Insights
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# Climate Data Nuances in Equity Index Portfolios

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In our recent paper, "Weathering the Storm: Exploring Climate Strategies," we explored the main approaches to integrating climate considerations in investment portfolios.

In this article, we dive deeper and look at some nuances in climate data that need to be considered prior to implementation of climate objectives in equity index portfolios.

Figure 1 shows the various climate metrics used in equity portfolio construction at State Street Global Advisors.

Figure 1
**State Street Global Advisors' Climate Metrics**[1]

| | Climate Risks | | | Climate Opportunities | |
|---|---|---|---|---|---|
| **Dimensions** | **Carbon Emission Intensity** | **Fossil Fuel Reserves** | **Brown Revenues** | **Green Revenues** | **Adaptation/ Resilience** |
| **Description** | Rate of carbon emissions relative to company revenues | Carbon footprint that could be generated if reserves are burned | Revenues from extraction or power generation of sources like oil, coal, and natural gas | Revenues from green goods, products, and services | Extent to which companies recognise climate risks and are prepared to respond |
| **Metrics** | $CO_2$ emissions per $m revenues | Fossil Fuel Total Reserves $CO_2$ Emissions (metric tons) | % revenues from extractives activities | % revenues from low-carbon tech | Score on climate change preparedness, (scaled 0–1) |
| **Data Provider** | S&P TruCost | S&P TruCost | S&P TruCost | FTSE Russell | ISS-ESG |

Source: State Street Global Advisors, as of March 31, 2022.

## Climate Data Characteristics

Let's take a deeper look at the unique data characteristics of climate data, focussing on the sector distribution. To start with, some high-level observations:

- Climate data is highly skewed and concentrated in a small number of names.
- It is also concentrated in a few sectors of the economy. For example, the utilities, materials and energy sectors account for the majority of carbon intensity, fossil fuels and brown revenues.
- Some metrics exhibit a size bias. Larger companies tend to have a better adaptation score.
- Due to regional differences in sector compositions, climate profiles also vary across regions. For example, there is a large weight of energy companies in the UK and materials companies in Australia.

In this article, we focus on the first two points above.

The table below shows descriptive statistics of climate data for the MSCI World index as at 31 March 2022.

Figure 2
**Climate Metrics in MSCI World Index**

| MSCI World Index (31 March 2022) | Carbon Intensity | Fossil Fuels* | Brown Revenues* (%) | Green Revenues* (%) | Adaptation Score* |
|---|---|---|---|---|---|
| # Non-zero | 1,539 | 38 | 112 | 161 | 1432 |
| Mean (%) | 257.6 | 1,933.4 | 31 | 28 | 0.6 |
| Std Dev (%) | 639.6 | 2,014.5 | 32 | 34 | 0.3 |
| Min (%) | 1.8 | 153.7 | 0 | 0 | 0.0 |
| 25% | 22.1 | 451.1 | 6 | 4 | 0.4 |
| Median (%) | 61.2 | 1,036.7 | 19 | 12 | 0.6 |
| 75% | 171.3 | 2,792.9 | 43 | 44 | 0.9 |
| Max (%) | 8,377.2 | 6,820.3 | 100 | 100 | 1.0 |

* Statistics are based on non-zero observations only.
Data as at 31 March 2022. Source: Trucost, FTSE Russell and ISS ESG.

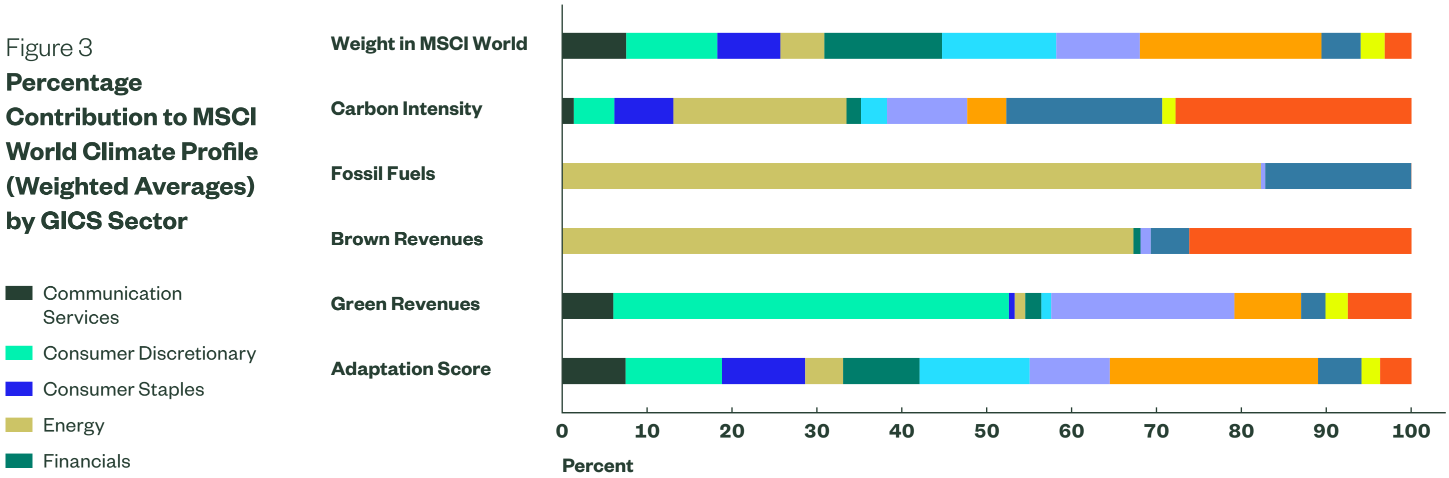
Notice the small proportion of companies that have non-zero scores for fossil fuels, brown revenues and green revenues. Out of approximately 1,600 companies, only about 2% own fossil fuel reserves, and about 10–12% possess green or brown revenues. This concentration is a unique characteristic of climate data.

Next, looking at carbon intensity, the median value is about 61, the mean is about 256 and the maximum is 8,377. The mean carbon intensity is significantly higher than the median. This is an example of the extreme skewness pointed out earlier and it has interesting implications for portfolio construction.

Since carbon intensity, fossil fuels and brown revenues are concentrated in a few names, it is relatively easy to achieve large improvements with low tracking error impact. On the other hand, for green revenues, it is difficult to get large improvements without sacrificing diversification.

Next, we look at sector concentrations and distribution of climate data across sectors. Figure 3 shows the weight of different sectors in the MSCI World index, as well as the percentage contributions to the climate profile of the overall index by GICS sector.

Figure 3
**Percentage Contribution to MSCI World Climate Profile (Weighted Averages) by GICS Sector**




Data as at 31 March 2022. Source: Trucost, FTSE Russell and ISS ESG.

- The three worst polluting sectors: energy, materials and utilities (combined index weight of 13%), contribute 67% of the benchmark weighted average carbon intensity (WACI) and nearly 98% of brown revenues.
- Similarly, fossil fuels are almost all concentrated in the energy and materials sectors. In addition, only five companies account for about 65% of the index fossil fuels score and only 10 companies account for about 90% of the index fossil fuels score.
- The utilities sector (with an index weight of 3%) contributes 28% of the WACI, 26% of brown revenues, and 7.5% of green revenues, making it a critical sector when implementing climate objectives.

Figure 4 presents descriptive statistics for the MSCI World index, this time divided into quintiles based on carbon intensity.

Figure 4
**Climate Metric Averages per Carbon Quintile in MSCI World Index**

| Climate Metric Averages | Quintile 1 | Quintile 2 | Quintile 3 | Quintile 4 | Quintile 5 |
|---|---|---|---|---|---|
| Carbon Intensity | 1,046.45 | 140.97 | 60.68 | 29.46 | 9.57 |
| Fossil Fuel Reserves | 214.17 | 24.37 | 0.00 | 0.00 | 0.00 |
| Brown Revenues (%) | 0.10 | 0.01 | 0.00 | 0.00 | 0.00 |
| Green Revenues (%) | 0.06 | 0.04 | 0.03 | 0.01 | 0.00 |
| Adaptation Score | 0.68 | 0.59 | 0.48 | 0.54 | 0.40 |

Data as at 31 March 2022. Securities are sorted based on carbon intensity and divided into quintiles with equal number of securities and securities are equal-weighted within each quintile. Quintile 1 represents the worst 20% carbon emitters and Quintile 5 represents the best 20% carbon emitters. Source: Trucost, FTSE Russell and ISS ESG.

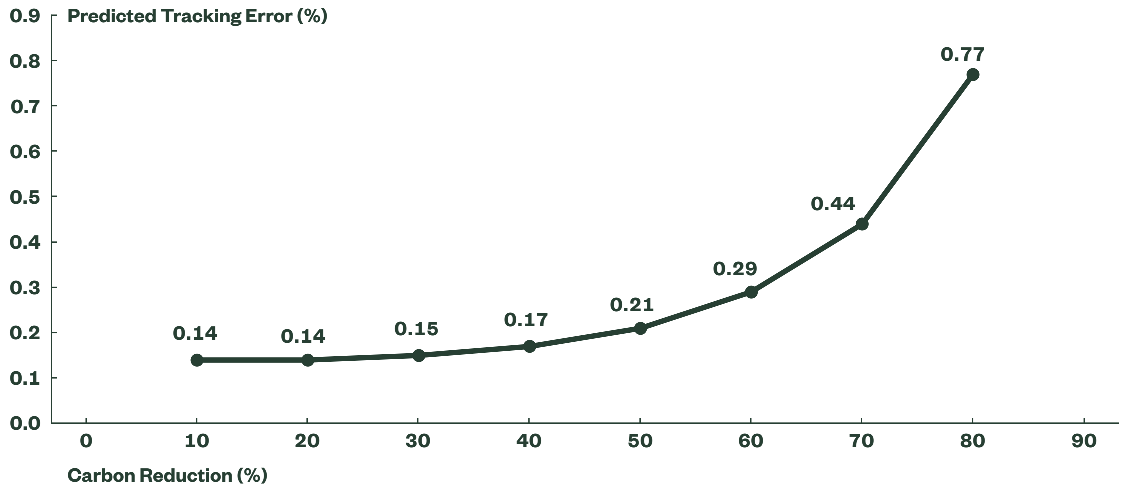
As we would expect, we see that the top carbon emitters also own large amounts of fossil fuels and derive a large proportion of revenues from brown sources. Interestingly, however, we see that quintile 1 (worst emitters) also has the highest concentration of green revenues and adaptation score metrics. This is a clear indication that companies that are currently amongst the worst emitters are often also the same ones that understand that evolving their business models and adapting to climate change is important.

The concentration and skewness of climate data means that sector limits need to be tightly monitored in any index or index-enhanced strategy that seeks to target climate exposures. If this is lacking, we risk losing exposure to critical sectors in the economy, as well as climate investment opportunities.

## Incorporating Carbon Reduction Objectives

In this section, we look at the impact of incorporating carbon reduction objectives on the tracking error and diversification properties of a hypothetical portfolio built using the Axioma portfolio optimization engine. Figure 5 shows the impact of carbon reduction targets on predicted tracking

Figure 5
**Predicted Tracking Error vs. MSCI World Index at Different Levels of Carbon Reduction**

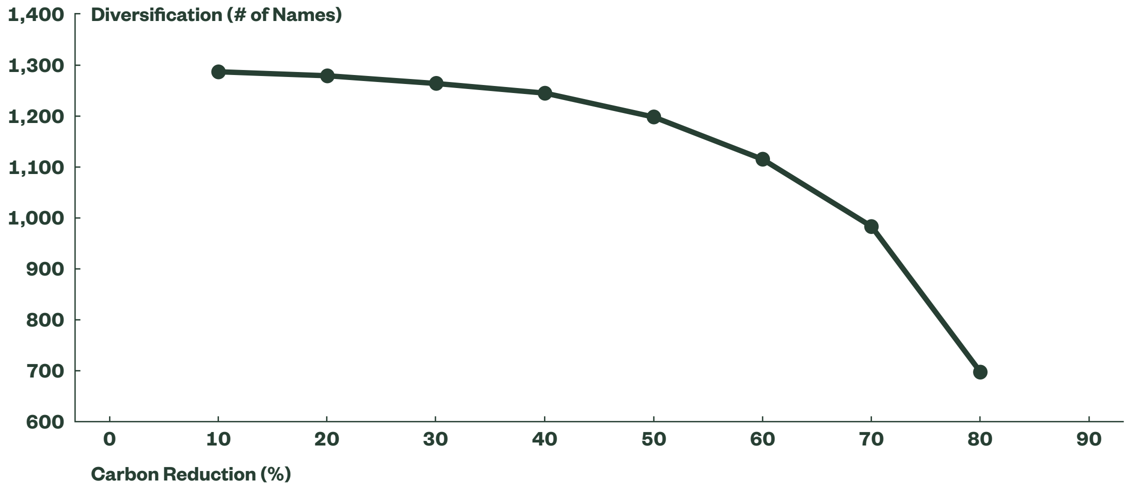



Data as at 31 March 2022. Predicted Tracking Error is an estimate based on certain assumptions and analysis made by State Street Global Advisors/Third Party. There is no guarantee that the estimates will be achieved. Source: State Street Global Advisors. The results shown represent current results generated by the Axioma model. The results do not reflect actual trading and do not reflect the impact that material economic and market factors may have had on State Street Global Advisors' decision making. The results shown were achieved by means of a mathematical formula, and are not indicative of actual future results, which could differ substantially.

error vs. the MSCI World index.
As the chart shows, based on a hypothetical portfolio, a significant amount of carbon reduction can be achieved for a relatively low amount of tracking error — we achieve 50% weighted average carbon intensity (WACI) reduction with only 21bps of tracking error,[2] while 70% WACI reduction can be achieved with only 44bps of tracking error. The trade-off does tends to become more convex at higher levels of carbon reduction targets, with the marginal cost of additional carbon reduction becoming ever higher the further along the curve we are.

Figure 6 shows the impact of these same carbon reduction goals on the number of names held by the hypothetical portfolio. As targets become more aggressive, the portfolio will become more concentrated and hold fewer names — ranging from 1,287 names at 10% WACI reduction to 983 names at 70% reduction. For comparison, the MSCI World universe consists of 1,539 names as at 31 March 2022.

Figure 6
**Number of Names Held in the Hypothetical Portfolio at Different Levels of Carbon Reduction**

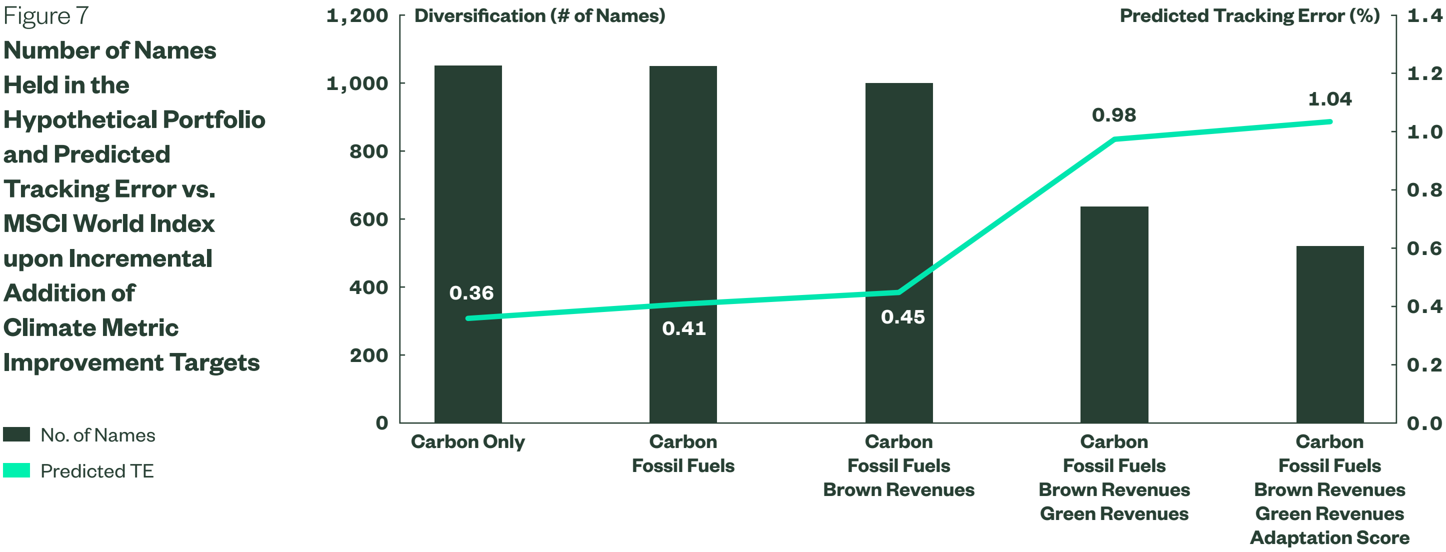



Data as at 31 March 2022. For comparison, the MSCI World index consists of 1,539 names as at 31 March 2022. The index results referred to are provided exclusively for comparison purposes only. It should not be assumed that they represent the performance of any particular investment. Source: State Street Global Advisors. The results shown represent current results generated by the Axioma model. The results do not reflect actual trading and do not reflect the impact that material economic and market factors may have had on State Street Global Advisors' decision making. The results shown were achieved by means of a mathematical formula, and are not indicative of actual future results, which could differ substantially.

## Incorporating Multiple Climate Objectives

In this final section, we look at the impact of targeting multiple climate objectives in the same portfolio construction. Figure 7 shows the effects of incrementally adding one additional climate target to the hypothetical portfolio.

Figure 7
**Number of Names Held in the Hypothetical Portfolio and Predicted Tracking Error vs. MSCI World Index upon Incremental Addition of Climate Metric Improvement Targets**




Data as at 31 March 2022. Targets are as follows: Carbon intensity reduction: 65%, Fossil fuels reduction: 90%, Brown revenues reduction: 90%, Green revenues improvement: 300% and Adaptation Score standardized score improvement: +0.25. Diversification does not ensure a profit or guarantee against loss. Source: State Street Global Advisors. The results shown represent current results generated by the Axioma model. The results do not reflect actual trading and do not reflect the impact that material economic and market factors may have had on State Street Global Advisors' decision making. The results shown were achieved by means of a mathematical formula, and are not indicative of actual future results, which could differ substantially. Predicted Tracking Error is an estimate based on certain assumptions and analysis made by Axioma and State Street Global Advisors. There is no guarantee that the estimates will be achieved.

We see that the incremental effect of targeting brown revenues and fossil fuel reduction is negligible. This is because of the positive correlations between the three data points — carbon emission intensity, fossil fuel reserves and brown revenues.

However, as alluded to earlier, it becomes more challenging to add a green revenues target, and especially more so for aggressive improvements. This is because the very same companies that perform poorly on carbon emissions are also the ones evolving their business models and adapting to climate change. We see the impact on portfolios clearly — adding a green revenues improvement target sharply decreases the number of names held in the portfolio, as well as increasing the tracking error required drastically.

## Conclusion

As climate investing becomes mainstream, it is important to understand the underlying data characteristics and implications for portfolio construction. In particular, it is necessary to account for the skewness, concentration and sector biases that are inherent in climate data inputs in a way that does not sacrifice broader investment opportunities and portfolio goals like diversification.

State Street's deep understanding of the climate data landscape enables us to provide a diverse set of climate integration solutions. In the equity indexing space, our proprietary Low Carbon and Sustainable Climate investment solutions tackle these complex issues and are available to investors seeking to mitigate risks or take advantage of opportunities related to climate investing.

## Endnotes

1 We are continually reviewing our data inputs and are committed to implementing changes where needed.

2 As measured by the Axioma Worldwide v4 Medium Horizon Fundamental Risk Model.

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- Build from breadth
- Invest as stewards
- Invent the future

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