constant.

‘Safe’ assets such as government bonds and low-beta hedge funds appear to provide diversification against fluctuations in risk assets. However, the extent of this diversification varies.

We can now ask which types of market stress we can expect in 2025 and beyond. Inflation appears to be

retreating around the world, so we do not think this will be a likely trigger of volatility (at least in the short term). However, geopolitical tensions in Eastern Europe and the Middle East are a serious concern and so (from an investment point of view) is the high valuation of US mega-caps.

In the past when geopolitical events – such as the tragic 11 September 2001 events occurred – all risk assets such as stocks and high-yield bonds suffered, while ‘safe-haven’ assets such as government bonds outperformed. Even though the September 11 events had roots in the Middle East, commodity prices did not move very much. Meanwhile, in 2022 when Russia invaded Ukraine, risk assets suffered and ‘safe’ assets outperformed, but commodities had the highest gain due to supply concerns.

In terms of US stock valuations, the dot.com bubble (during a period of low inflation) illustrated the effects of a sudden fall from high stock valuations (note we are not suggesting that the current valuations of the largest US stocks is necessarily a bubble). In 2000-2002, after the market turned away from technology stocks, while risk assets lost en masse, traditional ‘safe’ assets such as government bonds performed quite well, providing good diversification.

Therefore, if investors are concerned about geopolitics and the possible overvaluation of stocks, they should consider a diversified allocation to ‘safe’ assets, starting with liquid (such as government bonds) and possibly extending to private assets. For those that fear an explosion in commodity prices due to geopolitics, a commodity exposure may be helpful, with a focus on energy.





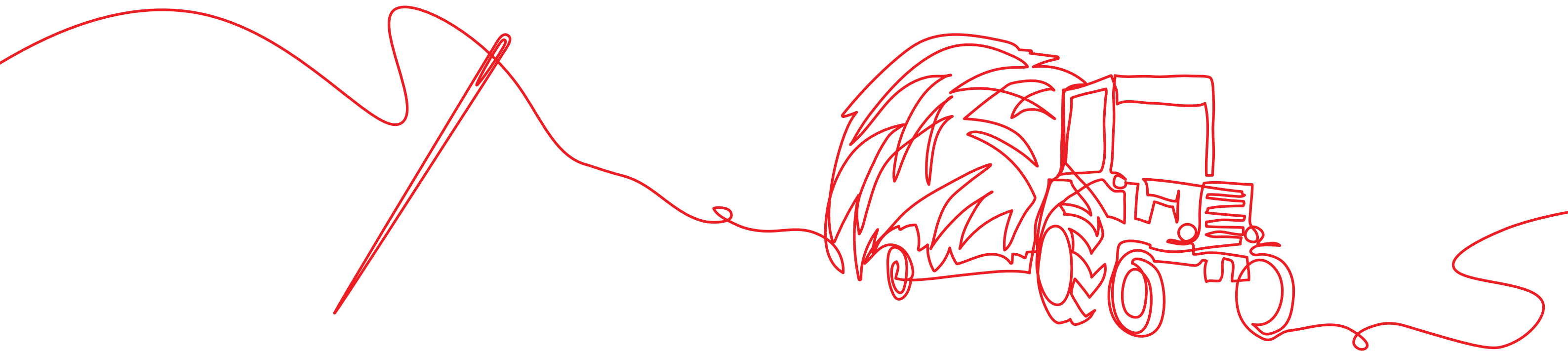


# Needles in haystacks

A stockpicker's  
nightmare



**Ian MacIntosh**  
Head of Active  
Equities



With stock market gains being driven by only a handful of companies, Ian McIntosh ran 1,000 simulated portfolios at random to see just how difficult an environment it has been for active managers.

Harry Markowitz, the father of modern portfolio theory, is credited with saying that the only free lunch in investing is diversification.

Diversification is an extremely old concept, older than the Old Testament. King Solomon – the wisest and richest investor of the ancient text – wisely balanced his investments across commodities, agricultural land and infrastructure.

Yet the benefits of diversification might be lost on the new generation of investors; big winners in equity markets have gotten bigger and simply riding the wave has been an extremely successful strategy. This is one of the best years for momentum investing on record.<sup>1</sup> So why diversify away your portfolio returns when all you need to own is Nvidia and bitcoin?

Diversification has become more elusive in a world where owners of broad market indexes are taking on concentrated risk that resemble the risk profile of highly active portfolios.

In the S&P 500, three stocks (Nvidia, Apple, Microsoft) now account for around 20% of the index weight and more than one quarter of the risk (as measured by the Barra US Long Term Risk). This is in an index with 497 other holdings. The situation is more extreme in popular indexes like the Russell 1000 Growth that barely pass regulator definitions of diversification such as the 5/10/40 rule of UCITS funds in the EU.

For most of history, active global equity portfolio managers didn't need to pay too much attention to what they didn't own in the MSCI World Index. If you built a diversified portfolio with 50 holdings out of the 2,000 or so names in the index, your top active risk contributors were likely large overweights. With the rise of the Magnificent 7, this has changed. Errors of omission are now costly. Not owning the two largest index weight names this year wiped out the alpha target of most active managers.

In this environment, the best class of long only active equity strategies have been 'index huggers' – systematic strategies where small tilts and deviations from the benchmark have meant that errors of omissions are limited. Low 'active share', once derided, has helped to limit the damage. An index hugger must own a large index weight like Nvidia. Are these strategies well diversified? By definition, they are only as diversified as the index they embrace.

The concept of active share became popularized after being coined in the 2009 paper How Active Is your Fund Manager? A new Measure that Predicts Performance (Martijn Cremers, Antti Petajisto). Regulators started to pay attention to active funds that had low active share, low tracking error to benchmark, while charging active fees – with 50% being a commonly used threshold that is a warning of low activeness.

To illustrate how a concentrated benchmark can present a challenge for an active portfolio manager, consider the following thought experiment. Imagine 1,000 portfolios each with 50 holdings, chosen at random from the S&P 500, with the portfolios built to be equal active weighted,

meaning the weight of each holding relative to the benchmark weight is the same. This weighting approach is selected as a simple proxy for the approach of the average active portfolio manager; larger index weighted names tend to have higher portfolio weights as it is the active weight that drives relative performance. Each of the 1,000 portfolios is 'buy and hold', meaning the holdings are not traded for the duration of the evaluation period.

How many of the 1,000 portfolios would be expected to outperform the S&P 500 in a given year? For a year chosen at random, the intuitive answer is 50% – a coin flip.

How many of the 1,000 portfolios would have outperformed the S&P 500 from 1 July 2023 to 30 June 2024?<sup>2</sup> Instinctively you will likely appreciate the number is low, given this was a period dominated by the ascendancy of Nvidia, Apple, and a narrow band of megacaps. How low, though? There is a 10% chance the portfolio is overweight Nvidia, so that might seem to be a reasonable floor. Run the simulation, and the answer is approximately three out of the 1,000 portfolios. The median simulated portfolio underperformed the index by a whopping -12.2% (before fees).

Of course, an active portfolio manager is paid to perform better than a random one. But the result illustrates the challenge active managers had during this period as they are in effect searching for the active portfolio in the distribution of possible portfolios that is going to outperform. This search equates to looking for a needle in a haystack.

<sup>1</sup> On a calendar year basis, global momentum factor indices recorded materially higher returns in 2013, 2017, 2019, 2020 than in 2023. However, returns were still strong. And if you take the year ending to 30 Sep 2024, momentum performed very strongly: +46% in USD terms. Bloomberg, UBS Asset Management.

<sup>2</sup> Note: The number of possible simulated portfolios is very large (10<sup>69</sup> possible portfolios with the above design)



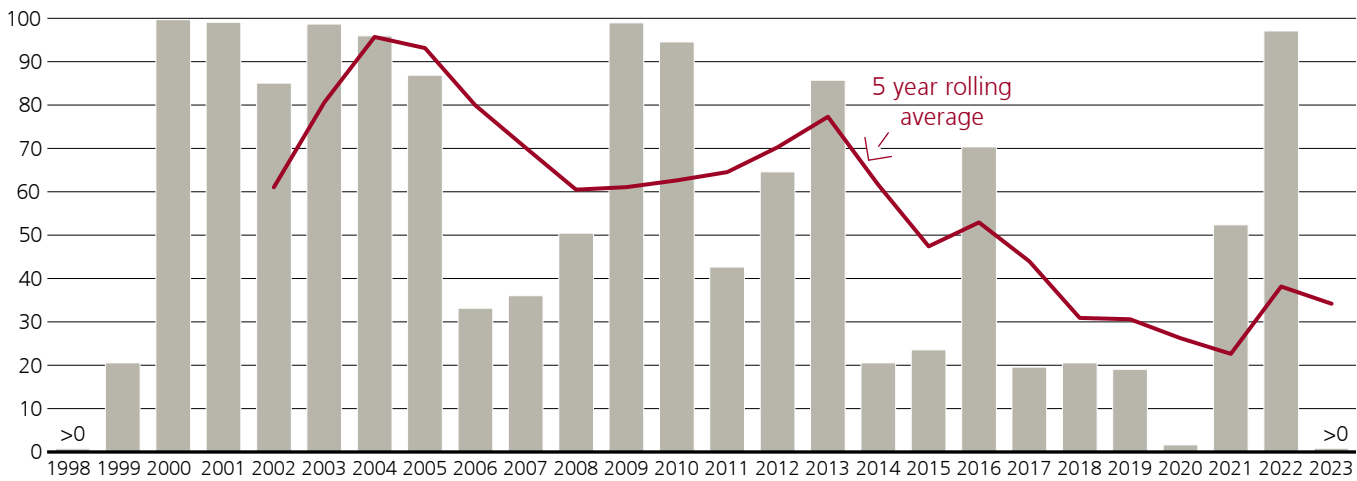
How could an investor improve on the simulated results? By adding constraints, such a sector constraint (e.g., to limit the underweight to technology), or factor constraints, (e.g., to limit the underweight to the size factor)? Or perhaps by holding large index weight positions – albeit at an underweight – to mitigate the risk of omission. In other words, to start hugging the benchmark more, or in more technical speak to reduce the active share of the portfolio – the measure of ‘activeness’ in the portfolio.

Is this extreme result in favor of the cap weighted index expected to be repeated in future? Will the search for the outperforming active portfolio always be this challenging?

Let’s put this result in historical context (see Figure 1). Over the past 25 years, the average hit rate has indeed been about 50%, roughly in line with intuition. The last 10 years have been challenging for active managers, as the chart shows.

Figure 1: How unusual is this outcome?

% of simulated portfolios outperforming the S&P 500



Source: UBS Asset Management, October 2024. Data from 1 July to 30 June.

The last time the S&P 500 was extremely hard to beat, with less than 80 out of 1000 simulated portfolios outperforming, was back in 1998 in the lead up to the tech bubble. 1999, the last full year before the tech bubble burst, was also challenging with 200 out of 1000. However, this was followed by six years where the outcome flipped; where an active manager was best to stay away from the inflated index weights that were deflating post bubble. In an opportunity rich environment like this, the search for an outperforming active portfolio was easier.<sup>3</sup>

There are some stark differences between the market today and the tech bubble. The largest index names of today are highly free cash-flow generative, unlike their tech bubble counterparts. However, the dominance of cap weighted indexes is not pre-ordained, and like every regime that came before, this one shall end. We believe in setting up for a multi-year period when hugging broad-based cap weighted benchmarks that merely offer the illusion of diversification could be foolish.

<sup>3</sup> Note 2020 was low because of particularly narrow market leadership.







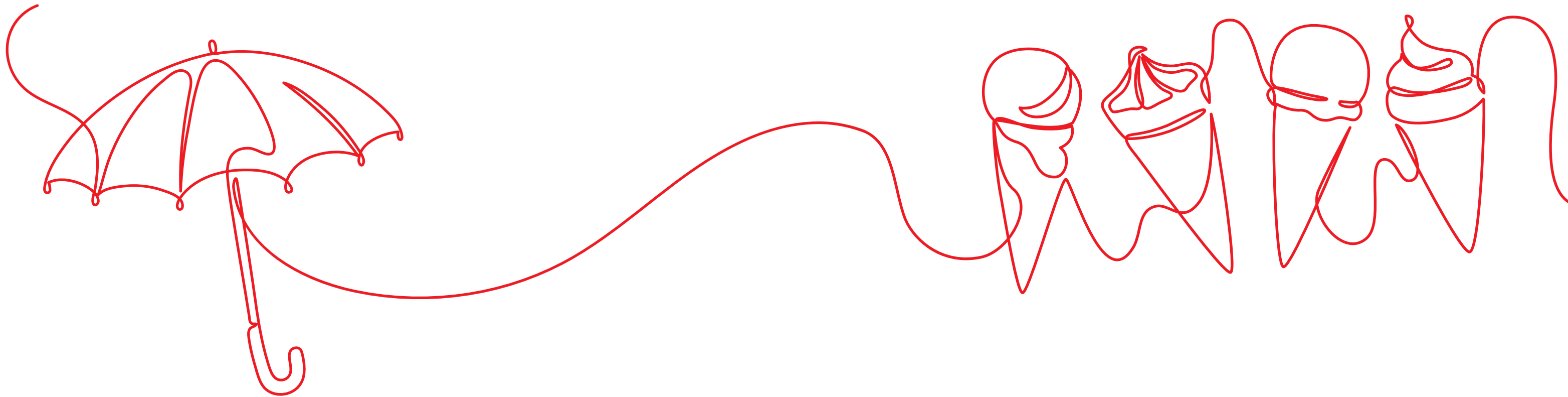
# The beauty of indexing

Alleviating concentration in cap weighted indices via other indexing techniques



**Boriana Iordanova**  
Head of  
Index Research





With the increasing concentration of many equity markets, Boriana Iordanova explains how rules-based techniques can help offer more effective portfolio diversification than traditional market cap weighted indexes.

One of the topics from my financial economics undergraduate classes that has stayed vividly in my memory is the importance of portfolio diversification. Buy a stock in a company that makes umbrellas and a stock in a company that makes ice cream, our tutor told us – the former would tend to do well in autumn/winter, the latter – in spring/summer, helping your portfolio achieve steady returns over the year (unless you live in the UK, in which case an umbrella comes in handy all year-round!).

Despite its oversimplified nature, the idea of the 'umbrella-ice cream' portfolio is a sensible diversification strategy, and one of the reasons investors are drawn to indexing: holding a 'slice of the market' should, in theory, be the ultimate diversifier.

Over the past several years, though, the global 'market slice' has become increasingly Technology heavy, US-oriented, and concentrated in a handful of stocks (Figure 1), prompting index investors to seek other routes of gaining global market exposure, but without the high concentration currently exhibited by cap weighted indexes. There are a number of rules-based approaches designed to

achieve that, and in this article we outline some of these and discuss their practical application. Investors should be mindful that some of these approaches could at times result in significant underperformance vs. cap weighted indexes – hence, a combination of diversification strategies might be more optimal compared to exposure to just one.

Figure 1: 'Triple trouble': global equity market cap weighted indices are highly concentrated at present on stock, sector, and country level



Source: UBS Asset Management, MSCI, Rimes. Data as at 30 September 2024.

Before we describe these approaches, it is worth noting that concentration in equity indexes, and the solutions to alleviate it, is nothing new.

The first equity index, the Dow Jones Railroad Average, constructed in 1884, comprised 11 stocks, 9 of which were railroads (the other two were a sea shipping stock and a telegraph stock). And if you thought concentration could not possibly get worse than that, think again: if equity indexes existed in the 1630s, they would have likely been even more concentrated – in tulip bulb stocks.

In more recent times, at the end of the 1990s, before the ‘dot.com’ bubble burst, the aggregate weight of Technology and Communication Services in global market

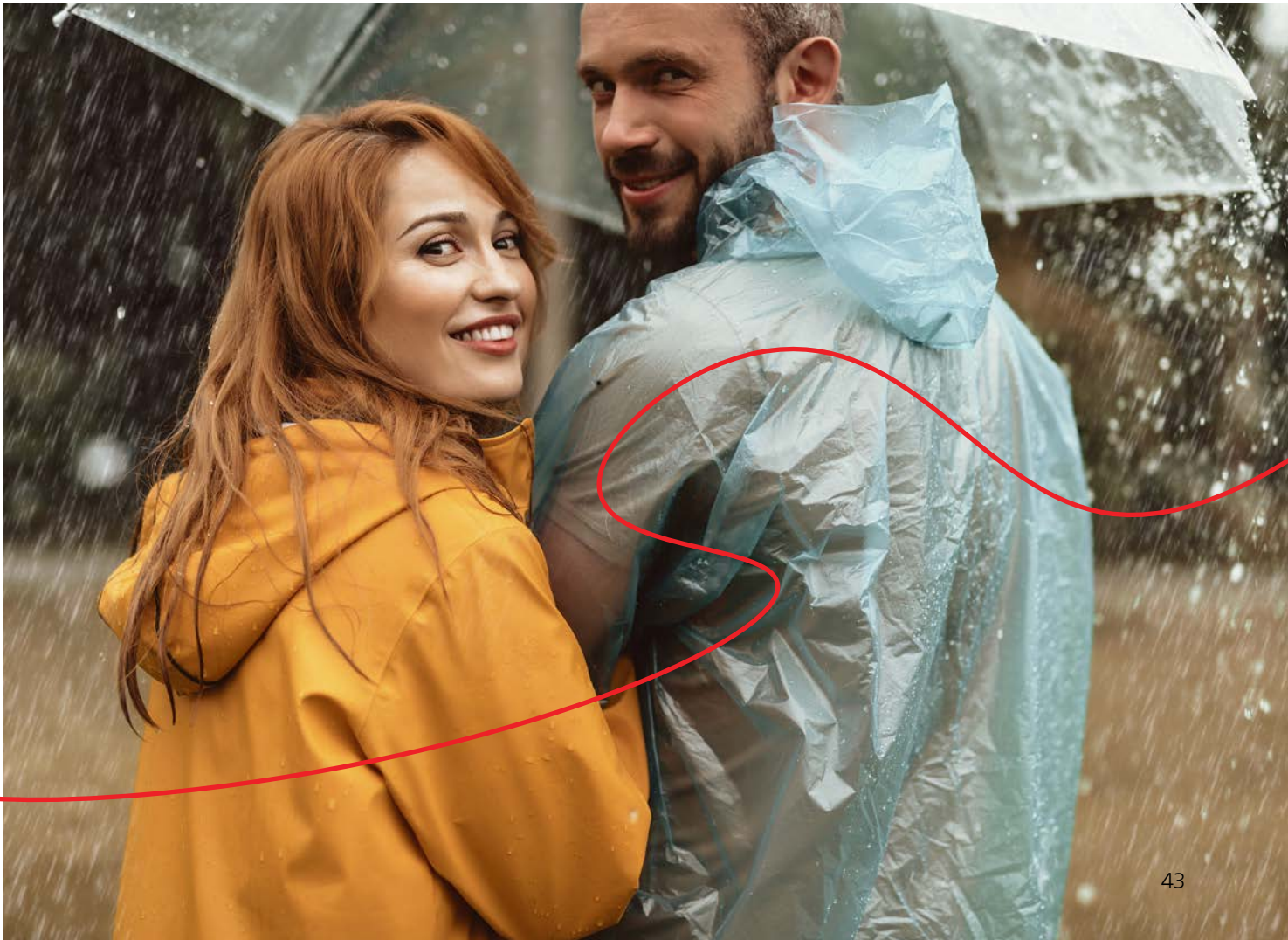
cap indexes was the same as it is now, representing more than a third of the total index weight, and at the end of 2006, the year before the start of the Global Financial Crisis, Financials represented more than a quarter of the total global index weight.

Many of the historic instances of high index concentration self-corrected following a market crash. Index providers subsequently thought of diversification solutions, which attracted attention in the aftermath of the market correction (Figure 2), but as new investment themes emerged, and the next bull market gained momentum, these diversification strategies took backstage, until the next correction/crash, and so on, history has been repeating itself ...

Figure 2: Examples of new index techniques introduced in the aftermath of market corrections

New index technique introduced			
Event	Cap weighted indexes flaw evident during the event	Overview	Relative performance vs. cap weighted indexes: highlights
Late 1990s – early 2000s ‘dot.com’ bubble	Increasing index weight of overvalued and unprofitable internet and communications stocks	Fundamental indices: stock selection and/or stock weighting detached from price, and based on company fundamentals instead	2000-2022: +11% p.a. on average. 2009: +7%, benefitting from Financials overweight, as markets rallied following the GFC 2022: +13%, benefitting from Energy overweight, amidst Russia’s invasion of Ukraine
2007 – 2008 Global Financial Crisis (GFC)	Extreme price volatility	Low volatility and minimum variance indices: stock selection and/or weighting based on price volatility and/or correlations	Between 2000 and 2023, there have been 8 years when cap weighted indexes recorded negative returns (in USD): Min Vol indexes outperformed market cap by 11% p.a. on average during these years, including +18% in 2008
2010 – 2012 European sovereign debt crisis	High volatility in Financials, the largest sector in cap weighted indices at the time, spread to other sectors	Quality indices: select and/or overweight profitable companies with durable business models, stable earnings, and low leverage – viewed as ‘defensive’ and ‘safe havens’	Similar to low vol, quality outperformed market cap in the 8 ‘down’ years between 2000 and 2023 (+4% p.a. on average), but also outperformed by 1% p.a. on average over the 16 ‘up’ years in the same timeframe

Source: UBS Asset Management, index providers data. Data as of October 2024.





A simple and effective form of diversification in indexing are equal weighted indexes where, as the name suggests, the portfolio is invested equally across all index constituents. These indexes typically include the same constituents as market cap weighted indexes – they therefore provide the same sector and geography exposures as market cap indexes, but with different weights.

Equal weighted index strategies tend to introduce smaller cap bias to the portfolio and could be characterized by lower liquidity compared to market cap, especially for larger portfolios, and might not be suitable for all investors. A modified version aimed at mitigating these problems is equal weighting within regional building blocks where stocks within regions are equally weighted but the regional building blocks that constitute the index are weighted by their market capitalization.

Another type of diversification strategy are capped indexes. There are many different forms of capping, including: fixed capping where a specified caps are applied on stock/sector/country weights; adaptive/dynamic capping where a multiplier is applied to the stock/sector/country weights relative to the weights in the underlying parent index; regulatory-driven capping such as the UCITS 5/10/40 rule (10% maximum issuer weight, and 40% maximum aggregate weight of all stocks weighting more than 5%) and the US RIC IRS 25/5/50 rule (25% maximum issuer weight, and 50% maximum aggregate weight of all stocks weighting more than 5%).

The increased concentration in cap weighted indexes has prompted index providers over the past year to consider constructing parallel index series to their standard index series with capping meeting the various regulatory requirements or making the capped version of their indexes the default ‘standard’ index. While capping, in its various forms, can help alleviate concentration in index portfolios, and in some instances is a necessity in order to meet regulatory requirements, it is somewhat arbitrary and the cap thresholds, whether absolute or relative, are without particular economic justification.

More advanced forms of diversification in indexing include allocating portion of a portfolio to equity factors, which

could provide diversification in terms of performance patterns relative to market cap weighted indexes. Historically, investors were able to access factor strategies mostly via active/quant management which typically comes at higher cost.

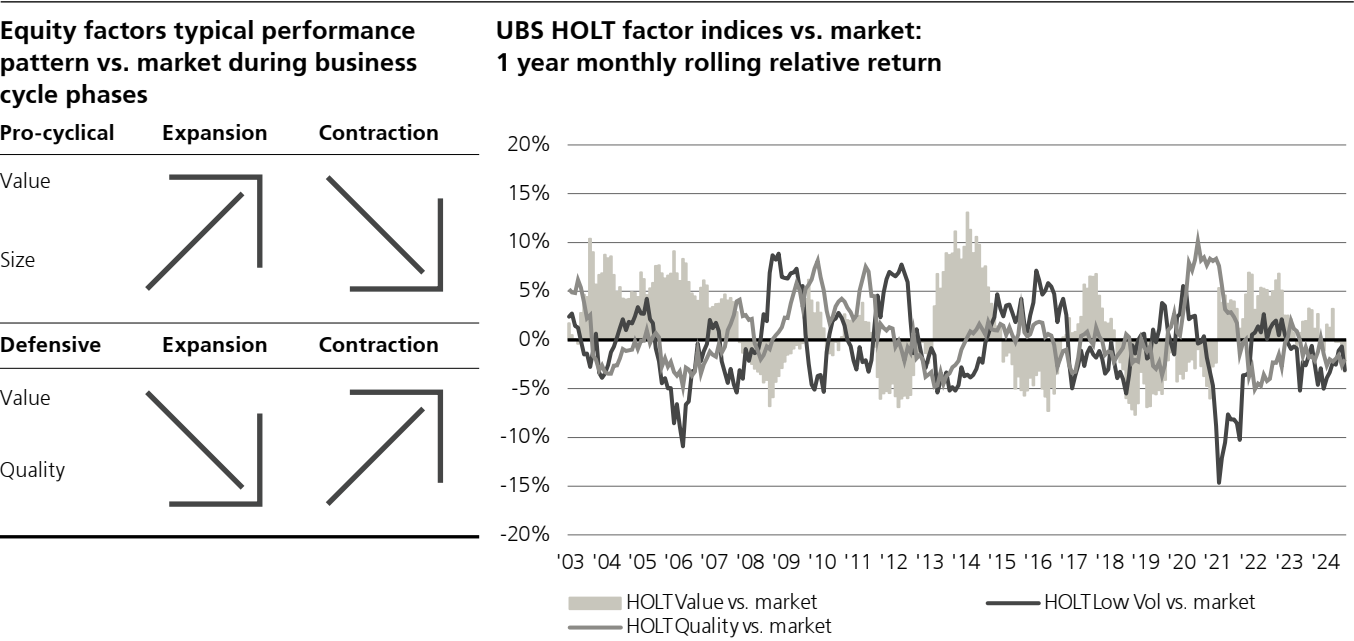
Factor indexes have changed this, enabling investors to access factors, such as value, low volatility and quality, in a cost-effective manner via simple, transparent, rules-based indexes, where stocks are selected and/or weighted by metrics other than market cap. They can provide diversification to market cap weighted index strategies, and potentially enhance portfolio returns over the long term.

Factor indexing grew in popularity after the Global Financial Crisis, expanding rapidly between 2010 and 2016. Following that, factors were somewhat overlooked, until the market correction in 2022 when investors that had already allocated portions of their portfolio to factor blends typically benefitted from their downside protection, while other investors revisited the idea of incorporating factors in their index portfolios.

Our research shows that factor indexes capturing equity factors have delivered better risk-adjusted returns than the market historically over the long term, but they tend to display different performance patterns (Figure 3). For example, an environment of rising interest rates tends to favor value stocks. To a large extent this is because in such environment investors typically rotate away from growth, and value stocks tend to outperform the market, but also because rising interest rates usually favour financials stocks, and financials is a classic value sector.

On the other hand, in periods of heightened volatility in the equity markets and search for ‘safe havens’, low volatility and quality factor strategies could be an effective means of providing downside protection. For example, during the Global Financial Crisis of 2007-2009, following the Brexit referendum in the summer of 2016, and in the first half of 2020 amid COVID-19, while value underperformed the market, low volatility and quality outperformed the market which would have helped to protect a blended equity portfolio.

Figure 3: Factor indices tend to be cyclical



Source: UBS Asset Management, UBS IB, MSCI, Rimes.  
Note: Data from 28 February 2002 to 30 September 2024. TR gross index performance data in USD for HOLT developed markets factor indices vs. MSCI World Index. Data for HOLT indices contains live and back-tested data. HOLT factor indices launch date April 2018, data prior that has been backtested and sourced from UBS HOLT. Past performance is not a reliable indicator of future results.

Trying to time the market and the allocations to different factors is hard. A more pragmatic approach would be to invest in a blend of pro-cyclical (e.g., value) and defensive (e.g., low volatility and quality) indexes.

Combining factor indexes capturing different equity factors can be a highly effective strategy which could potentially reduce performance cyclicalities and produce diversification benefits (Figure 4). When factor index blends combining

several equity factors are constructed, they tend to benefit from lower tracking error and higher information ratio vs. the market cap index, compared to the component indexes comprising the blend. Additionally, such index blends can benefit from potential turnover and transaction costs reduction and crossing opportunities.

Figure 4: Combining factor indices could smoothen performance patterns

UBS HOLT factor indices and blend 5 year annualized rolling relative return vs. market



Source: UBS Asset Management, UBS IB, MSCI, Rimes.

Note: Data from 28 February 2002 to 30 September 2024. TR gross index performance data in USD for HOLT developed markets factor indices vs. MSCI World Index. HOLT blend based on UBS Asset Management estimates for an index blend comprising 50% HOLT Value + 25% HOLT Low Vol + 25% HOLT Quality. Data for HOLT indices contains live and back-tested data. HOLT factor indices launch date April 2018, data prior that has been backtested and sourced from UBS HOLT. Past performance is not a reliable indicator of future results.

Although third party index providers offer a variety of single factor and multi-factor indexes, one of their weaknesses tends to be the use of generic untreated and inconsistent accounting data, which could potentially lead to flawed results.

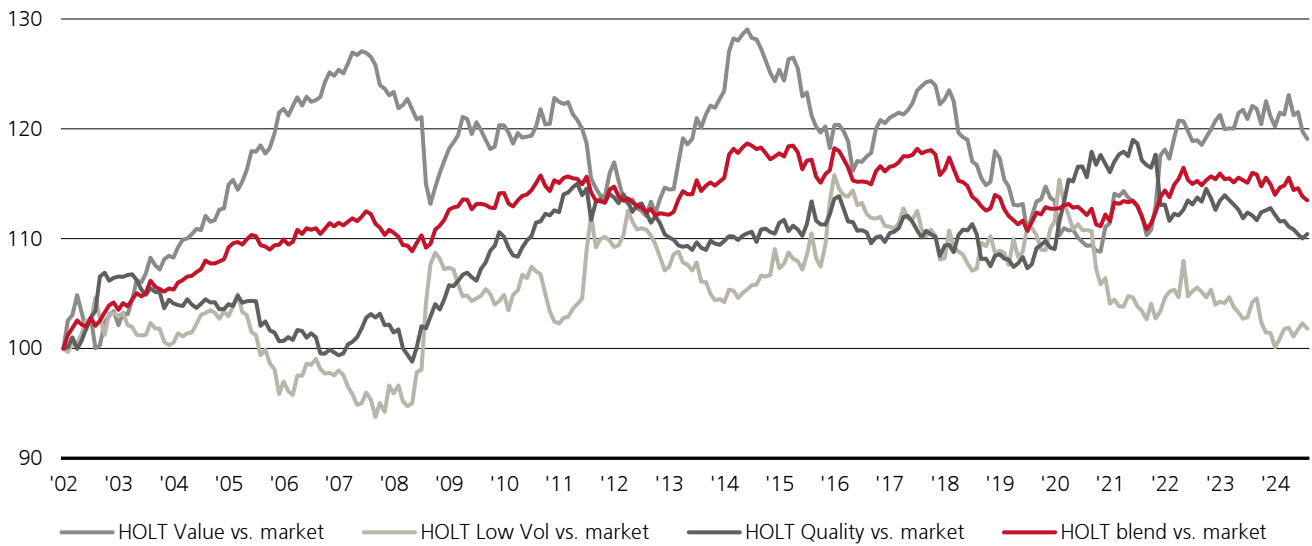
The UBS HOLT framework applies a standardisation process to the treatment of fundamental data, including economic and accounting adjustments, as well as consistency across geographies, industries, and over time. The focus is on the company's cash generating ability by converting noisy accounting data into Cash Flow Return On Investment® (CFROI®) metric, which is at the core of the HOLT factors. CFROI® is a proxy for a company's economic return,

analogous to the internal rate of return of a project, where valuations are based on projected cash flows discounted to present value, emphasizing a company's overall potential for value creation.

While the HOLT factors are constructed using similar metrics to those that have been extensively researched and tested in academia and by practitioners, the metrics comprising the HOLT factors are adjusted for inflation and accounting distortions, enhancing comparability of firms across time, geography and sector. Consequently, the HOLT factors are designed to perform as and when expected, aiming to deliver better risk-adjusted returns vs. the market over the long term (Figure 5).

Figure 5: Factor indices could provide diversification to market cap, and potentially enhance portfolio returns over the long term

UBS HOLT factor indices and blend vs. market cumulative return in USD (rebased to 100)



Source: UBS Asset Management, UBS IB, MSCI, Rimes.

Note: Data from 28 February 2002 to 30 September 2024. TR gross index performance data in USD for HOLT developed markets factor indices vs. MSCI World Index. HOLT blend based on UBS Asset Management estimates for an index blend comprising 50% HOLT Value + 25% HOLT Low Vol + 25% HOLT Quality. Data for HOLT indices contains live and back-tested data. HOLT factor indices launch date April 2018, data prior that has been backtested and sourced from UBS HOLT. Past performance is not a reliable indicator of future results.





# Diversifying the diversifier

Challenges for multi-  
manager alternatives  
in portfolios



**Daniel Edelman**  
Senior Investment Officer  
– Hedge Fund Solutions  
Investment Risk  
and Quant



**Edoardo Rulli**  
Chief Investment Officer  
and Head of UBS Hedge  
Fund Solutions (HFS)

"A desk, some pads, a pencil,  
and a large basket – to hold  
all of my mistakes."

Albert Einstein

Alternatives play a key role as a diversifier in portfolios. Daniel Edelman and Edoardo Rulli look at the challenges and benefits of using multi-managers to broaden access and capture distinctive market traits.

The word diversification is about as ambiguous as is the word risk. When told "don't put all your eggs in one basket," we quick-wittedly reply "What kind of eggs? How many baskets? What kinds of baskets? Which eggs in which baskets?"

We label this the problem of the three 'Rs' – replication, risk reduction, and representation. Diversification has multiple dimensions, and the term is frequently used imprecisely to mean only one of its several facets.

The importance of diversification is even more pronounced in alternatives, particularly in the segment for multi-managed portfolios such as hedge funds and real estate. Diversify too little, and your portfolio misses attractive opportunities while suffering a painful drawdown.

Diversify too much, and your portfolio becomes an unmanageable, index-like vehicle with no alpha. Yet diversification as a concept is in a state of ever-changing evolution. New asset classes, new investor dynamics, and changing world financial markets all point to a different quality for diversification today than in the past. It is time for a rethink on the topic, a 'Diversification 2.0', a new prototype managing the three Rs in the post-COVID world. Our views combine both recent academic as well as practitioner experience related to multi-manager, multi-asset alternative investments.

"Maybe we should  
diversify into sticks"

Illustration inspired by Jonny Hawkins Editorial Cartoon.  
Image used with permission of [CartoonStock](#).

"I wish I had an answer to that  
because I'm tired of answering  
that question."

Yogi Berra

### Diversification challenges for multi-managed portfolios

The appeal of non-traditional investments is straightforward. Real estate, hedge funds and other alternatives offer the potential for returns uncorrelated to equities and bonds, thereby reducing overall portfolio risk while isolating potential sources of alpha.

Funds of hedge funds (FoHF) and multi-manager real estate programs (MMRE) offer investors additional benefits including potential exposure to otherwise inaccessible managers, markets and strategies. FoHFs endeavor to secure capacity with the most successful traders and build portfolios spanning disparate directional and arbitrage strategies. MMREs take pride in potentially providing unique inflation protection (as rental income typically grows in line with price appreciation), new sources of income (through rents paid by occupants leasing properties) and capital appreciation (via active management).

As pooled investment vehicles, both MMREs and FoHFs seek to negotiate preferential fees, terms, transparency and investment conditions for their clients; design both commingled and bespoke offerings; hand-craft desired outcomes through aggressive side-letter negotiation; offer potentially favorable terms as cornerstone investors in new launches; and opportunistically join in co-investment opportunities with their network of sub-managers. With these capabilities, MMREs and FoHFs endeavor to address the three Rs of diversification by reducing risk, broadening access, and capturing market traits.

Yet markets and economies evolve over time, as does the nebulous concept of diversification. Long gone are the days when one could simply throw money at a handful of asset classes and geographies to create a diversified product. FoHF and MMRE specialists must grapple with changing geopolitical and financial market regimes to access alpha and reduce risk.





Indeed, the era of low interest rates, low inflation, low regulation, low global market volatility and negative correlation between bonds and equities are gone: the COVID crisis marks the turning point.<sup>1</sup> Climate change has had significant impact on real estate investments and MMREs.<sup>2</sup> In addition, the rise of passive investing (including rules-based)<sup>3</sup> has also increased pressure on hedge funds and FoHFs.

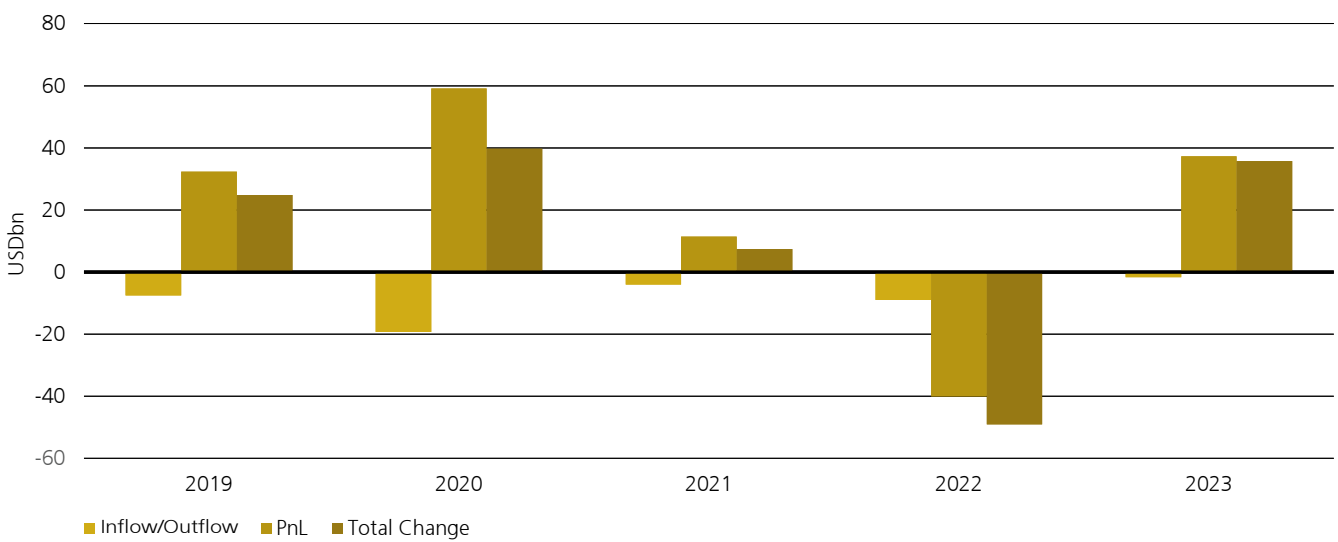
FoHFs have also seen increased competition from multi-platform firms that combine different strategies run by in-house portfolio managers. Such multi-strategy shops can offer comparable diversification while reducing overall fees.

Consolidation has occurred as investors have reallocated to single-manager funds or withdrawn entirely from these alternatives. According to Hedge Fund Research, the FoHF industry has experienced net outflows every year since

2008, totaling nearly USD 340 billion (see Figure 1). One might conclude that investors may have sacrificed some multi-manager diversification in favor of a different set of single-manager risks, ostensibly to improve performance.

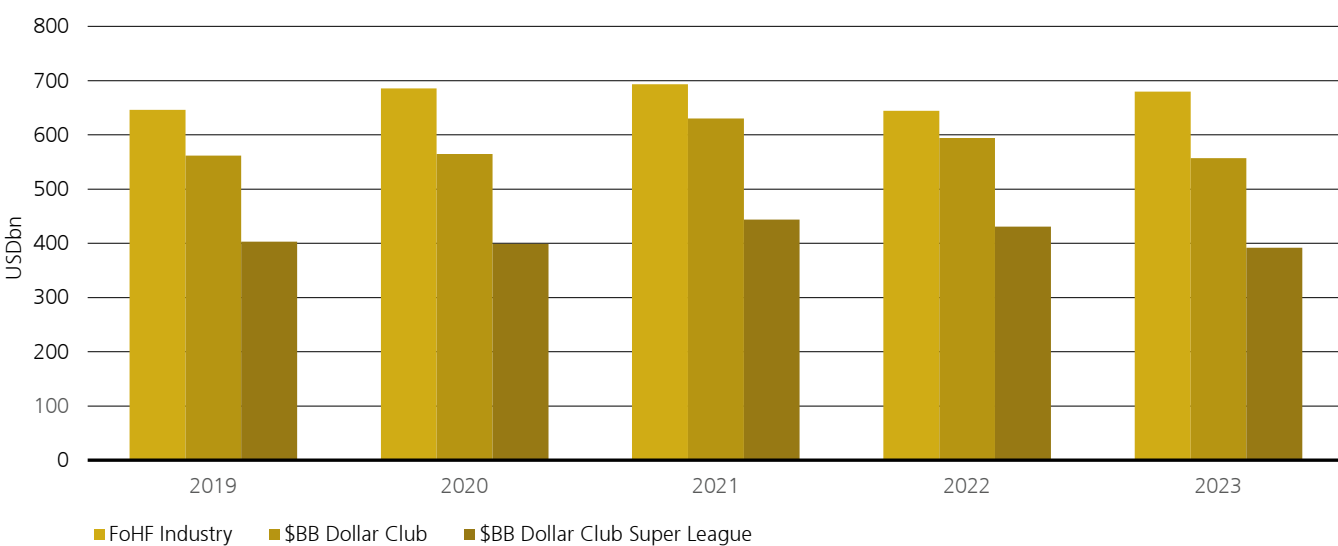
With Intelligence Limited puts out a semiannual “Billion Dollar Club” survey of FoHFs with over USD 1 billion in assets. The number of FoHFs making the cut has recently dropped from 65 to 58, and the “Super League” (FoHFs with over USD 10 billion in assets) has reduced from eighteen to fourteen. Consolidation has resulted in market share of the top ten largest FoHFs in this survey growing from 54% to 61% (see Figure 2).

Figure 1: FoHF asset flows, yearly, 2019-2023 (USD billions)



Source: HFR Industry Reports ©HFR, Inc. 2024, www.HFR.com; UBS Hedge Fund Solutions, a distinct business unit of UBS Asset Management (Americas) LLC

Figure 2: FoHF overall and Billion Dollar Club assets, yearly, 2019-2023 (USD billions)



Source: HFR Industry Reports ©HFR, Inc. 2024, www.HFR.com; With Intelligence Limited; UBS Hedge Fund Solutions, a distinct business unit of UBS Asset Management (Americas) LLC

1 K. Vatanen (2024), "Diversification and Asset Allocation in the Post-COVID Era," The Journal of Portfolio Management 50(10), pp. 42-43.  
2 MMREs, for example, cannot count on geographic diversification as they had previously. Perils such as flooding, wildfires, and hurricane wind damage – regardless of location— have created a bubble in the housing price market and driven up property taxes and insurance costs, weakening the real value of rents collected on leased properties.  
3 M. Anson (2022), "Diversification – A Free Starbucks Cup of Coffee?" The Journal of Portfolio Management 48(4), p. 222.

### Multi-managed portfolio teams fight back

It is our opinion that in the era leading up to and following COVID, sophisticated institutional MMREs and FoHFs have fought back in several ways to regain alpha and expand the benefits of diversification.

First, MMREs have broadened their reach into new market structures. For example, we believe the most successful MMREs have found ways of connecting retail clients with private market allocations – long the province of only institutional investors due to scale, access and informational asymmetries. Such private market opportunities offer higher return potential, lower correlation with public equity markets, inflation protection and exposure to harder-to-access markets and strategies. As transparency and the availability of data in these semi-liquid structures have improved, regulators have allowed greater access to non-institutional investors, which MMREs have facilitated.

Second, we have observed that leading MMREs have expanded their holdings to include those that would be difficult or impossible to replicate in the open market. For instance, providing unlisted real estate solutions means that non-institutional investors can benefit from the MMRE's network. Portfolios can be constructed via multiple routes, such as unlisted funds, co-investments, recapitalizations, and secondaries that are selected by an MMRE and actively positioned within guidelines agreed with the clients. Diversification is amplified as investors do not face the risk of individual funds or managers.

Third, FoHFs have embraced new sources of diversification and alpha in the form of alternative risk premia, ESG, generative AI, digital assets and other niche opportunities. Moreover, we have seen how leading FoHFs have morphed into 'solution providers' and blurred the boundary between internal and external trading. Most notably, some FoHFs now include a range of tactical co-investment opportunities where the FoHF teams up with individual hedge funds in their network to pursue tactical ideas.

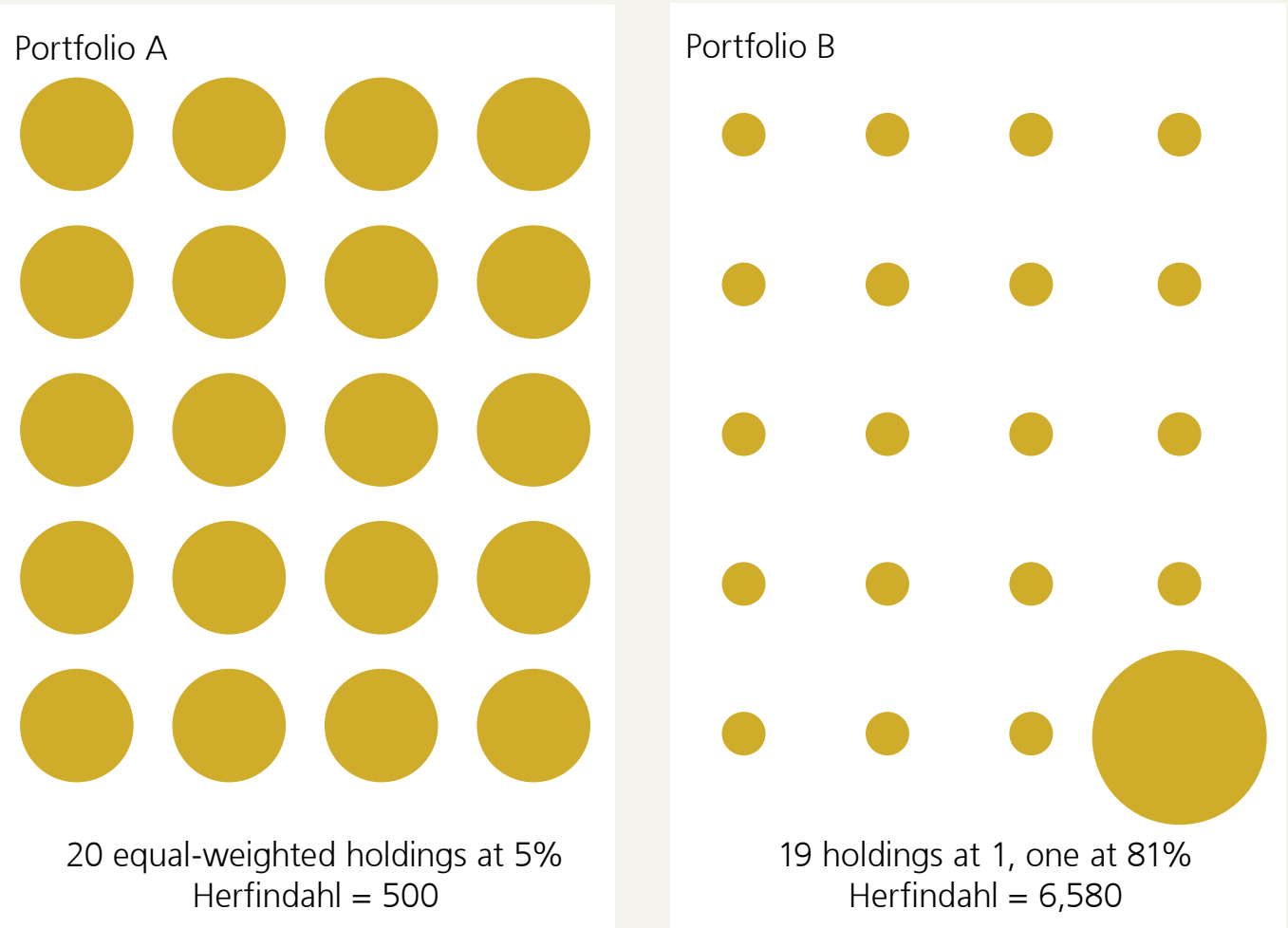
### Multi-managers look at many facets of diversification

Any standalone investor can compute a basic 'benefit of diversification': calculate the portfolio's overall expected variance using returns, variances and covariances of the underlying holdings. Now compute the same but assume all holdings have a correlation of one to each other. Subtract the latter from the former and presto ... the wonders of diversification.

While this all looks pretty on paper, it ignores some irksome questions. What if all correlations go to one? Is portfolio variance the correct measure of risk? Why only consider a single point in time? In our opinion, risk managers in a FoHF can delve deeply into the three Rs by exploring a much broader concept of diversification measures.

**1. Name Diversification:** Academics tend to focus on risk diversification whereas practitioners are usually more concerned about holdings diversification, i.e., the number of unique line items in a portfolio.<sup>4</sup> For bonds, this could suggest either issue- or issuer-related groupings; for equities, individual company names; for FoHFs, number of underlying funds and firms. Holdings diversification suggests protection against outliers or concentration risk, even reputation risk. A basic measure of name diversification is the Herfindahl Index (HI), which measures diversification on a scale of zero to 10,000. The higher the number, the greater the concentration risk and risk of single-name failure.<sup>5</sup>

Figure 3: Two portfolios, each with 20 constituents, and their Herfindahl Indexes



Source: UBS Hedge Fund Solutions, a distinct business unit of UBS Asset Management (Americas) LLC

<sup>4</sup> See for example J. Bender and X. Sun (2024), "How Many Is Too Few? Revisiting the Number of Names in Equity Portfolios," The Journal of Portfolio Management 50(4), p. 8.

<sup>5</sup> HI originates in the world of economics as a measure of the size of firms in relationship to the industry and an indicator of the amount of competition among them. It is defined as the sum of the squares of the market shares of each individual firm. The index therefore can range from 0 (highly competitive, many small firms, loss of pricing power, low collusion) to 10,000 (single monopolistic producer, no competition, highest pricing power, highest collusion). Since the index squares the market share, it gives more weight to larger firms. Some authors divide HI by 10,000 to rescale the values between 0 and 1. Note then that a related measure, the Diversification Index, is simply  $1 - HI$  rescaled. See for example J. Rodriguez (2024), "Portfolio Diversification During Calm and Volatile Markets," The Journal of Wealth Management 27(1), p. 87.





**2. Tail-risk diversification:** Alternatives differ from traditional investments in countless ways. They often exhibit properties of skewness (asymmetry between wins and losses) and kurtosis (excessive performance in the tails and center of the distribution). In the traditional case, mean-variance models are concerned with covariances, i.e., the behavior of pairs of assets. To improve diversification in the presence of skewness, one must look not only at each individual holding and each pair of holdings, but also every triplet of holdings. Diversification accounting for kurtosis requires examination also of every quartet of holdings. We humans are not wired to think in such higher dimensions.

**3. Liquidity diversification:** Sophisticated risk management plans can be designed for market crises where liquidity dries up, causing potential asset-liability mismatches. For mutual funds, this could lead to regulatory risk. For hedge funds and other alternatives, illiquid situations may result in reputational risk, compelling managers to institute gates, withhold redemptions or make inglorious payments-in-kind of non-tradeable assets. Liquidity diversification also encompasses the deeper topic of mismatches between contractual liquidity terms and the underlying liquidity of one's sub-advisors.

**4. Capacity diversification:** FoHF allocators compete with one another for scarce capacity. A newly launched hedge fund, or a veteran who is accepting new money, will only entertain a fixed amount of capital inflows. Similarly, rookie managers who may be the superstars of tomorrow may take on early investors and close their shop permanently to new subscribers. Capacity diversification involves game theory: how much capacity is needed now to diversify our portfolios in the future?

## Too few cooks in the alternatives kitchen

Academics and practitioners have long debated the question concerning the optimal number of holdings needed to diversify a portfolio adequately. The controversy stems back to the dawn of modern portfolio theory. In this ivory tower world, investors live in a mean-variance reality of normal distributions where they face neither transaction costs nor liquidity constraints. Authorities including Evans & Archer (1968), Fama (1976), Elton & Gruber (1977), and Reilly (1985) mandated that a mere 10-20 stocks are sufficient to eliminate 95% of the variability in an equity portfolio. This view has unfortunately spread and influenced beliefs about other non-traditional asset classes.

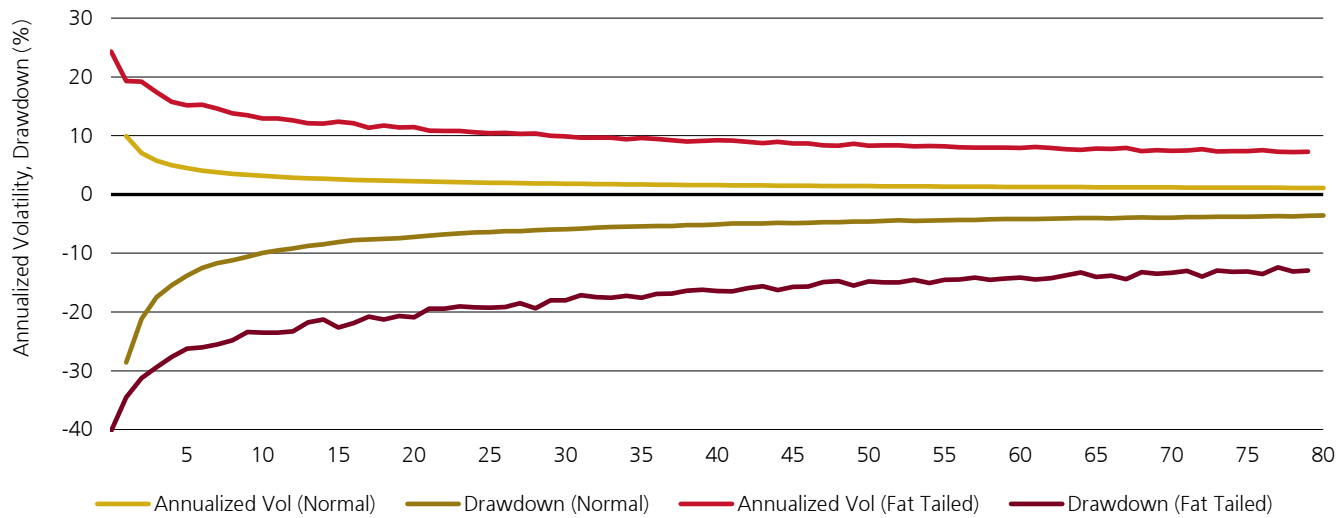
We know that hedge funds, real estate and other alternatives investments are different. Besides skewness and kurtosis, these asset classes often report serial correlation, meaning present returns are not random but may be influenced by the past. Many such funds are much less liquid than theory allows: some may suspend payouts, suffer blow-ups, fraud or other unfavorable 'headline' risks. Most critically, certain alternatives do not lend themselves well to standard benchmarks: they are considered 'absolute return' vehicles.<sup>6</sup>

A litany of early scholarly articles concerning FoHFs argued that a compact portfolio of 10-20 funds was more than sufficient to meet the needs of diversification. However, time and experience have revealed that these studies were misguided and flawed. We have issues with their methodology, data selection, biased historical time frame and an inadequate definition of risk. These researchers fell into the trap of the three Rs, as they confused diversification with only replication, ignoring the dimensions of risk reduction and representation.<sup>7</sup>

<sup>6</sup> See for example E. Aw, C. Carroll, D. Setola and H. Xie (2023), "How Many Securities Should an Active Manager Hold? The Journal of Investing 32(6), pp. 15-23. However, tracking error is a somewhat irrelevant concept for FoHFs and MMREs.

<sup>7</sup> D. Edelman (2010), "Diversiflagration," A&Q Bulletin 13, January, UBS, p. 3..

Figure 4: Volatility and drawdown for equal-weighted portfolios of 1 to 80 funds



Source: Source: UBS Hedge Fund Solutions, a distinct business unit of UBS Asset Management (Americas) LLC

Figure 4 illustrates a Monte-Carlo study in which we created equal-weighted portfolios consisting of one through 80 hedge funds. Each portfolio was the average of 2,500 simulations sampled from a universe of 10,000 time series.

We first assumed returns were normally distributed. The results suggest that only fifteen hedge funds can diversify away most portfolio volatility: further, the marginal benefit of reducing a potential drawdown is limited after 20-25 funds. However, when we reran the study assuming fat-tailed returns, the results were strikingly different. The speed of risk reduction was slower, and absolute losses were severe for portfolios with small numbers of holdings. Under certain crisis circumstances, it may be desirable to have 60 or more funds in a broad-mandate portfolio to mitigate the potential for a substantial drawdown.<sup>8</sup>

### Diversifying the diversifier

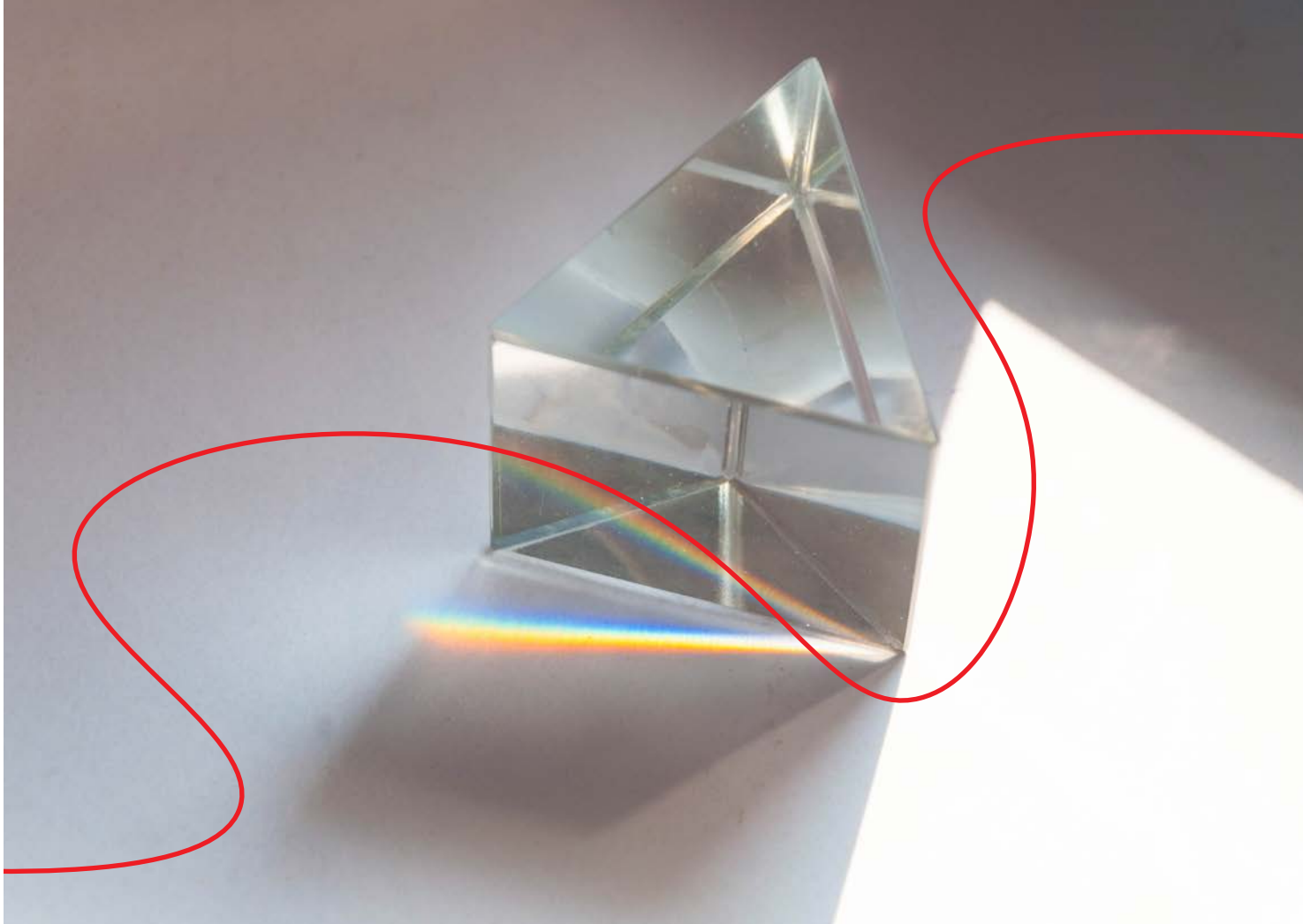
Recent academic research disputes a key tenet of modern portfolio theory apropos diversification; namely, we have been wrong all along to forecast risk using a static correlation matrix. Experience and analysis show this leads to trouble when faced with a major upheaval such as seen in 2008 or COVID in 2020: correlations tend to rise in the left tail of a distribution and fall in the right tail. As such, diversification is less effective in a risk-off tape, while conversely, investors sacrifice some upside due to diversification in a risk-on environment.<sup>9</sup>

In an example of an approach to address the issue of changing correlations, Vatanen (2024) proposes a multi-asset framework for asset allocation including listed equities, private assets, diversifiers and tail hedges.<sup>10</sup> This framework, though comprehensive, seems expensive to implement.

<sup>8</sup> Ibid

<sup>9</sup> S. Page (2020), *Beyond Diversification: What Every Investor Needs to Know About Asset Allocation*, New York: McGraw Hill.

<sup>10</sup> Vatanen, pp. 52-54 includes the following components in his framework: Listed equity, credit, emerging markets, and systematic volatility carry as well as private equity, private debt, real estate, and infrastructure, are basic return-seeking building blocks. To this he recommends diversifiers such as rates duration, macro hedge funds, CTAs, and several risk premia strategies (defensive equity, macro value, and commodity factors). The well-diversified portfolio also immunizes against tail risk with direct option hedges, systematic long volatility, and rules-based hedges.



Instead, we believe savvy MMRE and FoHF managers already do the work for the investor, by incorporating both bottom-up and top-down analysis into portfolio construction. This suggests that multi-manager solutions are not bound by fixed schemes for investing across strategies but rather may move in and out tactically as the situation demands.

For the complete investor, a well-designed asset management firm that offers various products, including both traditional and alternative, single-manager and multi-manager, can guide an overall portfolio into different fund vehicles. This will effectively diversify the diversifier and satisfy the requirement of the three Rs.

### The three Rs for multi-manager alternatives

For many market participants, diversification works until it does not. This is partly the result of an inadequate appreciation of the multiple facets of diversification: replication, risk reduction and representation.

MMREs and FoHFs offer opportunities for alpha and uncorrelated returns in normal markets but must adapt in the post-COVID era. This includes building portfolios that address many other forms of diversification; incorporating new strategies and asset classes; and evolving from static allocators to dynamic, tactical and opportunistic fund management. In this way, shrewd multi-manager alternative programs can embrace Diversification 2.0 and prosper in the uncertain times ahead.

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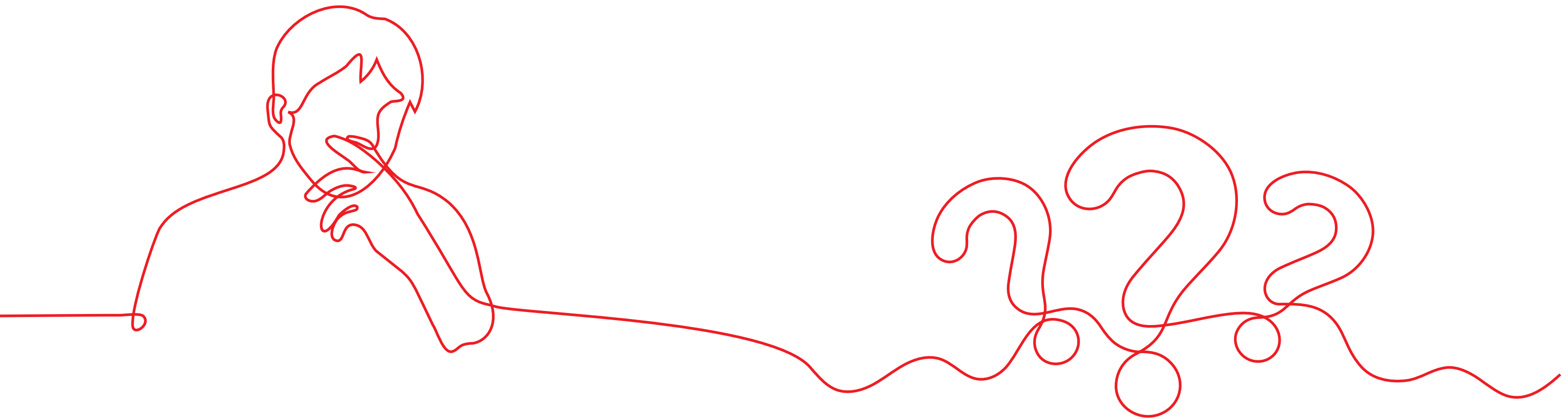
# The evolving role of private equity in diversified portfolios



**Markus Benzler**  
Head of Multi-Managers  
Private Equity  
(MMPE)



**James Pilkington**  
Multi-Managers  
Private Equity,  
Portfolio Manager



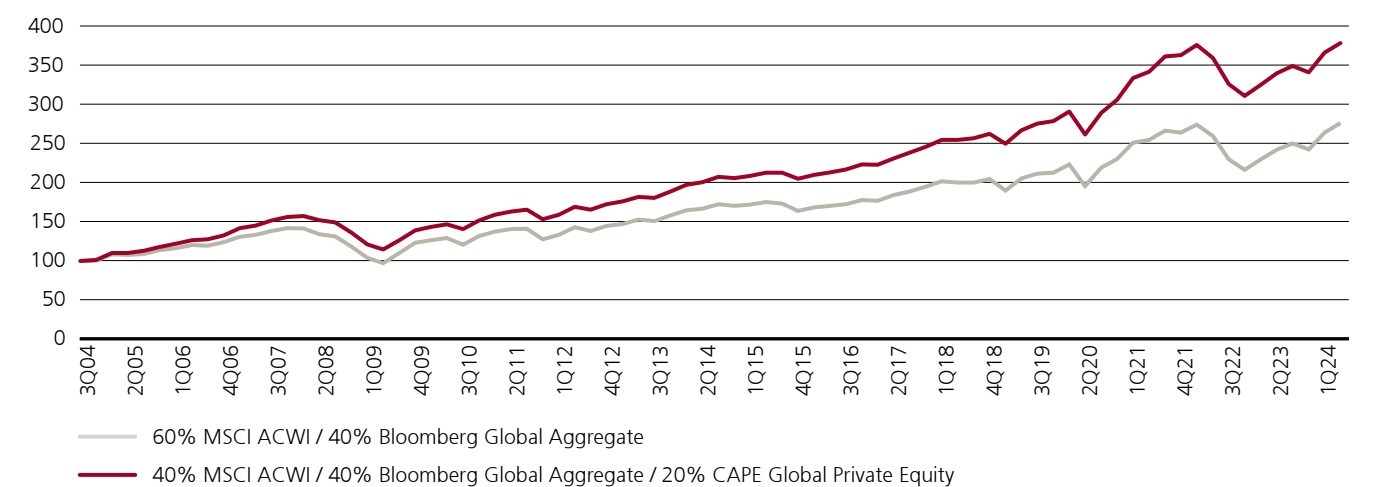
Are private equity portfolios really offering diversification benefits vs. public markets? Or is it just a mark-to-market illusion? Markus Benzler and James Pilkington offer their views.

As private equity sees another round of increased investor interest, it is worth considering its role in today's diversified portfolio. Investors have historically regarded private company exposure as a high-returning and diversifying asset class of its own – one which has outperformed public

markets over the past decades while reducing volatility – an enhancement to the traditional 60/40 portfolio.

This has certainly been true in the past,<sup>1</sup> but what about the future?

Figure 1: Historical analysis of adding private equity in a portfolio between 2004 and 1Q 2024



Note: For a portfolio starting in 3Q04.  
Source: Bloomberg, Cambridge Associates, UBS September 2024.

<sup>1</sup> "A portfolio of 40% global equities, 40% US bonds and 20% alternatives would have returned an annualized 6.9% with 8.3% reported volatility. By comparison, a traditional 60% global equities and 40% bonds mix would have generated 6.1% return with 10.6% reported volatility." UBS CIO GWM, Quarterly private markets update, September 2024.



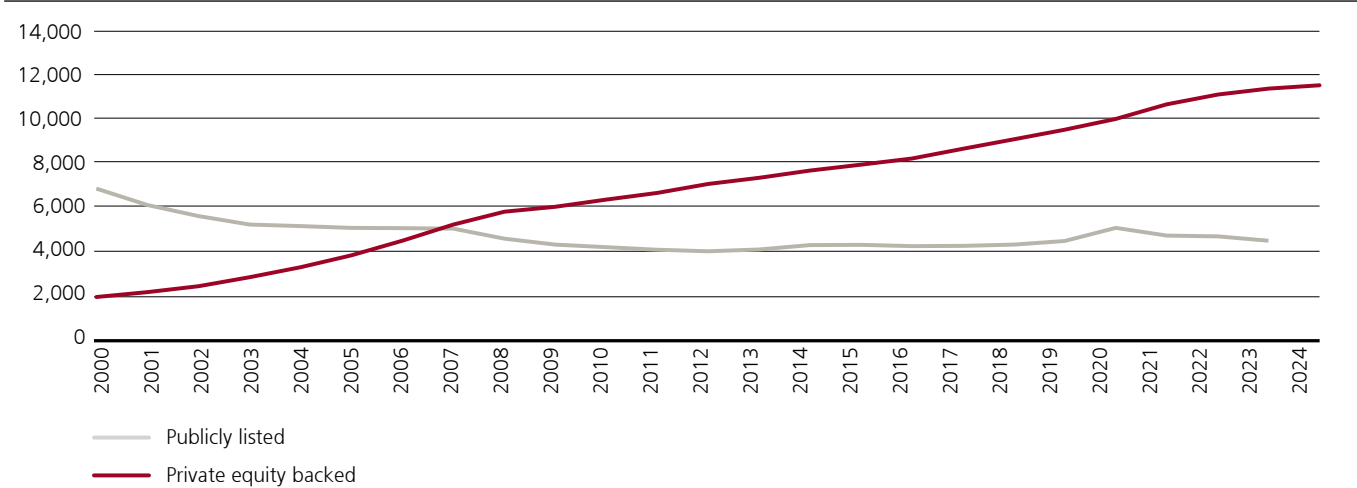
Why is private equity really different?

Private equity’s outpacing of public markets is a complicated story, most evident by asking “what is a public company?”

Historically, it has been a business of considerable scale, with a professional management team, experienced shareholders, and which is held to exacting standards of accounting and public disclosure. How does this hold up in 2024?

Private equity-backed companies are larger than ever, as more companies elect to remain private beyond the point where they would previously have gone public. Of companies with revenue over USD 100 million, Bain & Company notes that only 15% are publicly held.<sup>2</sup> In many ways private equity has taken the place that publicly traded small-cap equity used to occupy, but there are material differences.

Figure 2: Number of US private equity-backed companies versus domestic listed firms on NYSE and Nasdaq



Source: Pitchbook, UBS September 2024.

Private equity firms, as compared to the typical small-cap investor, are highly specialized and operationally focused. More importantly, they have control in the form of majority ownership which enables absolute discretion over the operating decisions of a portfolio company. This includes the selection of the management team; when private equity investors lose money, they do not ask what the management team did wrong – they ask what the private equity firm did wrong.

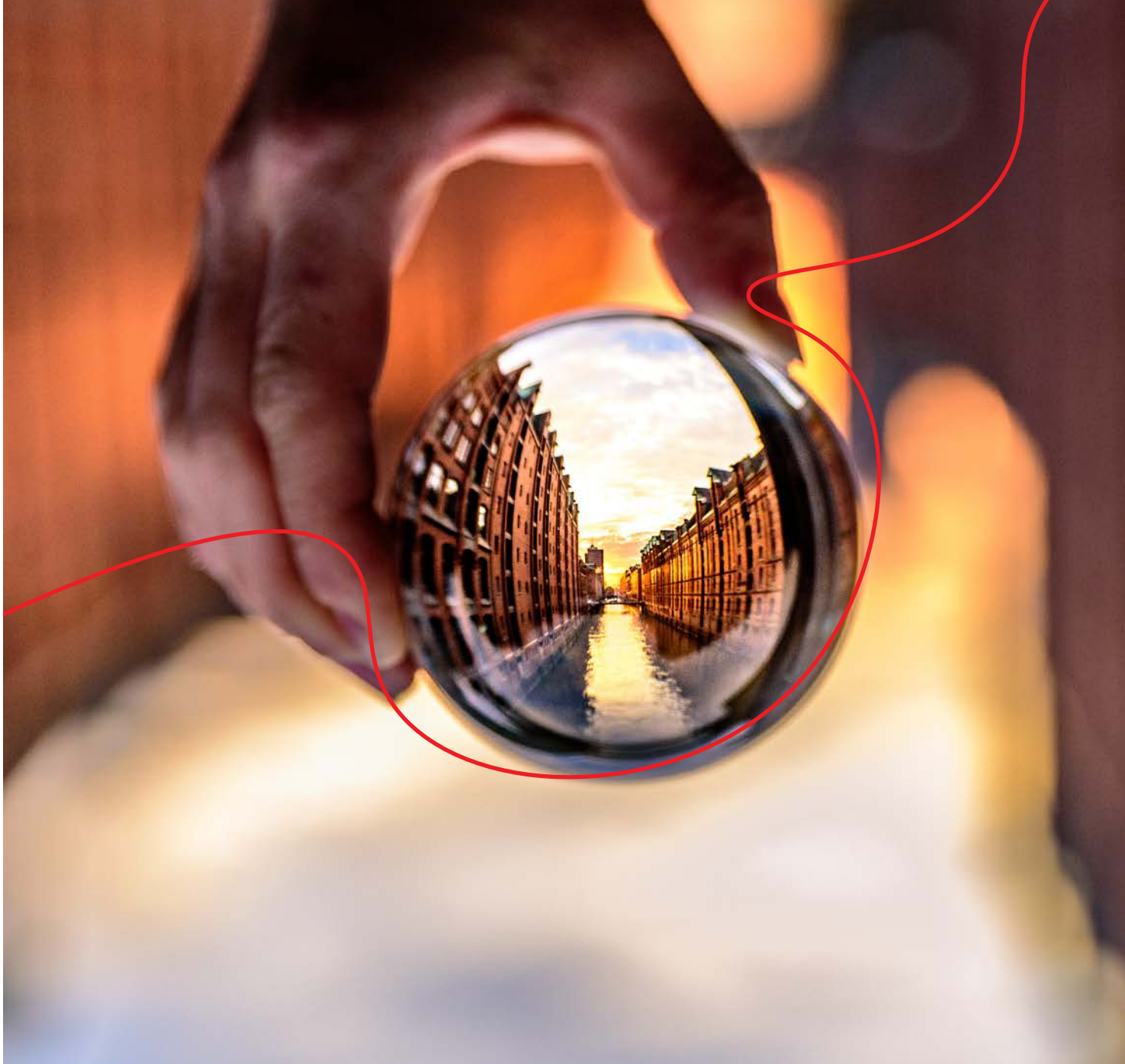
The average private equity owner is significantly more sophisticated than the average small-cap management team when it comes to financial engineering (usually generating a gain, but sometimes a painful loss).

Two more closely related aspects of private companies complicate the picture.

Public companies are required to report quarterly earnings, greatly increasing shareholder visibility into company performance, which cuts two ways. This is one of the greatest transparencies available to investors, which means quarterly earnings can become the primary focus of even a sophisticated and experienced management team. Most people agree that many important decisions should not be measured in quarters, a fact often sidelined when investing in public companies.

Freedom from managing to quarterly earnings is a fundamental differentiating factor as compared to public companies.

There is another, less glamorous possibility for the seemingly more stable and more attractive return profile of private companies.



Cause for caution

If strict quarterly reporting standards result in a myopic focus on short-term performance, their absence can sometimes be to investors’ detriment and allow sponsors to hide behind opaque internal practices. Valuation methodologies for privately held companies can vary considerably between managers, and auditors allow significant discretion. The most proximate valuation metric is (ironically) public company-comparables, the valuations at which listed companies tend to trade.

One particularly timely example in which investors may have a false sense of security is when smoothing effects obscure volatile performance. To take an obvious case, when a private equity portfolio contains a publicly traded position, the fund in almost every case has to take the

public mark for its valuation. But a stock which loses and then regains value from one quarter-end to the next appears perfectly stable, where the same investor may perceive it as risky if they saw the daily performance.

Many factors behind valuing private companies can contribute to this return smoothing. The peer set can change (or be changed). The valuation multiple may be an average of several quarters, making it slower to reflect a new market reality. These effects can cause an investor to believe that its portfolio has a certain value even when that value could be predicted to be lost in the future – something which is not possible in public markets.

And some academic studies have tried to correct for such effects, finding that while there is some smoothing, private equity returns are still distinct from public markets.<sup>3</sup>

2 Bain Global Private Equity Report 2023.

3 The Private Equity Conundrum: Reconciling Private and Public Equity Risk/return Profiles, State Street Global Advisors, August 2019.

More than meets the eye: Size and manager selection

The fact that exposure can be tailored within a private equity allocation allows investors to configure their portfolio in such a way that reduces this effect further. While a mega-cap private equity fund likely mirrors public markets more closely, lower middle-market funds invest in small companies which have very different profiles than today’s large-cap dominated equity markets.

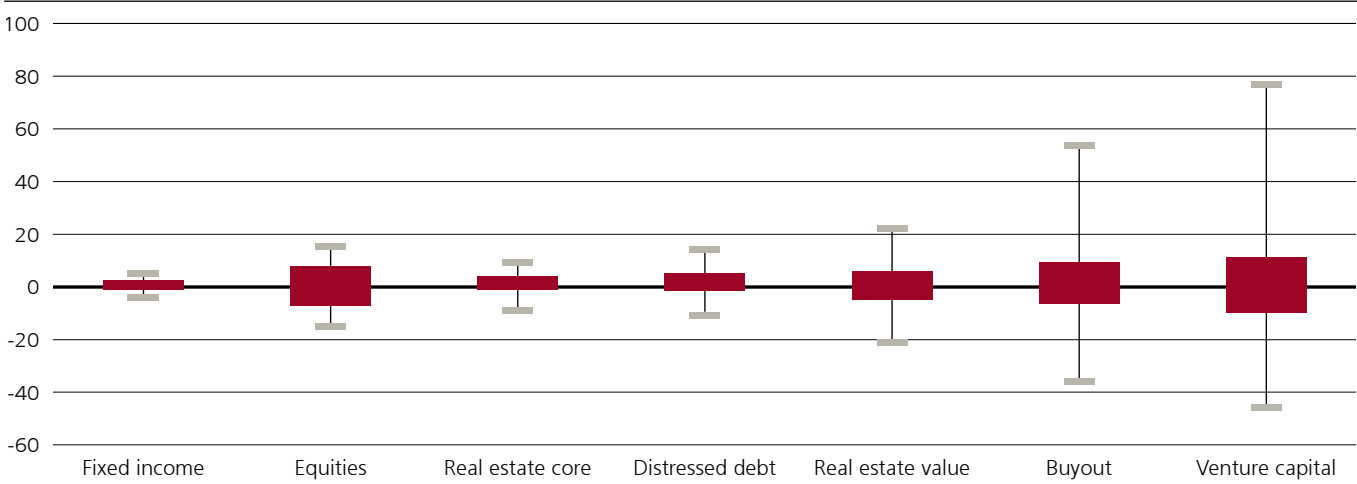
Venture capital (often also a part of the private equity allocation) is more distinct still. If public equity is the best

way to bet on today’s winners, lower middle-market private equity and venture capital are the avenue by which to back their challengers.

Another important distinction is the lack of passive-investment options the way public markets have index funds.

This feature means manager selection, differing value creation abilities, and fund strategy are unique opportunities and risks to the private equity portfolio.

Figure 3: Difference between top and bottom quartile managers (%)



Source: Pitchbook, Bloomberg, UBS Asset Management. Dispersion of fund returns relative to median performance. Data as of September 2023.

Private equity allocations continue to grow

The attractions of private equity have caused more investors to add exposure to their portfolios. Long dominated by the world’s most sophisticated investors, such longtime backers continue to increase allocations.

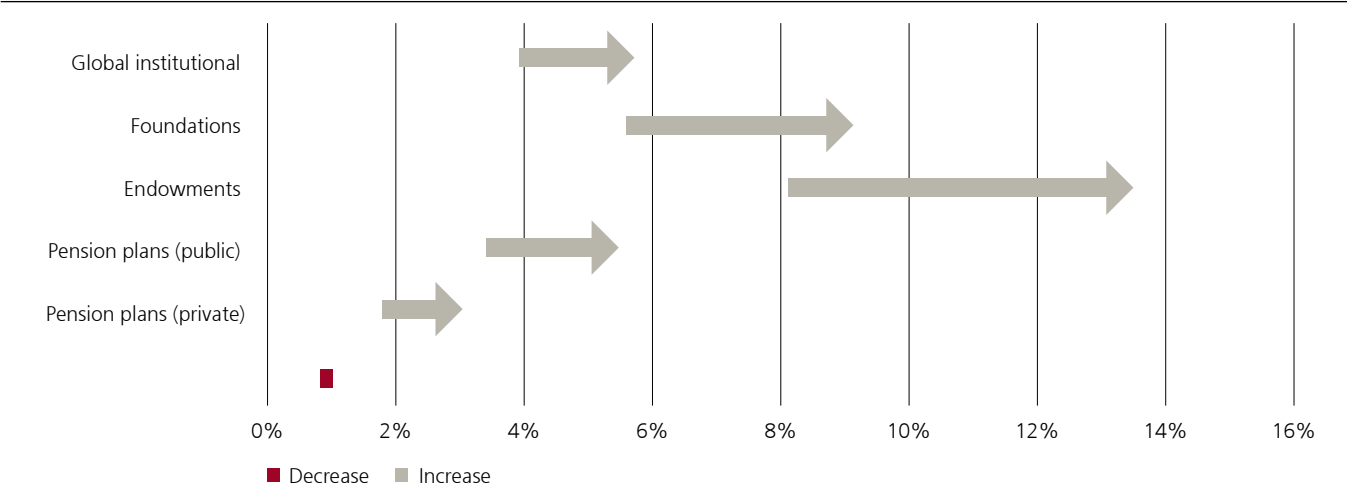
But the asset class is also becoming more mainstream; with retail investor access to alternatives proliferating, institutional investors of all stripes have indicated they plan to increase their allocations, including to private equity.<sup>4</sup>

One reason for that may be the manager selection benefits already mentioned. At top quartile, the return potential of

private equity (buyout and venture capital) is attractive. Combined with the active management component of private equity portfolios, and overlaid with the active management of portfolio companies, this outperformance and return profile can seem tangible and repeatable in the eyes of investors.

While private equity may not offer a public equity-based portfolio the same fundamental level of diversification that you would expect from fixed income or real assets, investors are recognizing the distinct value and return profile it brings to a portfolio. Little wonder investors are full speed ahead on private equity.

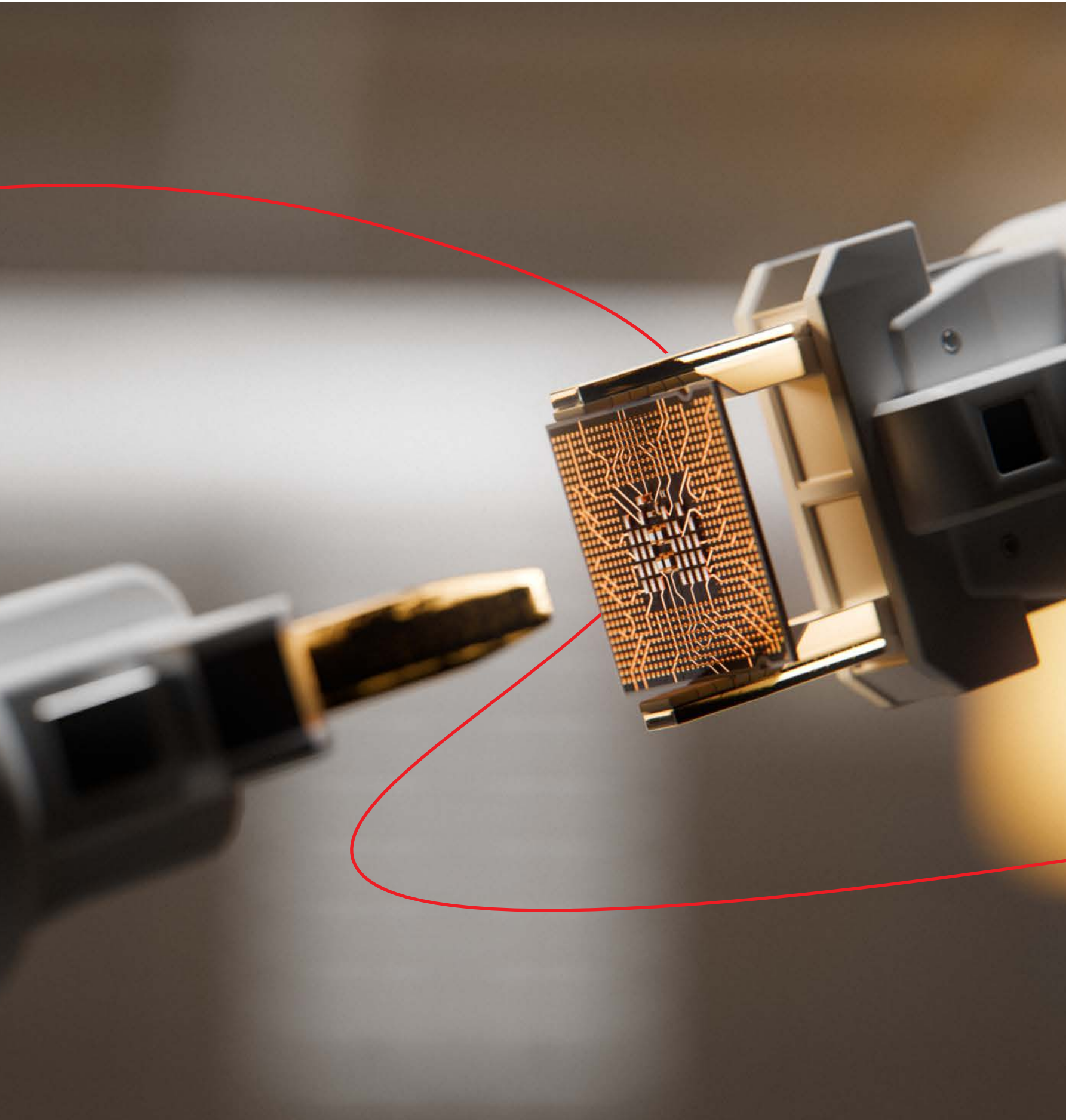
Figure 4: Change in private equity allocation, 2019 vs 2023



Source: Preqin Pro. Asset allocation across time, 2019 and 2023, weighted average.

4 Bain Global Private Equity Report 2024, Nuveen Institutional Investor Survey 2024, UBS Global Family Office Report 2024.





# Comparative & competitive advantages

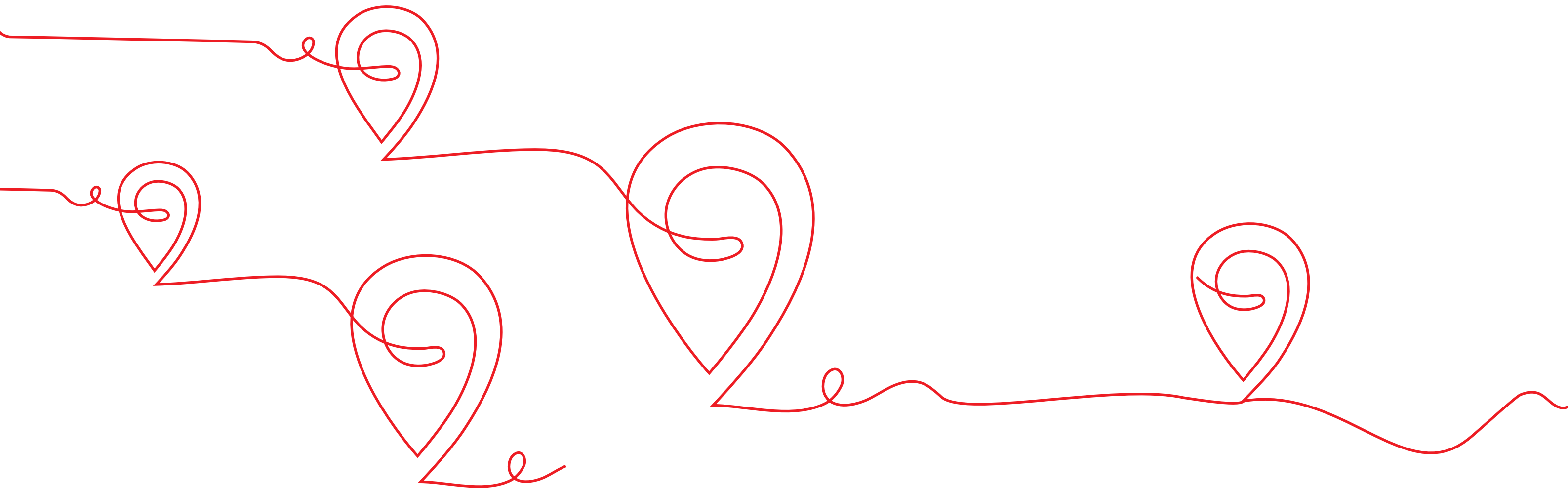
Reflections on supply  
chain concentration



**Massimiliano Castelli**  
Head Global Strategy,  
Global Sovereign  
Markets



**Lucy Thomas**  
AM Head of  
Sustainable  
Investing



As the world continues to fracture and fragment, effective supply chain management is increasingly important to companies' profitability and resilience. Massimiliano Castelli and Lucy Thomas explore the crucial role of geopolitics and sustainability in such strategic and operational decision-making.

It is July 2011 and 65 of 76 Thai provinces have just been declared flood disaster zones. Lives and livelihoods are in tatters. The effects are ripping through communities. When the final count is eventually tallied, assessed and verified, official records will show the devastating impact of Tropical Storm Nock-ten: 815 deaths (with three missing) and 13.6 million people affected overall. Some areas remained underwater until 2012.

In addition to the tragic human impact, the storm had far-reaching commercial implications. One industry particularly affected was disc drive manufacturing.

As the second-largest producer of hard disk drives at the time, Thailand supplied approximately 25% of the world's production.<sup>1</sup> The flooding of factories caused great disruption, with estimated related costs for one of the leading manufacturers – Western Digital – running into the hundreds of millions of US dollars. And while some factories in the same location but on higher ground faced

less disruption (such as Seagate), prices for most hard disk drives almost doubled globally, taking approximately two years to recover.<sup>2,3</sup> Many leading industry analysts predicted worldwide shortages of hard disk drives – something that did not actually materialize as manufacturing capabilities came back online.

Did such an extreme event – arguably a forewarning of the dangers of supply chain concentration – change corporate strategy and cause management teams to build more resiliency into their operations?

The answer – perhaps surprisingly – is no.<sup>4</sup> To appreciate why, and also draw broader lessons across different sectors and regions, we need to better understand the decision-making factors influencing supply chains.

1 ["Thailand floods to put the grinch in Christmas"](#) Carey, Adam (29 October 2011).

2 [Thailand Flooding Cripples Hard-Drive Suppliers](#), The New York Times, 6 November 2011

3 ["Storage Pricewatch: HDDs back to pre-flood prices, SSDs grow as \\$/GB holds steady"](#). ExtremeTech. 19 April 2013.

4 UBS Asset Management (based on contact with various media and investor relations contacts), September 2024.



Real-world diversification? Balancing efficiency and resilience

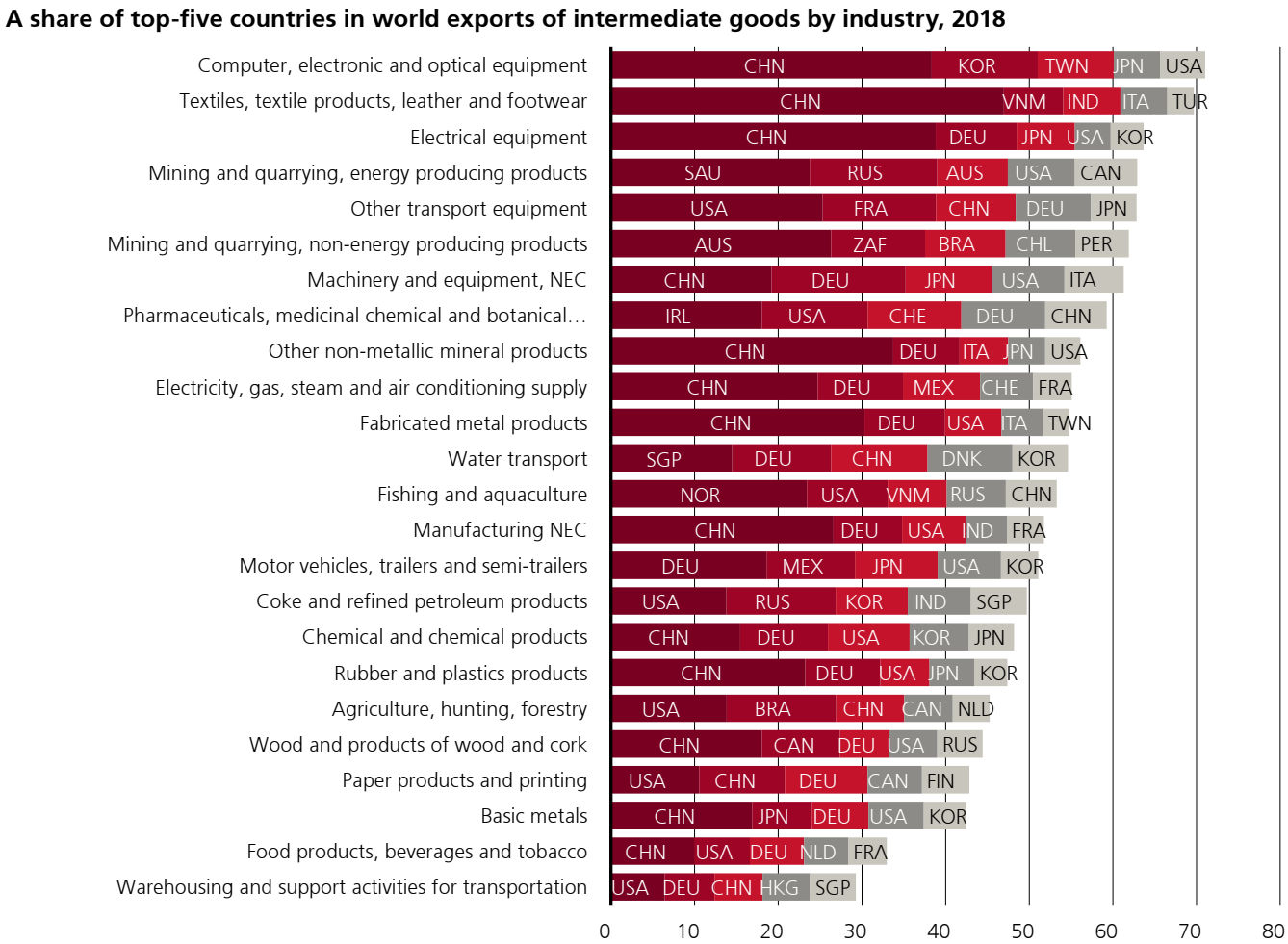
The implications of the Thai floods extend far beyond disk drives. After all, the rise of global value chains has resulted in production networks expanding across the globe.

The lure of low-cost labor locations and increased costs associated with spreading operations across multiple locations has led to key production capacities

agglomerating and concentrating in specific regions of a single country. Whether implicitly or explicitly, the relentless pursuit of optimal resource allocation has caused management executives to make probability judgements on the likelihood of disruptive and expensive upstream events occurring.

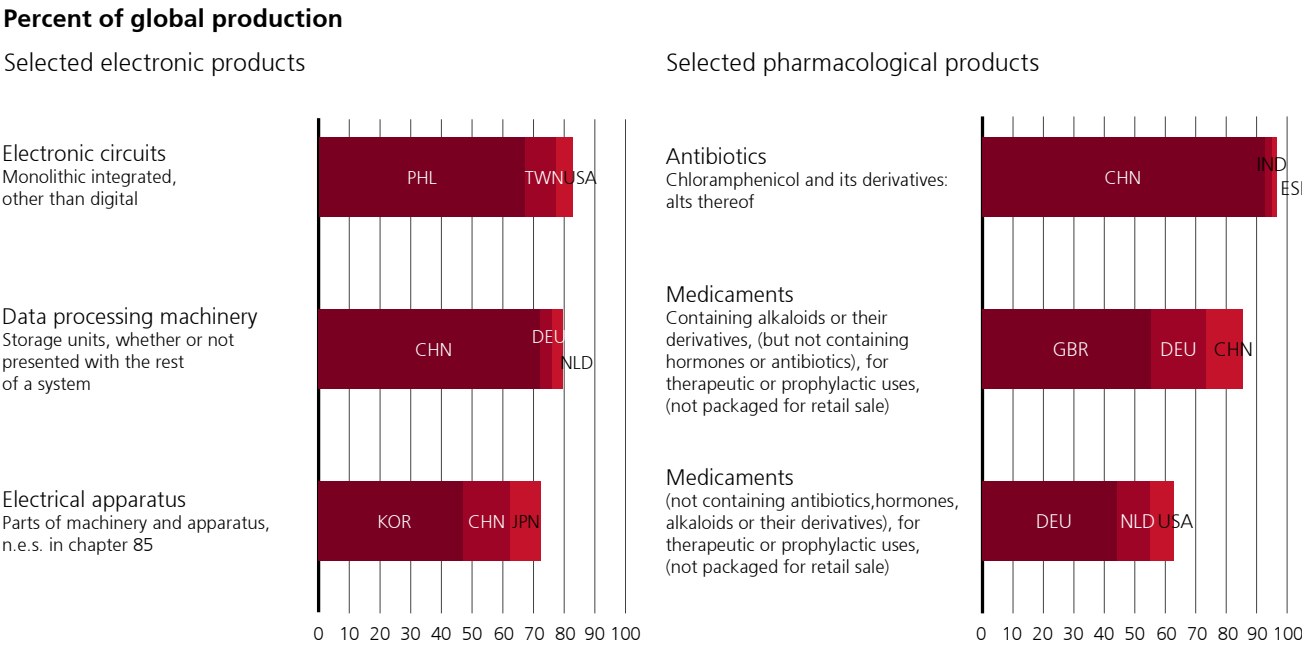
A recent report from the OECD quantified the extent of this high-risk strategy in various geographies and markets.

Figure 1: The geographic concentration of intermediate goods exports is high in some sectors



Source: Inter-Country Input-Output (ICIO) database; and OECD calculations.  
Note: Excluding exports of the rest of the world in the Inter-Country Input-Output (ICIO) database. NEC stands for not elsewhere classified.

Figure 2: The geographic concentration of production is also very high for individual products



Source: OECD calculations based on the 2020 BACI (Base pour l'analyse du Commerce International) database; and and Arriola et al. (2020[23]), "Efficiency and risks in global value chains in the context of COVID-19", OECD Economics Department Working Papers, No. 1637, OECD Publishing, Paris.

To understand why such industrial concentration has persisted it helps to remember that, for the last few decades, the global economy has remained on a steady geopolitical equilibrium centered on a few key pillars: globalization, free movement of goods, capital, technology and people, and the role of the private sector. In other words, the incentives for real-world diversification were low.

However, this equilibrium is shifting. A pivot towards deglobalization, protectionism, and rising trade barriers of goods, labor and increasingly capital is causing the economic and political world to fragment, with governments reassessing their political priorities. Issues such as energy security, access to essential resources, defense, resilience of supply chains, as well as strategic positioning around artificial intelligence and technology, are at the top of their political agendas (and in their spending plans).

As a result, and after decades of relative stability, corporate management teams worldwide are being forced to carefully consider the makeup and configuration of their supply chains. In theory, companies are incentivized financially to reduce the risks of costly disruptions to production.

Yet, as Figure 3 from McKinsey shows, despite some pandemic-triggered excitement around ‘plus-one’ value chain strategies, it is not yet clear how much site location diversification and near/friend-shoring is actually happening. Less expensive and operationally intensive measures like increased inventory buffers appear to be winning the day. Like all great hangovers, the immediate effects fade, and – in this case – a heady mix of short-term efficiency gains and sunk-cost fallacy prevails.

Figure 3: Companies’ intentions and implemented actions to boost supply-chain resilience



Source: McKinsey survey of global supply-chain leaders (May 4 – June 16, 2021, n = 71).

## Geopolitical complexity

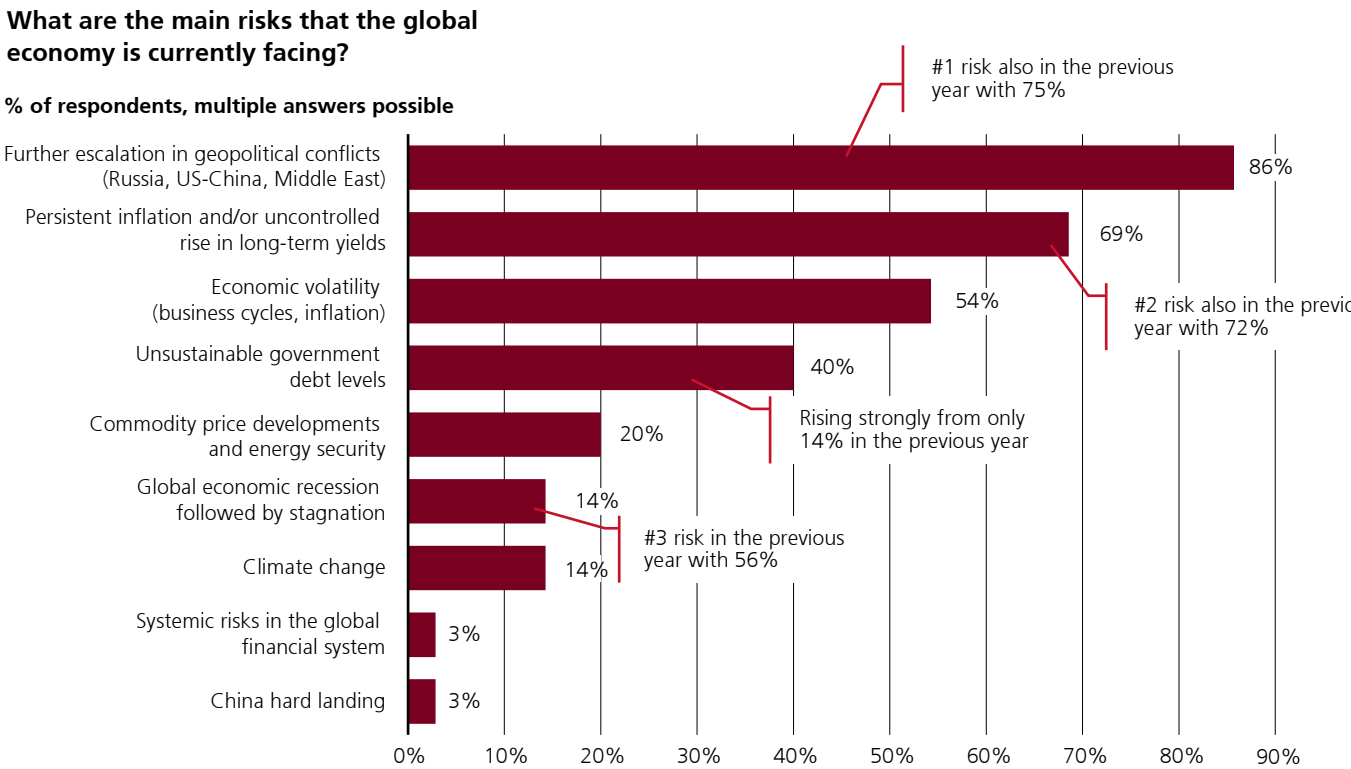
In our 2024 UBS Reserve Management Seminar Survey (RMS) of central bankers, the most cited risk facing the global economy was further escalations in geopolitical conflicts. This is hardly surprising given the ongoing military conflicts in Europe and the Middle East, the confrontation between China and the US, and the latest wave of protectionist measures announced or launched by the US and Europe.

Indeed, national security breaches, as well as the potential social costs from disruptions to production and any knock-on unavailability of products, could ultimately impact the economic, health or military security of a country, according to the OECD.<sup>5</sup>

A tangible example of how geopolitics are influencing supply chain configuration is technology and the race for supremacy in artificial intelligence. The CHIPS Act in the US is a prime example of industrial strategy in action; a protectionist measure in the face of significant competition from China. With 60% of all semiconductors and over 90% of the most advanced chips manufactured in Taiwan, there is strong strategic rationale for diversification.<sup>6</sup> Public policy drives private sector behavior.

Geopolitical risk is notoriously difficult to diversify away. However, both governments and firms must find effective ways of continually measuring these such risks and, as the OECD points out, “come up with proportional measures to mitigate them.”<sup>7</sup>

Figure 4: Main concerns impacting the global economy



Source: UBS Annual Reserve Manager Survey, results as of June 2024.

5 Risks and opportunities of reshaping global value chains, OECD, 2023.

6 <https://www.cfr.org/article/onshoring-semiconductor-production-national-security-versus-economic-efficiency#:~:text=But%20even%20that%20understates%20Taiwan's, chips%20are%20manufactured%20in%20Taiwan.>

7 Risks and opportunities of reshaping global value chains, OECD, 2023.



Geopolitical and sustainability  
interconnections

Interestingly, few of our central banking survey respondents flagged climate change and other sustainability factors as a significant risk. Yet, Everstream – a supply chain analytics firm – listed their top five supply chain risks for 2024 as:<sup>8</sup>

- 1

Extreme weather
- 2

New environmental regulations that could create disruption to operations
- 3

National protectionist measures, particularly between the US and China
- 4

The potential for escalating tension over Taiwan and its political status with respect to China
- 5

Shortages of agricultural commodities

Sustainability and geopolitical issues dominate the list. There could be many reasons for this disconnect.

Firstly, it could simply be the difference between top-down and bottom-up views. Perhaps more likely though, it could reflect the growing interconnections between geopolitics and sustainability. A growing linkage between the two has been glacially forming over the last decade or so, and across multiple dimensions of each. This means that, depending on your perspective, you may view an issue like energy security primarily as geopolitical, sustainability, or both.

Global relations and geopolitics are typically shaped by the needs of countries to have access to the resources necessary to prosper and develop: a) energy/material; b) technology; and c) human capital. Current geopolitical developments – deglobalization, fragmentation,

protectionism and conflicts – reflect the political efforts made by nations to have a reliable access to these ‘production factors’.

So, while geopolitics has a large impact on all these resources, so too do sustainability issues (such as via the impact of climate change on human capital through migration and health, among other things).

A prime example of where supply chain concentration and the interplay between geopolitics and sustainability overlap is electric vehicles and renewable energy demand. China dominates the supply of rare earth minerals, giving it significant geopolitical leverage over countries transitioning to green energy. In response, the European Union and the US are reshaping their supply chains to reduce dependence on China for key materials that are crucial for electric vehicle batteries.

<sup>8</sup> [Extreme weather is 2024's top supply chain risk: Everstream](#), Supply Chain Dive, 11 January 2024

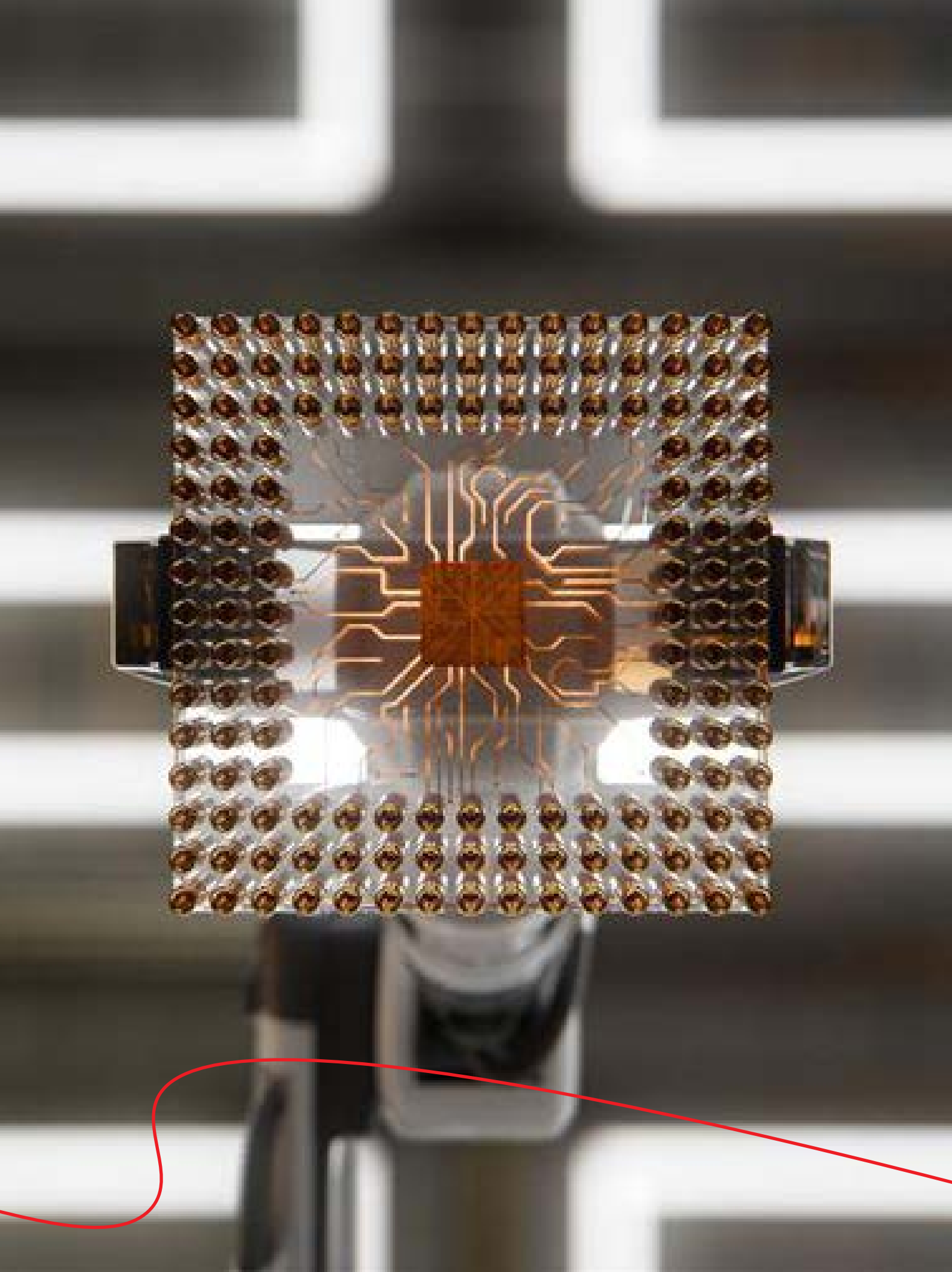
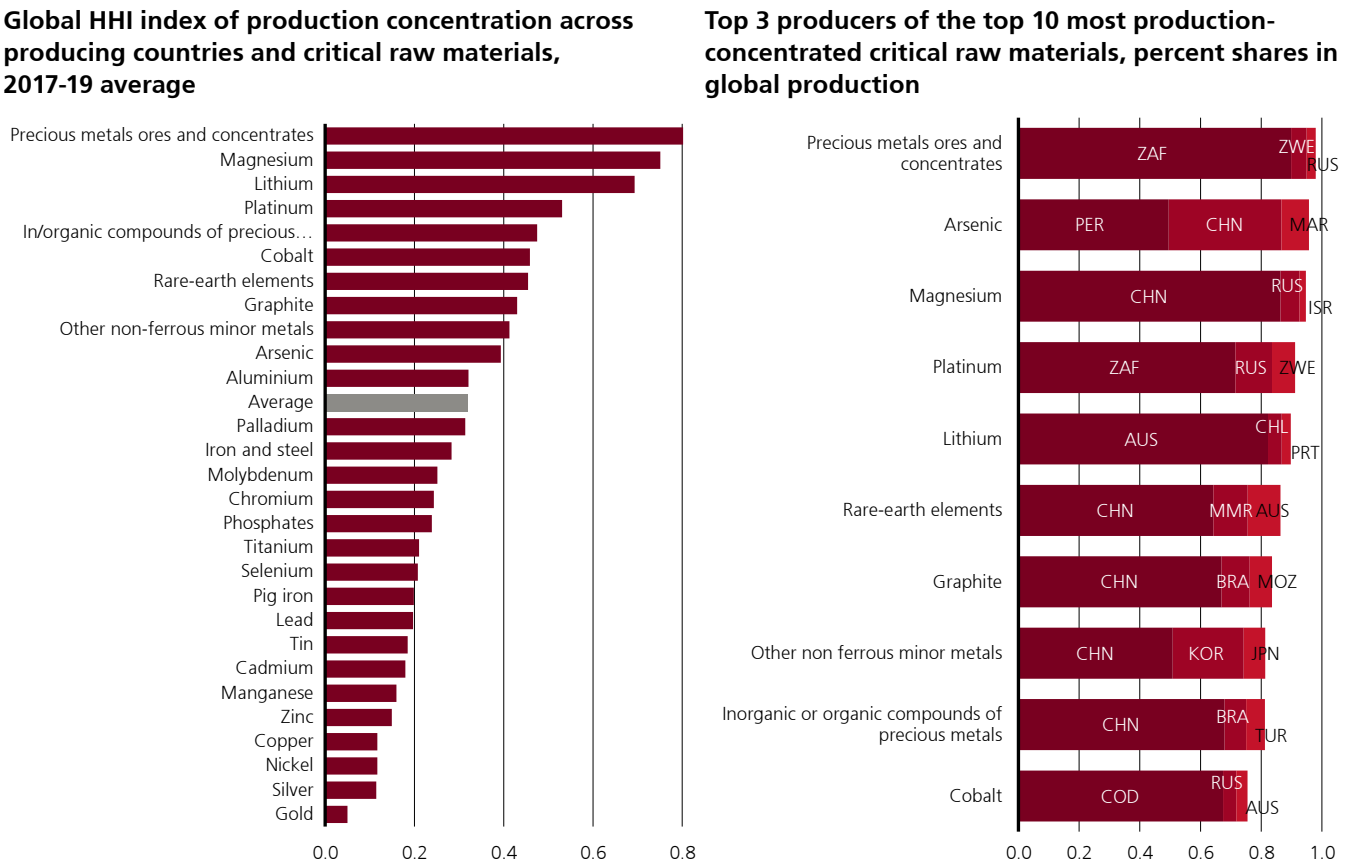


Figure 5: Concentration of production of critical raw materials is high



Source: Kowalski and Legendre (2023[31]), “Raw materials critical for the green transition: Production, international trade and export restrictions”, TAD/TC/WP(2022)12/REV1; and OECD calculations based on the United States Geological Survey data.

Note: Concentration of production in Panel A is measured by the Herfindahl-Hirschman index (HHI). In Panel B, 3-letter country ISO codes for countries that are not in the OECD and are not among the key partners and the accession countries refer to: Democratic Republic of the Congo (COD), Morocco (MAR), Mozambique (MOZ), Myanmar (MMR), Russia (RUS) and Zimbabwe (ZWE).

As ex-ECB governor Draghi wrote in a recently published report, “Decarbonisation can be an opportunity for Europe, both to take the lead in new clean technologies and circularity solutions and to shift power generation towards secure, low-cost clean energy sources in which the EU has generous natural endowments.”<sup>9</sup> In other words, reduce reliance on a single supplier, and improve supply chain resilience while meeting sustainability goals.

From a sustainability perspective, it is not just environmental factors overlapping with geopolitics. Social considerations are increasingly intertwined and likely to influence corporate and investors’ outcomes.

International value chains have traditionally been built to have better and cheaper access to resources, including human capital. As companies explore the shortening and diversification of their supply value chains, labor demand could shift across sectors, countries and regions. Some countries will likely benefit – for instance the Indian skilled labor force might have an advantage over China facing increasing opposition and scrutiny over immigration. As such, companies arguably face increasing risk of the lack of skilled labor should their value chain not be sufficiently diversified.

The demand dynamic for human capital is shifting, too. As the need for digital skills increases, while historically demand for non-skilled labour has led to China becoming a prime location, India, Vietnam and Mexico are likely to benefit as well. Equally, climate-related migration is now the largest form of migration and growing. Therefore, the interplay between geopolitics and local immigration policies is only set to grow.

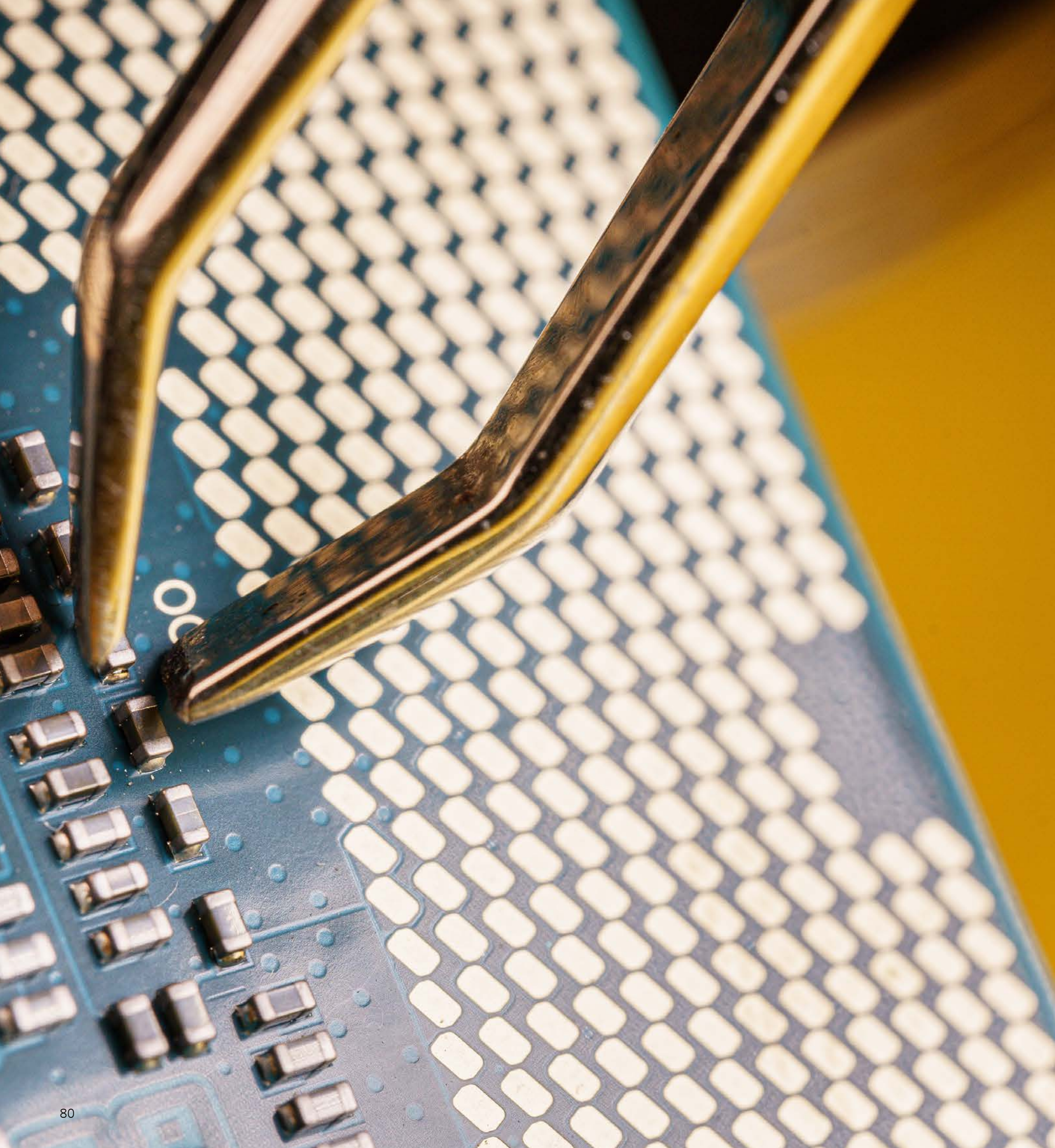
This is where active policy engagement by companies and investors could play a key role. While engaging with governments and multilateral organizations is not a new concept in sustainable finance circles, as geopolitical complexity increases it is likely to become ever more important.

After all, governments can play a role to support resilience in supply chain management (as shocks can impact economies). Governments can model concentration and bottlenecks using stress testing for essential supply changes and then making sure regulations are supportive and not an additional source of uncertainty.

We should also remember that the interplay between climate change and geopolitics also creates opportunities. For instance, the reconfiguration of international supply chains driven by technology and resilience can become an opportunity for companies to improve the sustainability profile of their operations and be better prepared for the tightening sustainability-related regulatory environment.<sup>10</sup>

9 Draghi Competitiveness Report, 2024  
10 2024 Reserve Management Survey, UBS Asset Management, March 2024.





# Slipped discs and probability judgements

Active investors are judged on return outcomes, and not on perceived decision quality – often summed up by the notion that the market can stay irrational longer than most of us can stay solvent. This can play psychological tricks; the fear of missing out adds pressure to take excessive risks by concentrating in a few momentum stocks.

Similarly, management executives face the temptation to push the risk boundaries in favor of higher supply chain concentration. As we try to peek into the future, it seems inevitable that a more nuanced and subtle approach to international supply chain management will emerge. The practicalities of running a global business mean executives will have to balance the benefits of supply chain diversification with the cost efficiencies of concentration. The optimal strategy will likely differ across firms and sectors.

Updated risk models will need to reflect shifting trade policy and labour dynamics across the globe. Strategic decisions around manufacturing hubs will also need to factor into the evolving geographic realities of various regions and locales, not least how climate and nature crises are interconnected and influencing various societies and overall geopolitical trends.

Among other things, this should include analyzing the political stability and regulatory environment. Companies can use scenario planning to anticipate how different geopolitical developments might play out. An example would be to plan for scenarios where a country withdraws from a climate agreement or new sanctions are imposed.

The world today looks and feels very different from the one thirteen years ago, when risk managers and corporate executives at Thailand's disk drive manufacturers huddled around boardroom tables debating the pros and cons of diversifying their supply chains.

Headlines about extreme weather events, indicating a direct link to climate change, are now commonplace; they weren't back then. Should floods happen again in Thailand tomorrow – just as they are today in Spain – would the same conclusions be reached? Perhaps not.



# Afterword

## Supercharged



**Barry Gill**  
Head of Investments,  
UBS Asset Management

“Ten years of competition and 90 years of oligopoly” – that is how historian Alfred Chandler famously described American business after the civil war.

As I reflect on the research and opinions contained in this Diversification Edition of The Red Thread, I can’t help but sympathize with Chandler. This is undoubtedly a winner-takes-most (if not all) global economy; one where software and technology are now critical success components across every industry.

While Chandler was commenting on dynamics formed following the Industrial Revolution, our current knowledge-driven economy has many similarities. With artificial intelligence potentially set to turbo-charge the next productivity wave, access to talent and capital will be clear competitive advantages.

Yet one of the key determining factors to unlocking these factors is incumbency: simply being established as a top three or four player means capital expenditure and operational sophistication advantages compound. Existing leaders pull ahead by moving away from standardization towards greater levels of customization – delivering on an ever-growing set of complex client needs.

Complacency is, of course, still a threat. But perhaps not to the extent it once was. At this stage, a disruptive regulatory strike – akin to the ones landed in the US either side of 1900 – seems the most likely party-spoiler for the megacaps. How soon and severe, though?

The irony is that the same factor often hailed as a great disruptor – i.e., technology – could be the very thing supressing plucky start-ups and challengers. The rhyming nature of history always tells us something. And in this case, it could actually be that past trends and lessons – such as Chandler’s – could play out as if on steroids. For investors, the implications on portfolios cannot be underestimated.

A stylized, handwritten signature in black ink, appearing to read 'B. Gill'.

**Barry Gill**  
Head of Investments,  
UBS Asset Management



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