

## Investment viewpoint

## Risks and benefits of low-carbon investing: a new equity factor?

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January 2023

### Need to know

- In simple terms, a low-carbon investment strategy involves penalising companies with high emissions. The year 2022 was a good example of how things can go wrong with such a portfolio
- Our analysis shows that the way such strategies are implemented can make a huge difference – in fact, an alternative low-carbon portfolio formed on a sector-neutral basis performed exceptionally well last year
- In this note, we investigate the risks and returns of low-carbon investing and address whether low carbon is a new equity factor

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### Implementation matters

The climate transition increasingly dominates the investment landscape as fund managers focus on sustainability themes. Low-carbon investing is an early approach that addresses climate risks in a systematic way.

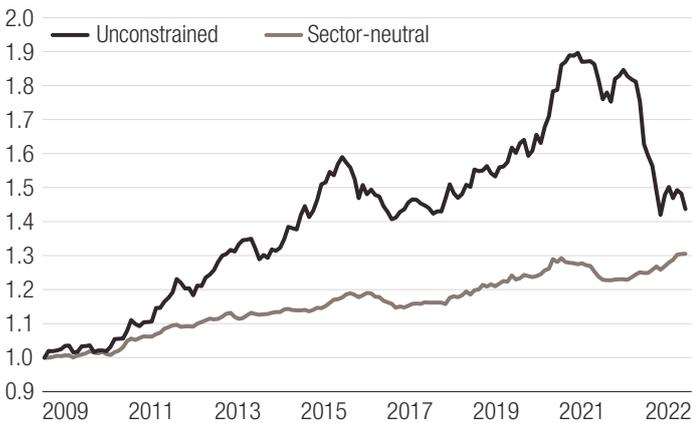
In simple terms, a low-carbon strategy involves penalising companies with high greenhouse gas (GHG) emissions and favouring those with low emissions. Since GHG emissions are directly related to the scale of the business, it has become standard practice to compare companies with respect to the intensity of their GHG emissions rather than their absolute footprints. Carbon intensity – a ratio of GHG emissions to USD revenues – reflects the emissions required to generate a dollar of revenue.

The carbon intensity of a company depends on the nature of its business. Consequently, integrating carbon intensity into equity portfolios will result in a permanent underweight of some sectors, particularly Energy. While Energy is clearly at risk from the climate transition, the sector bias exposes the portfolio to macro risks, which may hurt performance.

The year 2022 offered a good example of how things can go wrong. Figure 1 shows the performance of a hypothetical low-carbon equity portfolio built using carbon-intensity<sup>1</sup> measures. This portfolio generated a decent performance over the past decade but experienced a sharp drawdown last year of as much as four times its annualised volatility. The macro environment of 2022 was marked by skyrocketing commodity prices, which were particularly beneficial for carbon-intensive sectors.

<sup>1</sup> Carbon intensity is based on GHG emissions, including direct emissions (scope 1 and 2) and indirect emissions (upstream scope 3) attributed to direct suppliers.

The portfolio used is for illustrative purposes and does not reflect any of our products.

**FIG 1. PERFORMANCE OF A HYPOTHETICAL LOW-CARBON EQUITY PORTFOLIO**

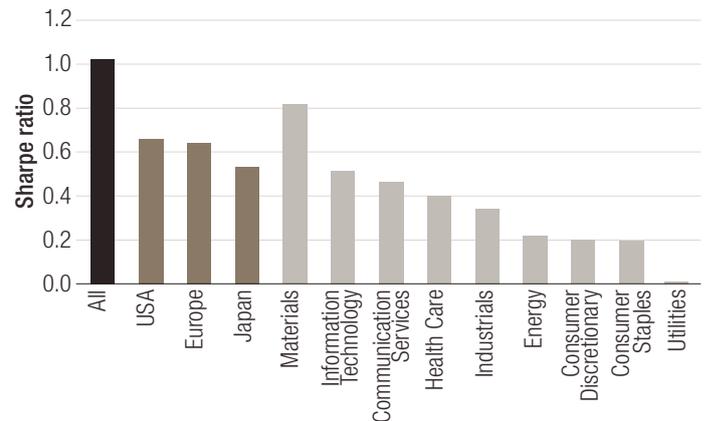
The performance of the long/short portfolio is based on the MSCI World, with weights proportionate to carbon-intensity scores<sup>2</sup> and rebalanced monthly. For the unconstrained portfolio, the score is built by ranking the carbon intensity within each geographical region. For the sector-neutral portfolio, the ranking is done within each GICS level 3 sector. Financials and Real Estate are excluded. Source: Trucost, LOIM.

Figure 1 further shows the performance of an alternative low-carbon portfolio formed on a sector-neutral basis. This ensures that the portfolio does not have any sector biases affecting companies within the same type of economic activity. The difference in the most recent performance is striking. Contrary to the unconstrained portfolio, the sector-neutral one enjoyed an exceptional performance, with 2022 being the third best year since 2009.<sup>3</sup>

An important lesson we can learn from this short analysis is that the way a low-carbon strategy is implemented can make a huge difference. Of course, the stable performance of the sector-neutral implementation catches our attention. It begs the question: is low carbon a new factor? In this note we hope to provide some answers.

### Performance attribution

The first thing to check is the consistency of the low-carbon strategy performance across sectors and regions. Figure 2 shows the Sharpe ratios of the 'carve-outs' of the low-carbon portfolio<sup>4</sup> for each broad sector<sup>5</sup> and major geographical regions. We note a quite similar performance across the three regions. Risk-adjusted returns vary across sectors but, most importantly, all of them are positive. The best-performing sector is Materials. Surprisingly, IT and Communication Services are also among the top.

**FIG 2. PERFORMANCE ACROSS REGIONS AND SECTORS FROM JANUARY 2010 – NOVEMBER 2022**

Source: Trucost, LOIM.

It is common in academic literature to take any evidence of a positive premia with a grain of salt. A portfolio formed on measurable stock characteristics may have exposures to known risk premia or factors; therefore, its performance will be driven by factor returns. Before we engage in a factor-based analysis, let us first eliminate one explanation for the low-carbon performance.

Division by revenues in the definition of the carbon intensity may automatically result in a spurious negative correlation between the carbon intensity and revenues. As a consequence, excess performance of low-carbon stocks might be seen as a mere reflection of the outperformance of stocks characterised by high revenues. We quickly dismissed this possibility after noting that the correlation between carbon intensity and revenues scores in fact tends to be slightly positive.

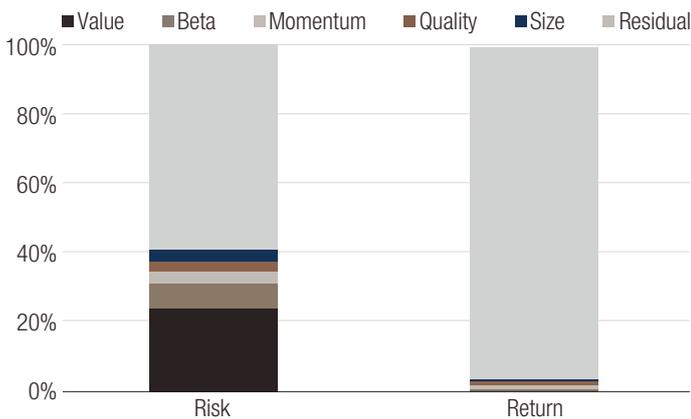
Our objective now is to check the residual performance of the low-carbon portfolio after controlling for its persistent exposures to known equity factors. The best tool for this study is the time-series regression of portfolio returns on returns of single-factor portfolios. For this study, we built five factor portfolios using a single stock characteristic per factor: Book-to-Price (Value), Return-on-Equity (Quality), 12-month Return (Momentum), Market Capitalisation (Size), and Market Beta (Beta). For consistency, we formed each factor portfolio in the same way that we built the low-carbon portfolio.

<sup>2</sup> Companies with lower carbon intensity receive higher scores.

<sup>3</sup> The period of observations ends on 20 November 2022.

<sup>4</sup> In the rest of the note we will study sector-neutral implementation.

<sup>5</sup> GICS 1 sector. We excluded Financials and Real Estate.

**FIG 3. DECOMPOSITION OF RISK AND PERFORMANCE**

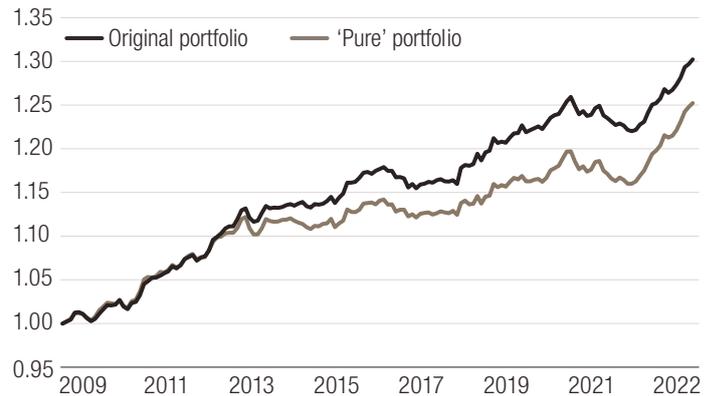
The period from January 2010 to November 2022. Source: Trucost, WorldScope, LOIM.

Figure 3 shows ex-post risk and return decomposition of the low-carbon portfolio performance. We note that factor exposures account for as much as 40% of the portfolio risk. Value is the dominant factor due to a strong negative exposure of the low-carbon portfolio to Value. Importantly, while factors explained a large part of the variation in portfolio returns, they did not contribute to the overall performance.

Carbon intensity may naturally interact with other fundamental metrics not directly related to carbon emissions. Intuitively, GHG emissions largely result from the use of physical assets. Therefore, we may expect a tendency of companies with a lower carbon intensity to have a higher ratio of revenues to physical assets, known as PP&E<sup>6</sup> turnover. Indeed, over the period observed, the average cross-sectional correlation between carbon intensity and PP&E turnover scores was as high as 0.26. While PP&E measures the stock of physical capital, a ratio of revenues to depreciation and amortisation, and a ratio of revenues to capex reflect the intensity of the use of physical assets. These two ratios tend to exhibit meaningful correlations with carbon intensity as well.

To account for the possible interaction effect, we formed a 'pure' version of the low-carbon portfolio that has no interaction with the three fundamental ratios mentioned above. Specifically, at each rebalancing date, we mixed the low-carbon portfolio with a linear combination of the portfolios formed on the three ratios to hedge away any holding-based correlations.<sup>7</sup> As a final touch, to account for possible factor biases, we performed the factor-based attribution of the pure low-carbon portfolio.

In comparing the original and the pure portfolios in Figure 4, we note that removing interactions diminishes the performance, while far from eliminating all of it.

**FIG 4. ACCOUNTING FOR INTERACTIONS**

Original portfolio is the residual performance of the low-carbon portfolio shown in Figure 3. Pure portfolio is the residual performance of the low-carbon portfolio 'purified' from interactions with three fundamental ratios measuring the turnover of the physical capital and the intensity of its use. Source: Trucost, WorldScope, LOIM.

### Is there any steam left?

Thus far we have not been able to fully explain the low-carbon performance by exposures to traditional factors or interactions of carbon intensity with other fundamental metrics. This result (or the lack of one) points to the existence of positive risk premia in low-carbon stocks, which is still to be explained. Economic intuition would suggest that low-carbon stocks are less exposed to the climate transition, hence there should be no risk to be rewarded. On the contrary, high-carbon stocks are more likely to benefit from the risk premia if the market is actively pricing it.

One possible explanation for the outperformance of low-carbon stocks that does not involve the existence of risk premia is a rise in their relative valuations. As investors have become more concerned with the risks of the climate transition, these risks have been gradually priced in by the market, therefore driving up valuations of the low-carbon stocks. If this is the case, then it might be too late to jump on the low-carbon train as there is no more steam left.

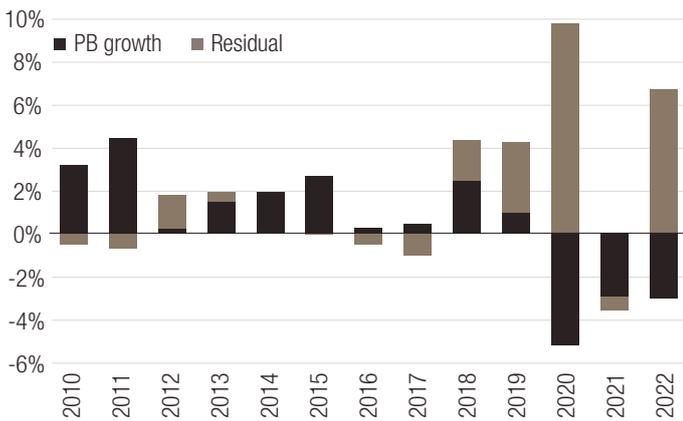
As we noted in our factor attribution study, low-carbon stocks indeed tend to be negatively exposed to the Value factor – in other words, more expensive. However, this observation alone tells us nothing about the impact of rising valuations. A more direct analysis is done in Figure 5, which provides the decomposition of yearly returns of the low-carbon portfolio into the valuation increase (growth of its PB ratio<sup>8</sup>), and the residual.

We observe that low-carbon stocks have been favoured by investors. Until recently, the portfolio performance was driven largely by the excess growth in valuations of low-carbon stocks.

<sup>6</sup> Property, Plant and Equipment.

<sup>7</sup> The coefficients of the linear mix were chosen such that the pure low-carbon portfolio is the least distant from the original one as measured by the sum of squared differences in weights.

<sup>8</sup> Since the portfolio is a long-short one, we compute the difference in PB growth of the long and the short leg.

**FIG 5. EFFECT OF INCREASED VALUATIONS**

The decomposition of yearly returns of the low-carbon portfolio into PB growth (valuation increase) and the residual. Source: Trucost, WorldScope, LOIM.

Surprisingly, however, during the last three years, the valuation effect turned sharply negative, while the residual performance became dominant. It is obviously too early now to speculate on what is behind this sudden change in the performance profile. What we can say for sure is that the performance of low-carbon stocks is no longer driven by the build-up in valuations.

### The missing piece

Carbon emissions considerations are now widely adopted by portfolio managers in response to the climate transition. In this note we investigated the risks and returns of low-carbon investing.

On the risk side, we emphasised that carbon investing without a control for sector allocations results in significant sensitivities to macro risks that were clearly realised last year. Incorporating carbon intensity into portfolios may also introduce meaningful exposures to equity factors. We noted a consistent negative exposure to Value, which along with other factors accounts for as much as 40% of the risk of a hypothetical low-carbon portfolio.

On the return side, we highlighted a consistent outperformance of low-carbon stocks, which holds after controlling for factor exposures and interactions with other fundamental ratios. We argued, however, that this outperformance could be largely attributed to increased relative valuations of low-carbon stocks. The most recent outperformance is still surprising given that the valuation effect worked against low-carbon stocks.

Based on the provided evidence, we are not yet ready to claim the existence of the low-carbon factor. From an economic point of view, we still need to find a rationale behind the risk premia in low-carbon stocks, which remains the most important missing piece of the puzzle.

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