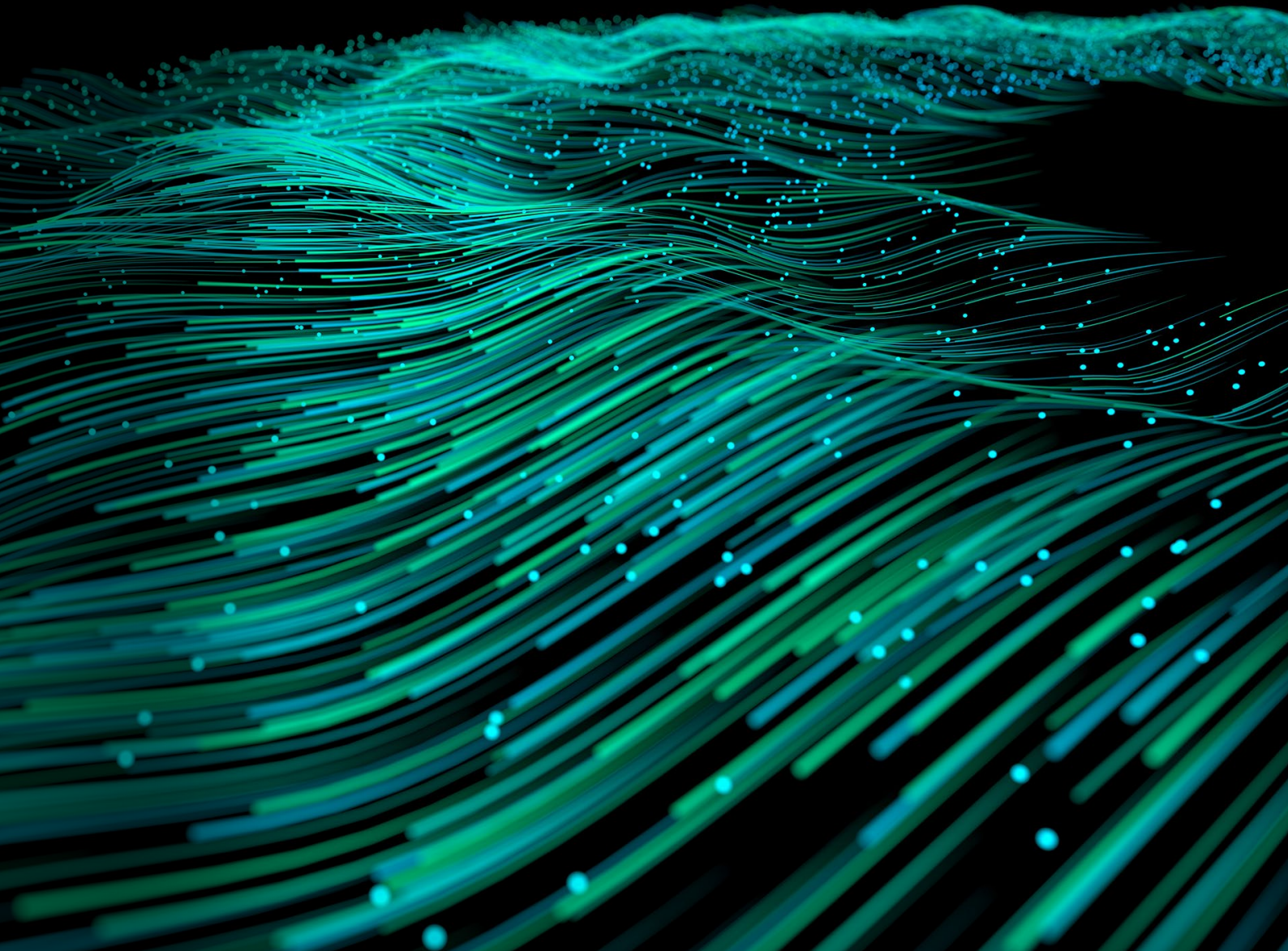



Should you keep your babies in the dark?

## Shining a light on correlation.





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# Introduction

When thunder roars, go indoors! On the face of it, this sounds prudent, and certainly a good axiom to live by if you're a golfer. But not every rainstorm brings thunder, just as not every market dip will lead to financial Armageddon. Running back to the clubhouse every time there's a distant cloud might be an overreaction. Similarly, rebalancing to hold only fixed income or cash every time the market loses a few percent would have hurt a lot of investors these last few years. So how about a more structured approach, the financial equivalent of a waterproof jacket, perhaps?

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If you're worried about the current market, perhaps you don't have to turn far? It isn't necessarily about finding the perfect sector to rotate into (for sector concentration, to be shown later, can lead to worse outcomes relative to holding equities from a broader variety of sectors). Often you can increase your chances for outperformance by sticking to the members of an index that aren't following the crowd so closely, so to speak. These equities, which may be forging their own path and doing something a bit more esoteric, can be found by using one of the humblest tools in the statistician's toolbox: correlation.


## So why might an investor be concerned right now?


At the time of writing, over 25% of the weight of the S&P500 Index is made of seven large companies: Apple, Microsoft, Amazon, Alphabet (Google), Tesla and Meta (Facebook). Clearly, a large percentage of index performance is being driven by these dominant firms' stocks that, it could be argued, are possibly the most sensitive to interest-rate hikes. A traditional view is that a company's stock price is equal to the value of its future cash flows, discounted by some interest rate back to the present day. If I were to offer you £1000 in ten years' time, that sum of money (discounted back to today) would be £951, if prevailing interest rates were 0.5%, but would be £862 if rates were just a percent higher at 1.5%. Incidentally, according to Bloomberg's World Interest Rate Probability, five interest-rate hikes are now priced in and expected before Feb 2023, leading to an implied rate of around 1.3%.





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So, regardless of a company's fundamentals and their actual ability to generate cash, market participants can be sure that as interest rates go up, the present value of future cash flows will go down. It is not unreasonable to assume, one might argue, that those companies with share prices reflecting the greatest amount of future cash flows will be most at risk when rates rise.

This begs the question, is it possible, using the same universe of assets that make up the index, to achieve similar overall performance, but be significantly less exposed to the main driving factors governing the returns from that index?" At the heart of this apparent investing panacea, which we will discuss next, is a term I glibly threw in the last sentence: correlation.

## A Refresher on Correlation

Correlation, in this financial context, refers to the relationship between two sets of asset returns (not prices). Being more specific, it captures the degree to which two assets are linearly related. Here, the word linear is used in the sense that if you made a scatter plot of the data, with one set of returns on the x-axis and the other on the y-axis, the correlation could be visualised as a best-fitting straight line through the points. We can break down correlation into three simple cases:

1. **Positive Correlation:** When the return value of one asset changes, the other tends to change in the same direction.
2. **Negative Correlation:** When the return value of one asset changes, the other tends to change in the opposite direction.
3. **Zero Correlation:** when the return value of one asset changes, the other changes in an entirely unrelated manner.

## Some Words of Warning

Correlation does not imply causation. Generally, when we see a correlation between X and Y, to establish that X causes Y we need more information, such as whether X happens before Y, whether the causation between the two variables is plausible, or whether there might be other influences and variables (often referred to as "confounders") we have not included, or controlled for, in our analysis. A good example of this can be found in an article published in Nature [Gee1999] claiming that leaving a night-light on for a baby or toddler predisposes them to short-sightedness later in life. However, a clear confounder in this case is the short-sightedness of parents. Not only will a short-sighted parent be more likely to need a light on in their children's bedrooms at night, but they will also be more likely to have short-sighted children, given the condition is known to be hereditary. Another often-quoted example is a correlation between ice-cream sales and the number of people who die from drowning. The clear confounder here is the season of the year, which influences both how much ice-cream is consumed and how many people go swimming in open water.

Correlation is also dependent on the window of data used to perform the calculation, and can be a noisy measure, especially with short window sizes. Heuristically, for well-behaved distributions, the error on the correlation decreases inversely proportional to the square root of the number of data points. So, as the window of observations gets larger, we drive noise down, but also take in older, potentially more irrelevant data. A compromise should be found that keeps observations relevant, but not too noisy.

Correlation is a unitless quantity that varies between -1 for perfect negative correlation and +1 for perfect positive correlation. It is an estimate from a sample of data and thus contains a margin of error. The cases of close-to-zero correlation, however, are more interesting and often less intuitive.

### Example - a look at some real data - 2020

Let's use data from the months leading up to February 2020 (i.e. pre-COVID-19) as example of correlation, selecting 10 shares from among the ones with the lowest exposure to the main factors which drive the returns of the FTSE 350. Figure 1 compares the subsequent performance of the index against an equal weight allocation to these 10 equities over the rest of 2020. This low correlation portfolio is able to effectively find sources of esoteric return that are hidden away in the index due to tiny allocation weights.

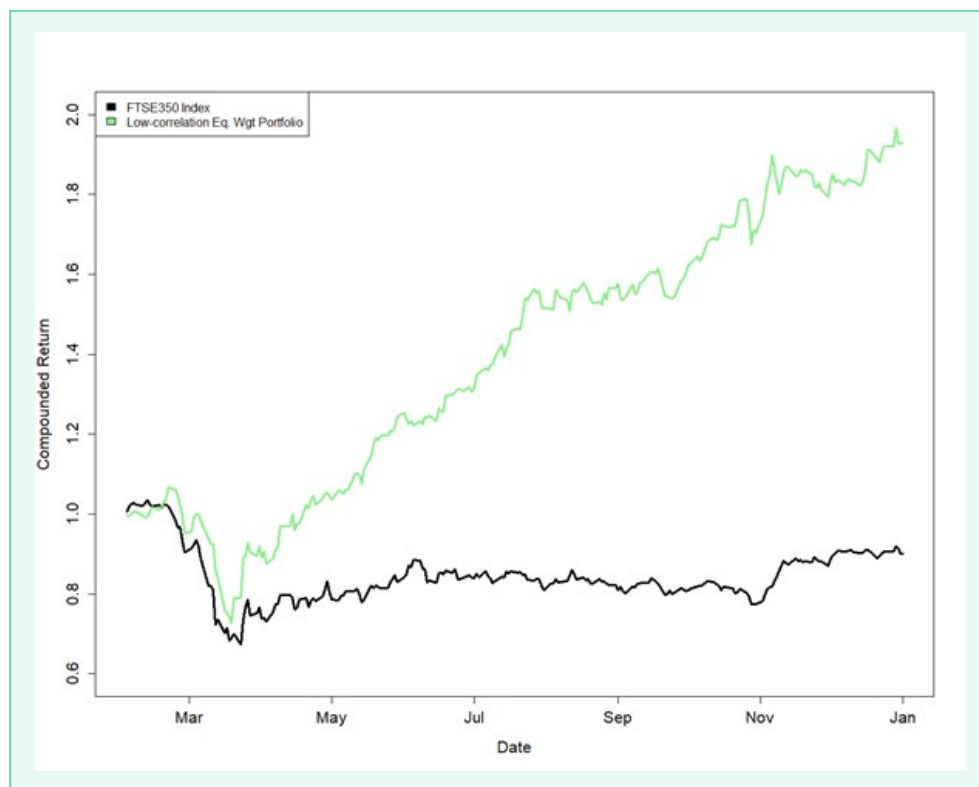


Figure 1: Equity curve for the FTSE 350 Index (black) against an equal weight portfolio of low-correlation equities (green). Source: Collidr/Bloomberg

In the US, the same strategy of being equal weight a small number of lowest correlated assets (calculated prior to the start of the period shown) produces results largely in-line with index performance for the Nasdaq (as shown in figure 2), yet under-performs somewhat in the S&P500 (figure 3). In the case of the S&P500, the lowest correlated assets shared much higher correlations with one another given that they are concentrated in the Utilities sector. Conversely, in the case of the FTSE350, the lowest correlation assets shared a much lower correlation with one another due to a more varied sector base, and correlations to the index remained more muted during the peak of the pandemic. These contrasting correlation matrices are shown in figures 4 and 5 for reference.

A large percentage of index performance is being driven by a few dominant stocks that, it could be argued, are possibly the most sensitive to interest-rate hikes

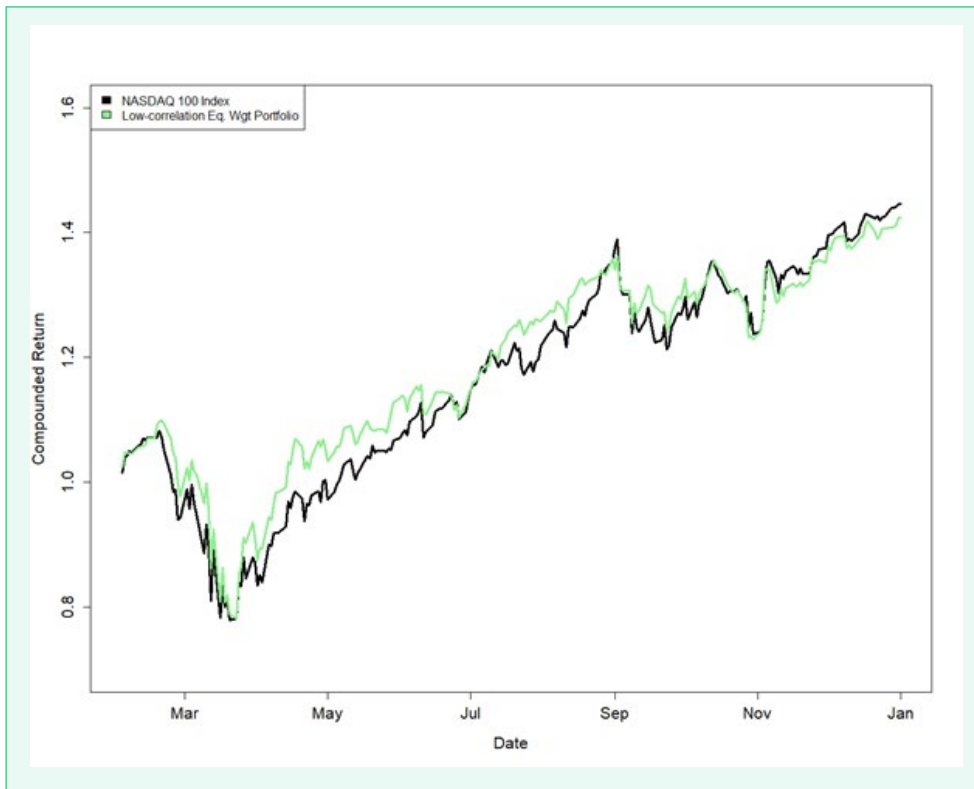


Figure 2: Equity curve for the Nasdaq 100 Index (black) against an equal weight portfolio of low-correlation equities (green). Source: Collidr/Bloomberg



Figure 3: Equity curve for the S&P500 Index (black) against an equal weight portfolio of low-correlation equities (green). Source: Collidr/Bloomberg

Correlation does not imply causation

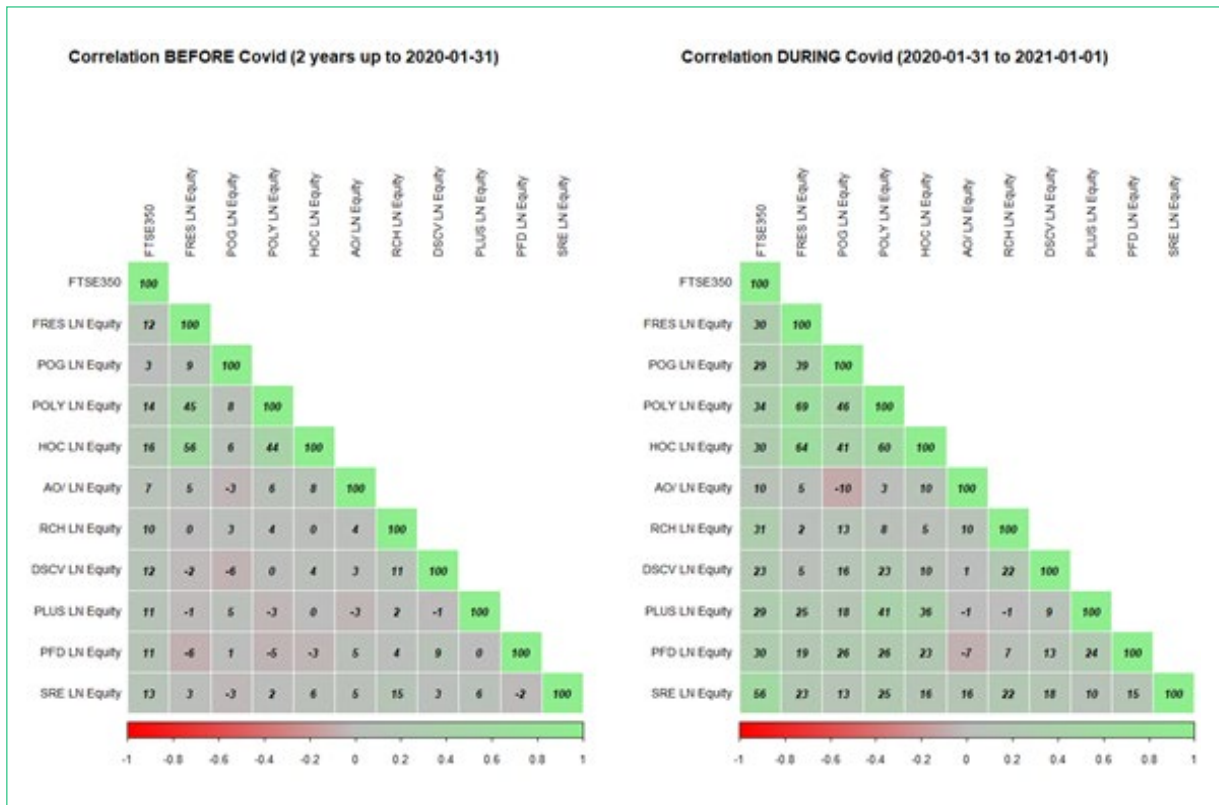


Figure 4: Correlation matrix between the FTSE350 Index returns and the 10 lowest pre-Covid correlation assets. The left panel shows correlations prior to the onset of the pandemic, and the right shows the correlations over a period during the rest of 2020. Source: Collidr/Bloomberg

Ticker	Name	Sector
FRES LN Equity	Fresnillo PLC	Materials
POG LN Equity	Petropavlovsk PLC	Materials
POLY LN Equity	Polymetal International PLC	Materials
HOC LN Equity	Hochschild Mining PLC	Materials
AO/ LN Equity	AO World PLC	Consumer Discretionary
RCH LN Equity	Reach PLC	Communication Services
DSCV LN Equity	Discover IE Group PLC	Industrials
PLUS LN Equity	Plus 500 Ltd	Financials
PFD LN Equity	Premier Foods PLC	Consumer Staples
SRE LN Equity	Sirius Real Estate Ltd	Real Estate

Table 1: Details of the low-correlation UK equities shown in figure 4. Source: Collidr/Bloomberg

Ticker	Name	Sector
NEM UN Equity	Newmont Corp	Materials
WEC UN Equity	WEC Energy Group Inc	Utilities
DUK UN Equity	Duke Energy Corp	Utilities
SO UN Equity	Southern Co/The	Utilities
ED UN Equity	Consolidated Edison Inc	Utilities
EVRG UN Equity	Energy Inc	Utilities
CMS UN Equity	CMS Energy Corp	Utilities
NEE UN Equity	NextEra Energy Inc	Utilities
ETR UN Equity	Entergy Corp	Utilities
XEL UN Equity	Xcel Energy Inc	Utilities

Table 2: Details of the low-correlation US equities shown in figure 5. Source: Collidr/Bloomberg

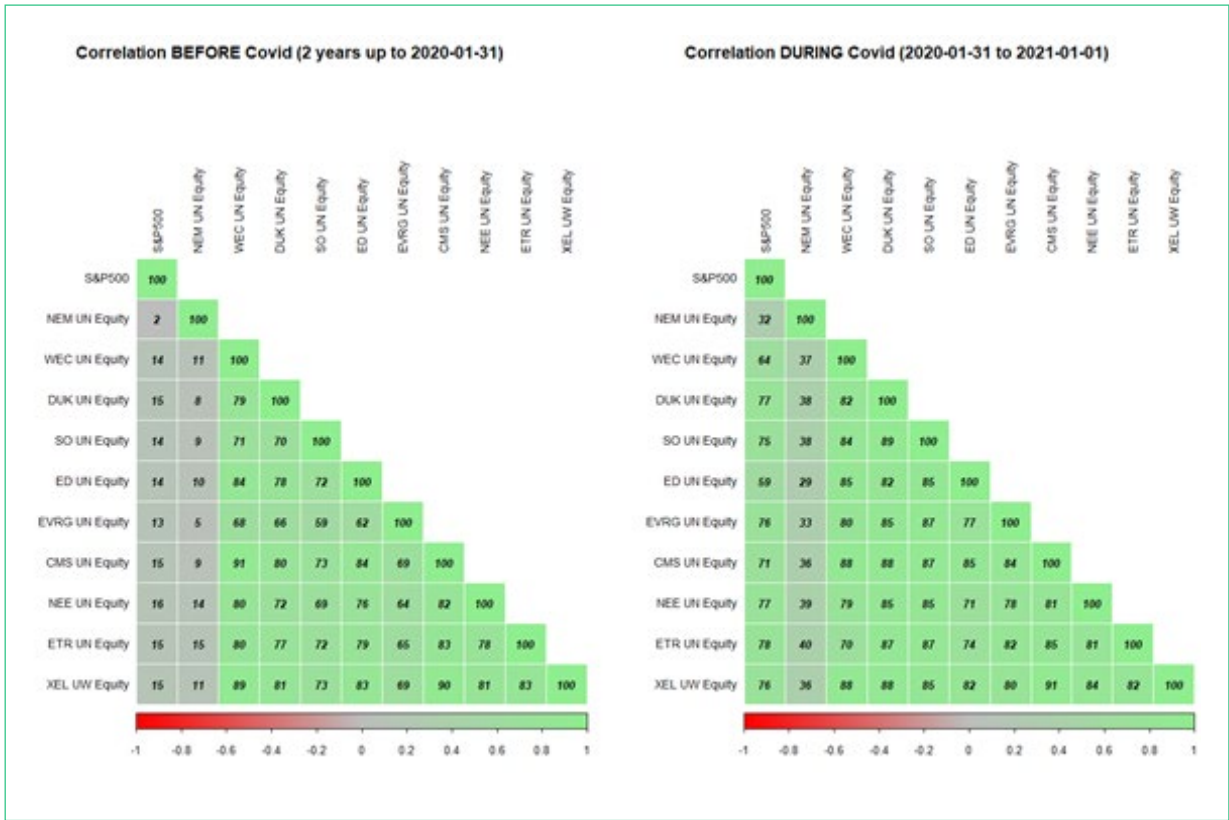


Figure 5: Correlation matrix between the S&P500 Index and the 10 lowest pre-Covid correlation assets. The left panel shows correlations prior to the onset of the pandemic and the right shows the correlations over the rest of 2020. Source: Collidr/Bloomberg

Figures 6 and 7 show the same analysis for Europe and Japan respectively.



Figure 6: Equity curve for the EuroStoxx (ex-UK) Index (black) against an equal weight portfolio of low-correlation equities (green). Source: Collidr/Bloomberg



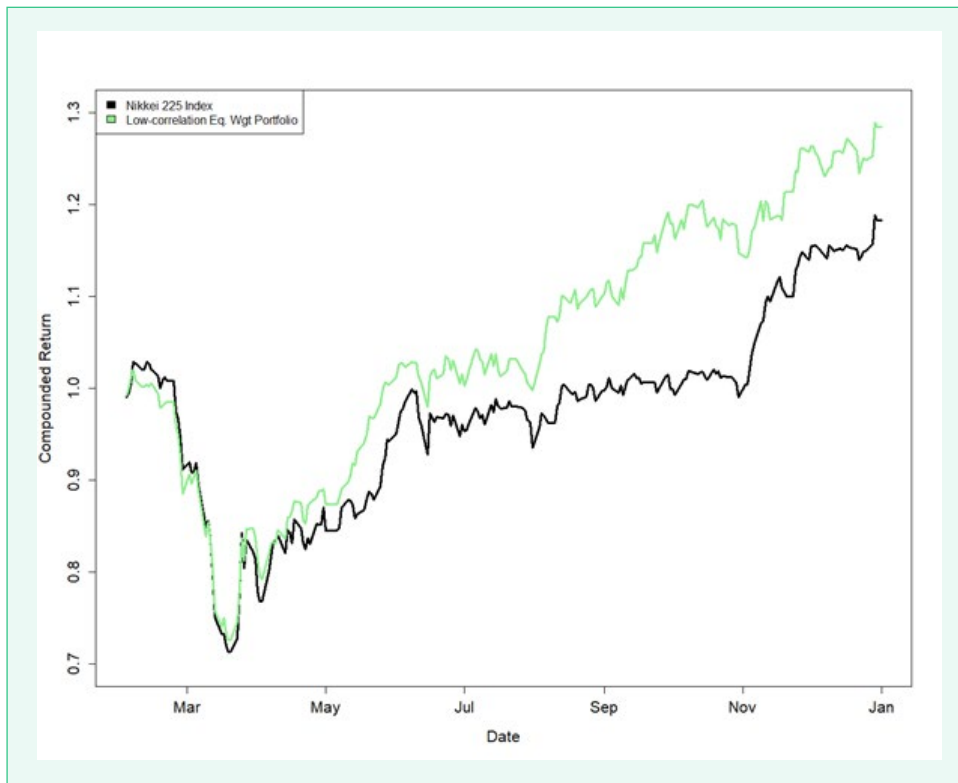


Figure 7: Equity curve for the Nikkei 225 Index (black) against an equal weight portfolio of low-correlation equities (green). Source: Collidr/Bloomberg

Holding a handful of less correlated assets can equal, or even beat, the performance of the entire index

## Concluding Remarks

As the above simple example demonstrates, holding a handful of less correlated assets can equal, or even beat, the performance of the entire index at times.

Simple techniques like this can reduce beta, add more esoteric returns (alpha, if you like) and provide some level of downside protection. As figure 5 perfectly illustrates, to be effective one needs to be careful not to over-concentrate in a particular sector or hold assets that are too illiquid, but a dedicated, possibly permanent, allocation to a low correlation set of equities is a good way to have your cake and eat it.

For those interested in knowing more about this, tables 1 and 2 uses the most recent data available (at the time of writing) to produce a top 10 list of these securities for both the FTSE 350 and the S&P 500.

Ticker	Name	Sector
RKT LN Equity	Reckitt Benckiser Group PLC	Consumer Staples
SBRY LN Equity	J Sainsbury PLC	Consumer Staples
ULVR LN Equity	Unilever PLC	Consumer Staples
AO/ LN Equity	AO World PLC	Consumer Discretionary
CEY LN Equity	Centamin PLC	Materials
CMCX LN Equity	CMC Markets PLC	Financials
HIK LN Equity	Hikma Pharmaceuticals PLC	Health Care
PNN LN Equity	Pennon Group PLC	Utilities
FRES LN Equity	Fresnillo PLC	Materials
AZN LN Equity	AstraZeneca PLC	Health Care

Table 3: Details of least correlated UK Equities using the latest available data. Source: Collidr/Bloomberg

Ticker	Name	Sector
KR UN Equity	Kroger Co/The	Consumer Staples
CLX UN Equity	Clorox Co/The	Consumer Staples
DPZ UN Equity	Domino's Pizza Inc	Consumer Discretionary
CPB UN Equity	Campbell Soup Co	Consumer Staples
ATVI UW Equity	Activision Blizzard Inc	Communication Services
BIIB UW Equity	Biogen Inc	Health Care
NEM UN Equity	Newmont Corp	Materials
NFLX UW Equity	Netflix Inc	Communication Services
CTXS UW Equity	Citrix Systems Inc	Information Technology
REGN UW Equity	Regeneron Pharmaceuticals Inc	Health Care

Table 4: Details of least correlated US Equities using the latest available data. Source: Collidr/Bloomberg

Allocating to a low correlation set of equities is a good way to have your cake and eat it

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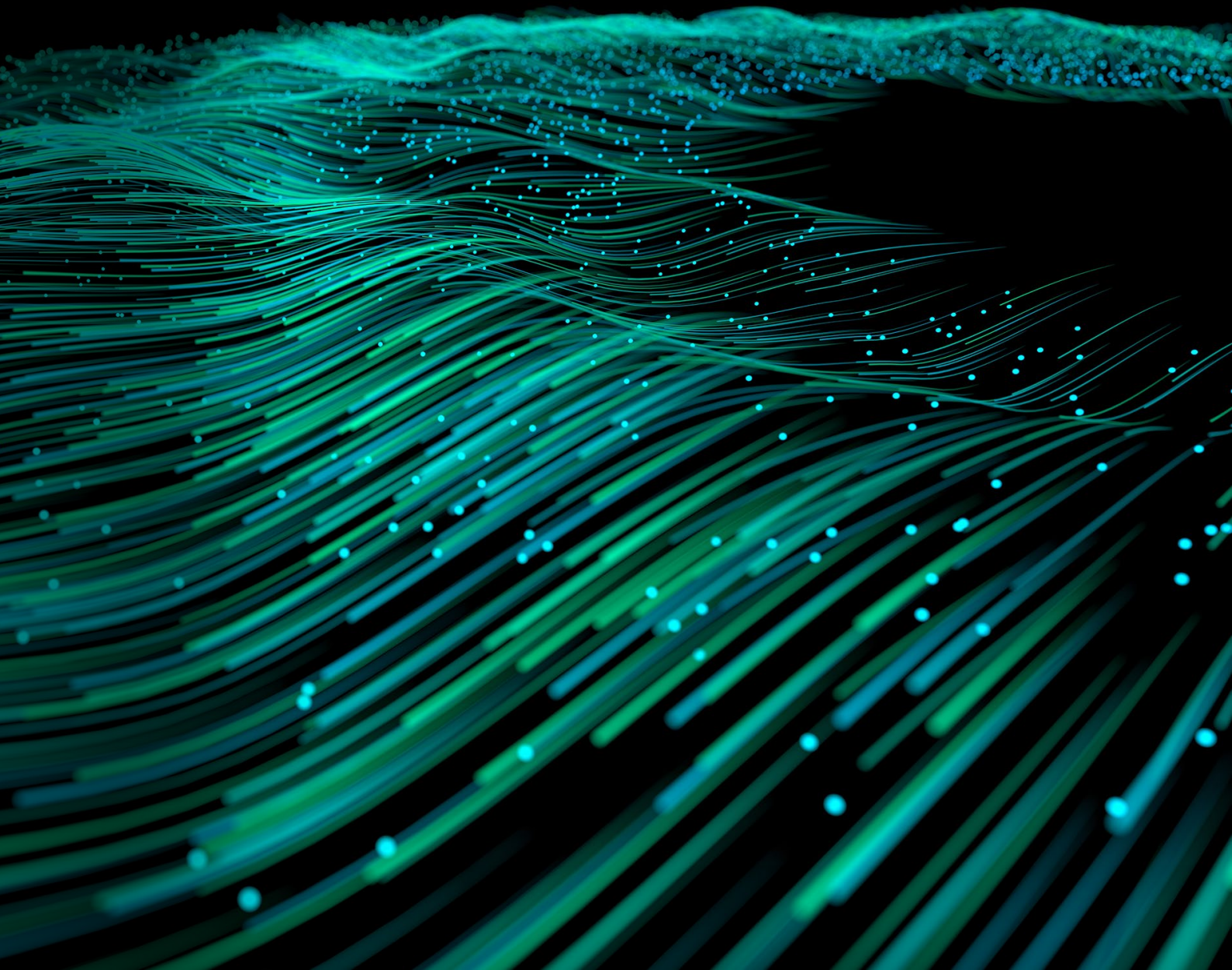
End note: [The Investment Association, Monthly Industry Data, Fund Sectors | The Investment Association \(theia.org\)](#)

Sources: Collidr, Bloomberg.




Simple techniques like low correlation can reduce beta, add more esoteric returns, and provide some level of downside protection


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