Quantitative Equity

Low Carbon and Low Volatility

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The Earth's climate is approaching a dangerous turning point. Left unchecked, climate change could have catastrophic environmental and financial consequences. According to the UN Intergovernmental Panel on Climate Change (IPCC), tackling climate change will inevitably call for a quick and full decarbonization of the world economy by mid-century.

As governments and regulators brace for this low-carbon world, new risks to companies and markets will come to bear. They may stem from regulatory changes (such as carbon taxes or hard limits on carbon emissions), technological changes (such as cheaper sources of renewable energy and battery storage) or demand-side changes (such as shifting consumer and market preferences towards more environmentally friendly products). These changes may prematurely strand fossil fuel assets in the ground, reducing their value to next to zero (so-called stranded asset risk). Many argue that most known fossil fuel reserves would need to remain buried and unburned for us to have any chance at remaining below the Paris Agreement warming targets.

Understandably, climate-aware institutional investors have increasingly been taking steps to lower their exposures to fossil fuels and CO2 emissions in order to mitigate carbon-related risks and better position themselves for the low-carbon transition. In this article, we try to reconcile low volatility and low carbon objectives. More specifically, we investigate whether a low volatility strategy can meaningfully shrink its carbon exposure, without compromising its defensive qualities.

Carbon Intensity

First, we need to come up with a proper definition of carbon exposure or carbon footprint. Under the Greenhouse Gas Protocol (GHGP)[1], greenhouse gas (GHG) emissions can be broken down into three categories, more commonly known as scopes. Scope 1 emissions are those from owned or controlled sources, such as a company's on-site combustion or its fleet's fuel consumption. Scope 2 emissions are those from the generation of purchased energy (e.g. the electricity that a company purchases to operate day-to-day). Scope 3 emissions are all other indirect emissions (not included in Scope 2) from both upstream and downstream activities along the value chain (e.g. extraction and production of purchased materials, use of goods sold, waste generated, etc.). Understandably, Scope 3 emissions can be difficult to delineate and measure, and data is often sparse and patchy. Therefore, we chose to exclude Scope 3 from this analysis. However, this does not mean that Scope 3 emissions are unimportant. In fact, for many industries, Scope 3 emissions can make up the bulk of their carbon footprint.

Nonetheless, data inconsistency makes systematic analysis and comparison much more challenging.

For this analysis, we describe the carbon footprint or carbon exposure of a portfolio as the weighted average of the carbon intensity of its individual holdings, where carbon intensity is the ratio of direct (Scope 1) and indirect (Scope 2) GHG emissions (expressed in tons of carbon dioxide equivalents or tCO2e) per million of USD sales. By normalizing emissions by company size (as proxied by sales), carbon intensity is much more comparable across companies and industries. It can be construed as a measure of how carbon-efficient a company is at generating a million dollars of revenues.

$$\text{Carbon Intensity} = \frac{\text{Scope 1+Scope 2 tCO2e}}{\text{(Sales in million USD)}}$$

The carbon intensity metric is by no means perfect. For one, it is sensitive to outliers (it can grow disproportionately as the denominator goes to 0). There is also a degree of double counting at the portfolio level. For instance, an industrial company's purchase of electricity from a public utility company would be counted as Scope 2 emissions by the former and Scope 1 emissions by the latter. More importantly, it is also backward-looking insofar as it can only tell us where a company is, not where it's going. For example, a company's commitment to carbon neutrality or the low carbon projects or products it has in the pipeline are excluded from the equation. Nonetheless, it is still a valuable proxy that can help investors identify companies in a portfolio with high potential climate-related risks and exposure. Moreover, carbon intensity is a commonly accepted industry standard and the reporting metric recommended by the Financial Stability Board (FSB)'s Task Force for Climate-related Financial Disclosures (TCFD).

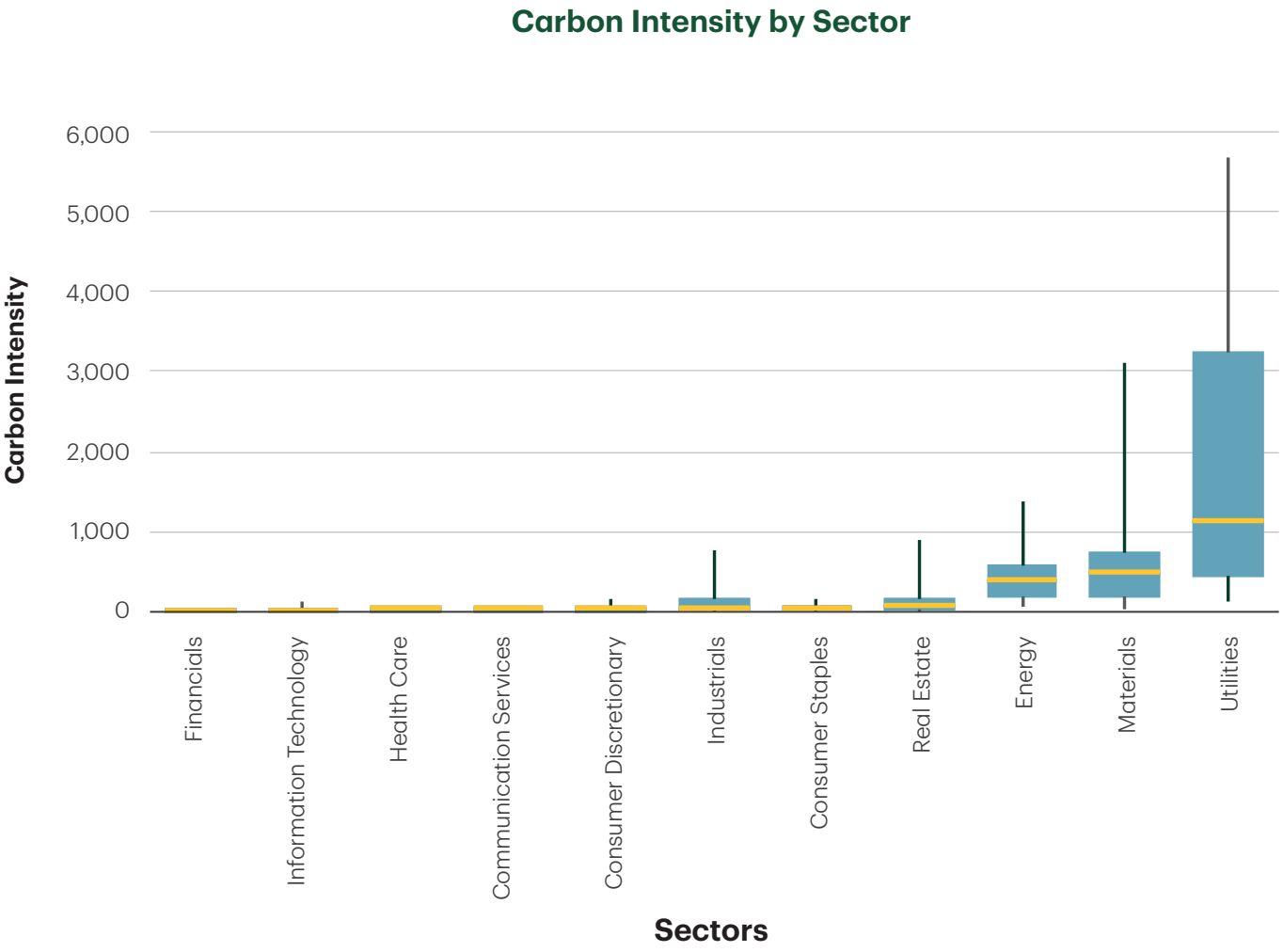
Valuable

[1] The Greenhouse Gas Protocol (GHGP) is a comprehensive, global, standardized framework for measuring and managing greenhouse gas emissions, born out of a relationship between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

[2] Task Force on Climate-related Financial Disclosures (2017), Recommendations of the Task Force on Climate-related Financial Disclosures, Final Report, June 2017.

The chart below **(Figure 1)** shows the distribution of carbon intensity values for the companies of each sector in the MSCI World Index. For each sector, the box plot displays the median (orange line), the quartiles as well as the 1% and 99% quantiles of the carbon intensity distribution. Intuitively, the most carbon intensive companies are found in the Utilities, Materials and Energy sectors. The Utilities sector shows the largest dispersion in carbon intensity values, reflecting the heterogeneity in electricity generation asset mixes (from thermal coal and natural gas to wind and solar). The distribution of companies in the Materials sector is also skewed upward due to cement and other construction material manufacturers.

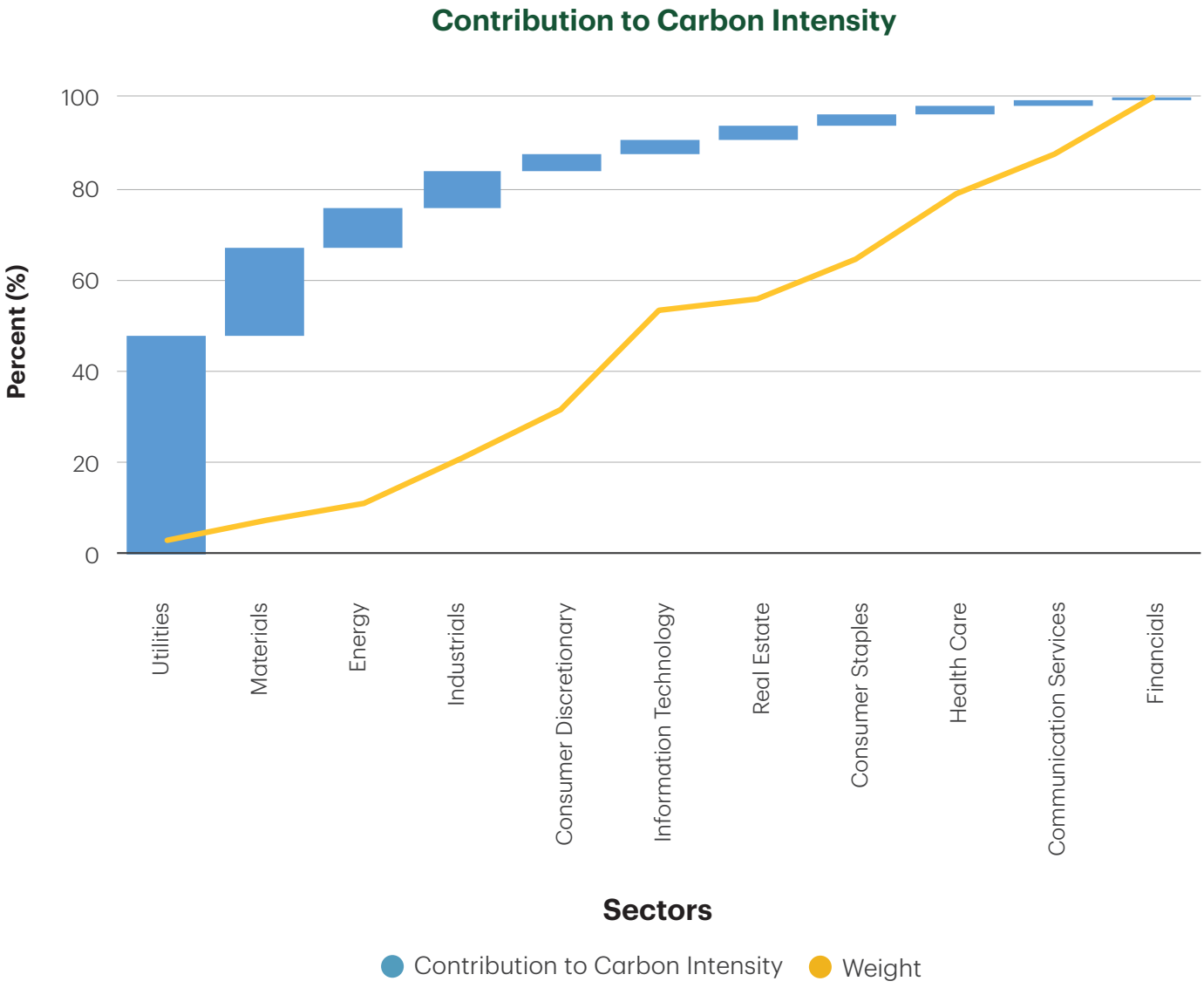
Figure 1: Distribution of carbon intensity by sector for the MSCI World Index (as of Jun-2020).



As of June 30, 2020. Source: MSCI, Sustainalytics, TDAM

The next chart **(Figure 2)** shows the contribution by sector to the weighted-average carbon intensity of the MSCI World Index. Naturally, the Utilities, Materials and Energy sectors stand out again. Together, these 3 sectors make up less than 11% of the market capitalization of the index but more than 75% of its carbon intensity. A divestment strategy directed solely at the energy sector may decrease one's fossil fuel exposure but is unlikely to do much for decarbonization (i.e. lowering the carbon footprint). In fact, we argue that it could even end up increasing the overall carbon intensity of the portfolio should the divested amounts be reallocated to more carbon intensive sectors such as Utilities and Materials.

Figure 2: Contribution to the Carbon Intensity of the MSCI World Index (as of June 30, 2020).

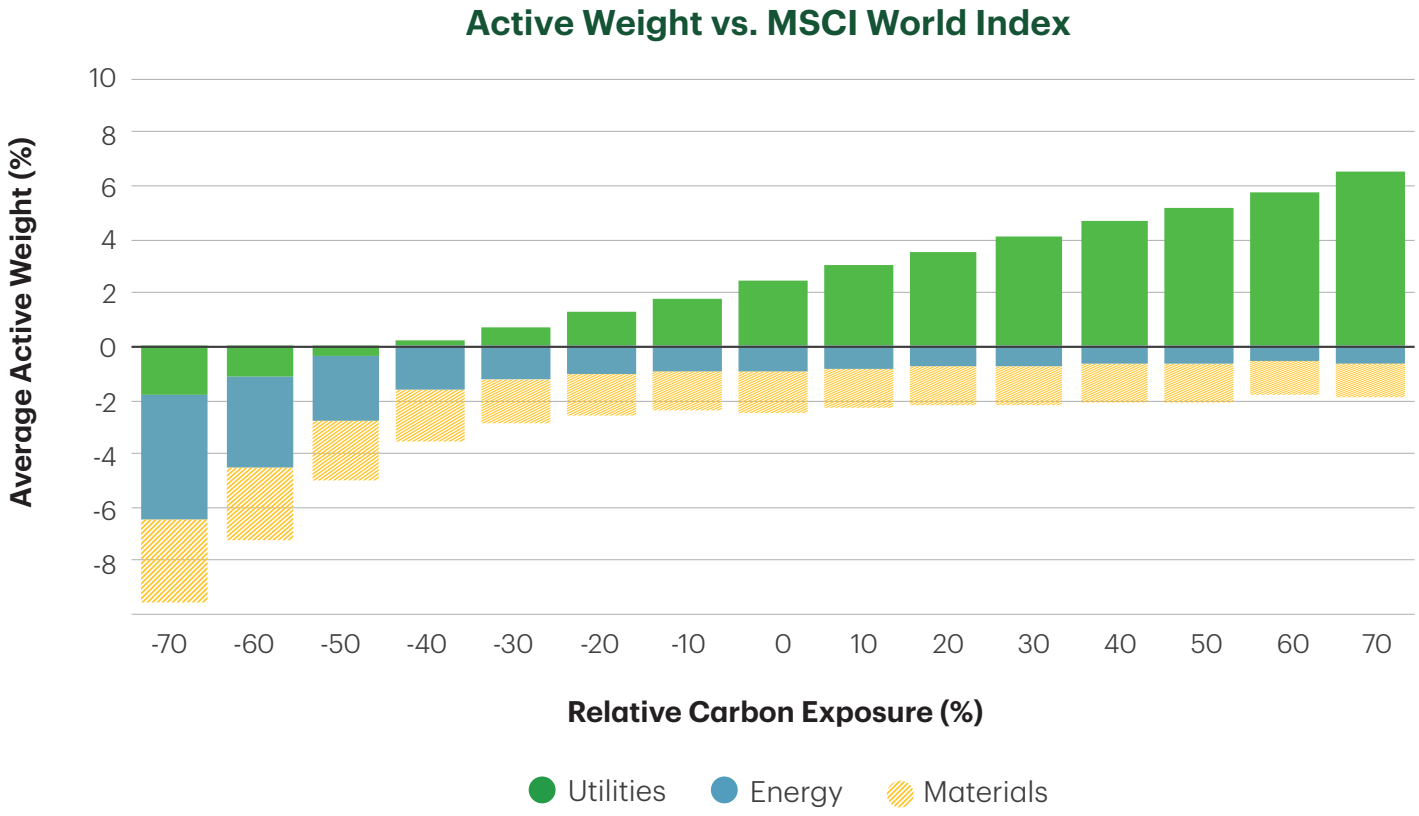


As of June 30, 2020. Source: MSCI, Sustainalytics, TDAM

Low Carbon, Low Volatility

The carbon footprint of a given portfolio is highly contingent on its exposure to the Energy, Materials and Utilities sectors. Though traditional low volatility strategies typically have limited exposure to the first two sectors, the same cannot be said for Utilities. Indeed, Utilities is a low risk, non-cyclical sector that is often the largest overweight position in many low volatility strategies. **Figure 3** shows the average active weight (vs. the MSCI World Index) of low volatility portfolios for various degrees of relative carbon exposure[3]. In this illustration, relative carbon exposure is defined as the percentage difference between the carbon intensity of a strategy and that of the parent index. For example, a relative carbon exposure of 0% is simply equal to the carbon intensity of the MSCI World Index, while a relative carbon exposure of +70% (-70%) is equal to a carbon intensity 70% higher (lower) than the index.

Figure 3: Average active weight of the Utilities, Energy and Materials sectors relative to the MSCI World Index by relative carbon exposure from Dec-2010 to Jun-2020.



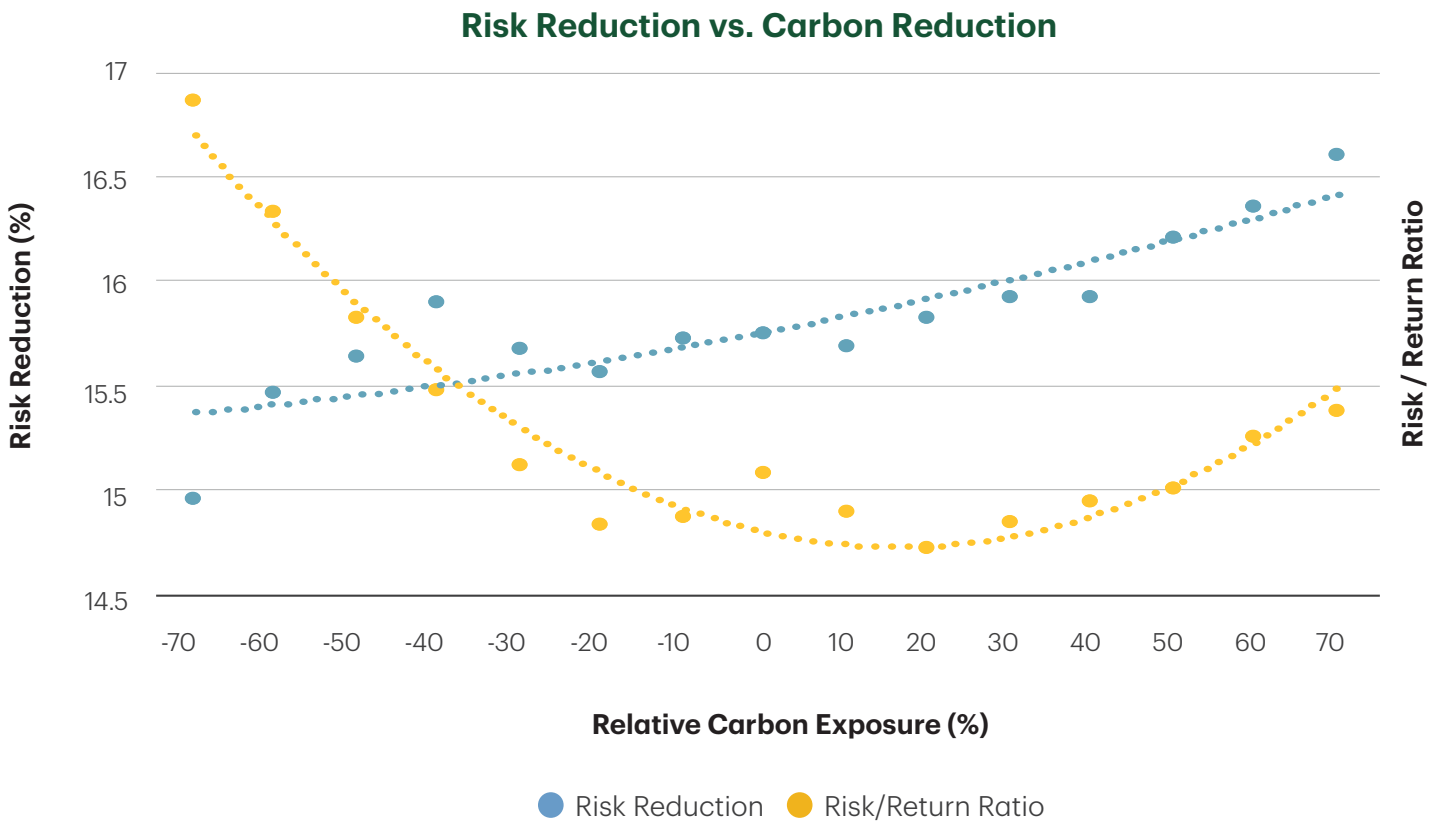
As of June 30, 2020. Source: MSCI, Sustainalytics, TDAM

Unsurprisingly, the more we constrain the carbon exposure of the low volatility portfolios, the more we constrain the weight of Utilities. Furthermore, we also constrain exposures to the second and third most carbon intensive sectors, Materials and Energy, but to a lesser extent as low volatility strategies do not typically invest as heavily in these more cyclical sectors in the first place.

[3] The analysis is based on back-tested simulations for the period Dec-2010 to Jun-2020 using the same sector and country constraints as the TD Emerald Low Volatility Global Equity Pooled Fund Trust and round-trip transaction costs of 30 bps.

Figure 4 displays the relationship between risk reduction and relative carbon exposure. As with **Figure 3**, we see a progression from lower carbon exposure (up to 70% less) to higher carbon exposure (up to 70% more) relative to the index as we move from left to right.

Figure 4: Risk reduction (vs. MSCI World Index) of low volatility portfolios as a function of their relative carbon exposure (Dec-2010 to Jun-2020).



As of June 30, 2020. Source: MSCI, Sustainalytics, TDAM

Fortunately, the reduction in carbon intensity (and therefore in the percentage invested in Utilities) has virtually no bearing on the overall risk profile of the low volatility strategies over the sample period. And while we do see a positive relationship between risk reduction and relative carbon exposure, the relationship is remarkably weak (roughly a 2.5% drop in risk reduction from the most carbon intensive portfolio to the least carbon intensive portfolio). Moreover, lowering the carbon intensity of the various low volatility strategies helped risk-adjusted performance as many carbon intensive stocks (Energy stocks, in particular) posted relatively low returns over the simulation period.

Conclusion

In this article, we showed that low carbon investing can go hand in hand with low volatility investing. After all, both are about risk mitigation. Managing exposure to Utilities is key to decreasing the carbon intensity of low volatility portfolios. We demonstrated that a meaningful reduction in the carbon intensity of a portfolio is not incompatible with risk reduction. Indeed, the carbon intensity of a low volatility portfolio can be reduced sharply without materially sacrificing the defensiveness of the strategy. ■

Conclusion

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