

MEASURING CARBON RISK WITH THE DISCIPLINED ALPHA PI METRIC



AUTHORS

The Loomis Sayles Disciplined Alpha team

WE HAVE DEVELOPED AN APPROACH TO ASSESS GREENHOUSE GAS RISK IN OUR DISCIPLINED ALPHA BOND PORTFOLIOS. DERIVED FROM OUR EXISTING CREDIT PI¹ MEASURE, AND COMBINED WITH THIRD-PARTY CARBON IMPACT RISK MEASURES, THESE WILL BE USED TO MONITOR, ADJUST AND REPORT CARBON RISK IN OUR STRATEGIES.²

¹ PI is a proprietary risk-adjusted duration measure. Durations are calculated by the Disciplined Alpha team using their own internal methodologies and may result in different calculations than are used by other investment teams at Loomis Sayles and by third parties.

² Following common practice, we use the shorthand “carbon” to refer to the various greenhouse gases (including carbon dioxide, methane and CFCs) identified as primary anthropogenic climate change drivers.



Carbon Risk and PI

Loomis Sayles and the Disciplined Alpha team believe the international response to climate change will have significant effects on investment portfolios in the coming years. Governments, businesses and individuals around the world are seeking to limit climate impacts of their activities by reducing emissions of greenhouse gases. The transition to a low-carbon economy will affect global financial markets, potentially in unexpected ways.



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Assessment of climate change risk is an inherent part of the analysis done by our credit research analysts when considering material ESG factors. As we assess fundamental credit quality, risk-adjusted relative value and market technicals in our security selection process, we are factoring in our assessment of climate change risks and opportunities. The industries, companies and sovereign issuers in our investment universe will be affected to varying degrees; how well they plan, prepare, and adapt over time will affect their credit quality.

QUANTITATIVE MEASUREMENT

In addition to this fundamental research, we have incorporated emissions data from third-party providers, allowing us to add quantitative carbon impact estimates to our risk assessment. The number of data providers has increased in recent years, and there has been a proliferation in the amount and types of data available. The specific vendors or metrics that we use for quantitative analysis may evolve in the future, but the underlying purpose will remain the same: to better assess carbon risk at the portfolio level, allowing for more informed portfolio management and risk management decisions.

At the most basic level, we seek a quantitative answer to the following question: are the portfolios we manage underweight or overweight carbon risk compared to their respective benchmarks? More concretely, in an event resulting in negative returns for carbon-exposed issuers, what relative performance would we expect for the portfolios we manage?



CARBON INTENSITY AND RISK

As we noted, there are multiple ways to consider carbon exposure for a company or sovereign issuer. We have chosen to focus on two third-party measures: carbon intensity and carbon risk.

Carbon intensity measures the amount of carbon a company produces as a proportion of sales.³ We use carbon intensity data from MSCI. This data allows for comparison of emissions across companies to better identify outliers. Coverage of the investment grade investment universe is broad at approximately 90%. However, we do not believe that this measure of carbon alone is sufficient. Emissions data is inherently backward-looking and must be estimated if it is not disclosed by the issuer. In addition, carbon emissions data does not incorporate secondary exposure to carbon transition (such as for a bank with risks in its loan portfolio or for an auto company manufacturing internal combustion engines), nor does it consider management actions.

To help remedy these limitations, we use Carbon Risk Ratings from Sustainalytics. This measure assesses carbon exposure from a broader, forward-looking perspective, giving consideration to the carbon exposure of a company's own operations and its products and services. The Carbon Risk Rating overlays an assessment of management action in addressing these exposures, thus measuring an issuer's unmanaged exposure to carbon risk.

INTEGRATING PI

Traditional methods of portfolio analysis weight carbon metrics by market value. This may be useful for addressing some questions, but in our view, it does not produce a very relevant measure of risk exposure. To characterize the risk exposures for a bond, we need to account for how market pricing of these risks can "propagate" through a company's capital structure.

Consider two firms, both involved in the same emissions-intensive industry. The first is relatively well capitalized and its debt trades with typical spreads for an A-rated industrial firm. The second has a more substantial debt load, trading at spreads typical for a low-BBB issuer. While both firms are, in this story, producing the same climate impact per unit of activity (sales, say), the debt of the first has lower carbon risk than the second. The equity holders "own" more of the total carbon impact and the bondholders less than for the second firm. A market repricing of carbon emissions will have a greater effect on the price of the second firm's bonds.

³ Specifically, scope 1 & 2 emissions. See <https://www.epa.gov/climateleadership/scope-1-and-scope-2-inventory-guidance>



As with any other market risk factor, the return impact on an individual bond will typically be approximately proportional to both duration and credit risk. But at the portfolio level this is just what our existing PI risk exposure already measures. Using carbon risk metrics linear⁴ in carbon price or impact, we then have a ready-made risk exposure measure available. We define, for a portfolio or benchmark, its carbon PI as the sum of its constituents' PIs, weighted by their carbon exposure:

$$PI_C = \rho \sum \beta_i w_i c_i D_i \quad \text{where}$$

- β_i is the PI model credit beta of the i-th bond
- w_i is its market value weight in the portfolio
- c_i is its carbon risk exposure
- D_i is its OAD
- ρ is an overall normalization to be determined

If we choose ρ so that the benchmark PI calculated by this formula is 100, we obtain a simple answer to the question, “what will be the relative return impact on a portfolio of a carbon-related market event causing a 100 basis point (bp) excess return to the benchmark?” namely $(PI_C - 100)$ bp.⁵

The relative carbon PI $PI_{CRel} = (PI_C - 100)$ is then the desired measure of relative carbon risk exposure for our portfolio.

(Note: As with all ex-ante risk measures, this is an estimate applicable to an idealized scenario. We would not expect it to be spot-on in a messy real-world instance. We would characterize the deviation as “specific” or “idiosyncratic” return relative to the accompanying market movements.)

⁴ That is, in the same way duration is a linear measure of exposure to interest rates. There are some intensity measures that work differently and would not be suitable here. For example, the Richter earthquake scale is logarithmic, where a unit step on the scale equates to an increase of a factor of about 10 in shaking intensity. A carbon exposure like this would not work for our purpose. But a measure like “carbon output per unit of economic activity” scaled by firm size is linear.

⁵ This is a slightly different convention from our usual PI, where the equivalent calculation would answer the question “what will be the relative return impact of a 100 bp benchmark spread change?” In this case, translating into spread terms does not have an equally natural interpretation.



With this definition, we can calculate carbon PIs for our strategies and analyze portfolio positioning along additional dimensions. From a portfolio perspective, our relative carbon PI indicates the benchmark-relative return risk entailed by exposure to carbon impacts. Reporting capabilities of the Disciplined Alpha risk tool platform allow the team to analyze contributions to portfolio exposure along industry and ticker lines. This can highlight relative concentrations at a detailed level and facilitate further dialogue within the team and with our credit research analysts.

Carbon PI is an addition to our risk measurement framework. As we consider how the world may evolve in the coming years, we are cognizant of the potential for market volatility related to climate-change-driven policies. As always, we continue to leverage the insights of our credit research analysts in assessing the fundamental risk to corporate and sovereign debt issuers. Together with our credit research, the carbon PI framework can enable us to better analyze carbon risk at the portfolio level, fostering more informed portfolio and risk management decisions.

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