Insights
**ESG**

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# Examining the Properties of Forward-Looking Climate Metrics

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Forward-looking metrics that project companies' future climate risks can be crucial tools for market participants seeking to invest not only in firms with strong environmental, social, and governance (ESG) records, but also in firms with solid and carefully constructed plans to improve their ESG performance. In this piece, we present examples of forward-looking climate metrics that can provide a more holistic view of companies' ESG profiles, versus those metrics that solely focus on backward-looking data. Also, we believe forward-looking climate metrics can potentially unveil risks that are not captured in the current climate profiles, or can uncover mispricing opportunities. However, various methods for building ESG portfolios can perform differently depending on which sectors are in or out of favor at a given time.[1]

## Why Forward-looking Climate Metrics?

Backward-looking climate metrics such as carbon emissions, carbon intensity, brown revenues, green revenues, and fossil fuel reserves[2] measure climate performance based on data from prior periods. This standard data can add value when incorporated in investors' portfolios, but it does not depict a complete picture of the company's climate-related risks and opportunities. For example, even a company with a large carbon footprint may be well positioned to avoid regulatory and carbon pricing risks if it's carrying out a credible transition plan. By contrast, a company with a low-carbon footprint still may face significant environmental problems if it's not adequately managing its physical assets. Nonetheless, most climate-aware products and benchmarks rely on backward-looking climate metrics to make investment decisions.[3]

Figure 1 Panel A lists some climate-aware indexes that mostly employ backward-looking metrics. For example, the MSCI ACWI Low Carbon Target Index aims to reflect a lower carbon exposure than the broad market, using two dimensions of carbon exposure: carbon emissions and fossil fuel reserves. These metrics capture a company's *current* carbon footprint. Fossil fuel reserves do express the potential carbon footprint of a company in the future, but it is derived from the fossil fuel reserves a company currently owns.

Figure 1
**Examples of Climate-aware Indexes in Equity Markets**

| **Index** | |
|---|---|
| **Panel A** | **Panel B** |
| MSCI ACWI Low Carbon Target Index | MSCI ACWI Climate Paris Aligned Index |
| S&P® 500 Fossil Fuel Free Index | MSCI Europe Climate Paris Aligned Index |
| MSCI EAFE ex Fossil Fuels Index | MSCI World Climate Paris Aligned Index |

Source: State Street Global Advisors, as of August 31, 2022. For more detail on the MSCI indices, see msci.com. For more detail on the S&P index, see: https://spglobal.com/spdji/en/indices/esg/sp-500-fossil-fuel-free-index/#overview.

Backward-looking carbon metrics contribute useful insights into companies' climate track records and will still have their place in our climate solutions; in some cases, they will work alongside forward-looking metrics. We see value in metrics that project companies' future climate performance. Figure 1, Panel B shows climate-aware indexes that incorporate forward-looking climate metrics.

## Types of Forward-looking Climate Metrics

Forward-looking climate metrics have sprouted so rapidly that investors may face challenges in navigating the new offerings and products. We provide an overview of forward-looking climate metrics available from three climate data providers, and we analyze the relevance of these metrics to three goals: the conventional measurement of risk/opportunity; the capture of mitigation/adaptation dimensions proposed in the Intergovernmental Panel on Climate Change (IPCC) reports; and the evaluation of decarbonization and climate solutions emphasized by the Institutional Investors Group on Climate Change's Paris-Aligned Investment Initiative (PAII) Initiative net-zero[4] investment framework.

State Street Global Advisors partners with more than 50 ESG datasets and we strive to employ the highest-quality ESG and climate data for investment or reporting purposes. Figure 2 summarizes some representative forward-looking climate data metrics from three climate data providers: MSCI, Institutional Shareholder Services (ISS) ESG, and S&P Trucost. The metrics in Figure 2 cover a wide range of topics, from the financial impact of climate-related risks and opportunities, to net-zero alignment and implied temperature, to risk assessment on physical risks or transition risk. For more detailed information on the metrics available by data provider or by theme, please refer to the Appendix.

Figure 2
**Overview of Forward-Looking Climate Metrics**

| Data Metrics | Description |
|---|---|
| **Climate Value at Risk** | Aims to quantify the company's earnings or value at risk due to climate-related risks (and opportunities) from certain vendors. |
| **Scenario Alignment (and Implied Temperature Associated)** | Aims to provide an indication of how companies align to certain global climate targets. It can take a binary or categorized form of description of the alignment status, an overshoot/undershoot percentage ratio, or degrees Celsius estimate of the global implied temperature rise if the whole economy had the same carbon budget overshoot/undershoot level as the company in question. |
| **Physical Risk** | Aims to provide an assessment of the company's exposure to physical risks related to climate change, and may take the form of risk rating scores or quantified financial impact. |
| **Transition Risk** | Aims to assess the company's risk related to transitioning to a low-carbon economy, such as policy risk or carbon pricing risk. |

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

## Forward-looking Climate Metrics Under the Lens of Risk and Opportunity

### Metrics Addressing Climate Risks

First, some of the most valuable climate metrics are those that can assess the environmental risks and opportunities of a particular firm. On the risk side, investment strategies have various criteria for risk depending on their objectives and construction methodologies. For example, portfolio return volatility may be one relevant risk indicator for a strategy that seeks to minimize the variance in strategy performance. Or, tracking error may be one risk indicator for a strategy that seeks to closely track its underlying benchmark. For climate-aware strategies, risk indicators may include the adverse impacts on securities' valuation resulting from climate-related risks, such as physical risk, carbon pricing risk, policy risk, and other transition risk.

### Metrics Addressing Climate Opportunities

On the other side of the equation, the opportunities borne out of the global transition to a low-carbon economy can also be important, depending on a strategy's objectives. However, as shown in Figure 3, few data metrics have been developed to evaluate the opportunity side of the coin. The one variable that stands out is technology opportunity climate value-at-risk (VaR) from MSCI, which seeks to identify the companies that may benefit from the transition to a low-carbon economy through potential revenue growth via innovations in low-carbon technologies. MSCI climate VaR captures opportunities through a Technology Opportunity Climate VaR component, and it captures risks through physical risk climate VaR and transition risk climate VaR components.

In Figure 3, the climate metrics are grouped into risk and opportunity; metrics that target climate-related risks are put in a risk column, while the metrics that target emerging opportunities are put in an opportunity column, and the metrics that capture both dimensions sit in the middle. Figure 3 shows that all three vendors provide a broad collection of metrics that evaluate climate-related risks, such as the physical risk climate VaR, transition risk climate VaR, implied temperature rise and low-carbon transition score from MSCI; the physical risk score, Sustainable Development Scenario (SDS) alignment, climate strategy assessment, temperature score, and carbon risk rating from ISS; and the physical risk score and carbon-earnings-at-risk metric from S&P Trucost.

If an investor prefers to measure risks and capture opportunities separately, it may benefit them to employ metrics that evaluate risk separately from those that measure opportunities. However, composite metrics that incorporate both risks and opportunities may be a better fit for investors seeking to avoid the complexity of multiple portfolio constraints.

Figure 3

**Forward-looking Climate Metrics Under the Lens of Risk Opportunity**

| **Risk** | **Opportunity** |
|---|---|
| **MSCI Climate VaR** | |
| MSCI Physical Risk Climate VaR | MSCI Technology Opportunity Climate VaR |
| MSCI Transition Risk Climate VaR | |
| MSCI Implied Temperature Rise | |
| MSCI Low Carbon Transition Score | |
| ISS Physical Risk Score | |
| ISS Physical Risk Management Score | |
| ISS Physical Risk Value at Risk | |
| ISS SDS Alignment | |
| ISS Climate strategy assessment | |
| ISS Temperature Score | |
| ISS Carbon Risk Rating | |
| ISS Climate Performance Category | |
| ISS Carbon Risk Classification | |
| ISS Carbon Performance Score | |
| Trucost Physical Risk Score | |
| Trucsot Carbon Earnings at Risk | |

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

## Forward-looking Climate Metrics Under the Lens of Mitigation and Adaptation

Mitigation and adaptation were the key themes of IPCC's 2014 Fifth Assessment Report and the 2022 Sixth Assessment Report. Mitigation refers to reducing greenhouse gas emissions, while adaptation can be understood as minimizing the impacts of climate change. Mitigation and adaptation need to work together to curb global warming and to minimize the impacts associated with it, but the time horizons of mitigation and adaptation approaches are likely very different. Mitigation is expected to take effect over a longer term because the warming effect of the increased greenhouse gas concentration in the atmosphere will remain even after the $CO_2$ concentration stops increasing. In addition, it is unlikely to have steep declines in carbon emissions arise in the short term.

Figure 4 categorizes the forward-looking climate metrics that reflect mitigation and adaptation, where the metrics that capture the risks, practices, strategies related to mitigation of greenhouse gas emission are in the column mitigation, and the metrics that capture more of the practices, impacts, and strategies responding to climate change are put in the column adaptation. The metrics that capture both mitigation and adaptation sit in the middle.

In Figure 4, we see that the majority of the firm-level adaptation-related efforts are captured in the physical risk-related metrics, such as the ISS or Trucost physical risk scores, the ISS physical risk management score or the MSCI physical risk climate VaR. That's because adaptation via physical climate risk management strategies may reduce a company's exposure, vulnerability, and thus the financial impacts of climate risk. Additionally, the metrics that target mitigation offer a broad range of perspectives, from a qualitative assessment of a company's reduction target (such as an ISS climate strategy assessment), to an implied temperature rise predicted from company's projected emissions under certain climate scenarios (such as metrics from MSCI and ISS).

Figure 4
**Forward-looking Metrics Under the Lens of Mitigation-adaptation**

| Mitigation | Adaptation |
|---|---|
| **MSCI Climate VaR** | |
| MSCI Transition Risk Climate VaR | MSCI Physical Risk Climate VaR |
| MSCI Implied Temperature Rise | MSCI Technology Opportunity Climate VaR |
| MSCI Low Carbon Transition Score | ISS Physical Risk Score |
| ISS SDS Alignment | ISS Physical Risk Management Score |
| ISS Climate strategy assessment | ISS Physical Risk Value at Risk |
| ISS Temperature Score | Trucost Physical Risk Score |
| ISS Carbon Risk Rating | |
| ISS Climate Performance Category | |
| ISS Carbon Risk Classification | |
| ISS Carbon Performance Score | |
| Trucsot Carbon Earnings at Risk | |

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

## Forward-looking Climate Metrics Under the Lens of Decarbonization and Climate Solutions

Figure 5 shows the forward-looking climate metrics grouped by decarbonization and climate solutions. We can see that almost all metrics focus on decarbonization, while the MSCI Climate VaR and the MSCI Technology Opportunity Climate VaR captures both decarbonization and climate solutions. That's because the MSCI Technology Opportunity Climate VaR considers not only innovations that reduce carbon emissions, but also innovations in a wide range of climate solutions, such as sustainable agriculture, sustainable water, and pollution prevention and control.

Figure 5
**Forward-looking Climate Metrics Under the Lens of Decarbonization-Climate Solution**

| Decarbonization | Climate Solution |
|---|---|
| **MSCI Climate VaR<br>MSCI Technology Opportunity Climate VaR** | |
| MSCI Transition Risk Climate VaR | |
| MSCI Implied Temperature Rise | |
| MSCI Low Carbon Transition Score | |
| ISS SDS Alignment | |
| ISS Climate strategy assessment | |
| ISS Temperature Score | |
| ISS Carbon Risk Rating | |
| ISS Climate Performance Category | |
| ISS Carbon Risk Classification | |
| ISS Carbon Performance Score | |
| Trucsot Carbon Earnings at Risk | |

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

## Conclusion

The PAII net-zero investment framework has the following two objectives:

1. Aim to decarbonize investment portfolios in a way that is consistent with achieving global net-zero greenhouse gas (GHG) emissions by 2050

2. Increase investment in the range of “climate solutions” needed to meet that goal

As investors increase their attention to these objectives, demands for disclosure rise and more forward-looking climate data metrics are added to climate data offerings from vendors, we look forward to continuing to provide perspectives on the ESG metrics relevant to our clients' investment objectives. When incorporating forward-looking metrics into portfolio construction, investors should take into consideration a wide range of criteria for the efficacy of each metric—more than just its coverage and accuracy. We will continue our discussions with clients about the benefits and challenges of incorporating forward-looking metrics.

## Appendix

Exhibit 1
**Forward-Looking Climate Metrics by Data Provider**

| Climate Metrics | Description |
|---|---|
| **Data Vendor: MSCI** | |
| **Climate Value at Risk (Climate VaR)** | The metric provides a forward-looking and return-based valuation assessment to measure companies' climate-related risks and opportunities, categorized into the following three core pillars. |
| Physical Risk Climate VaR | The metric quantifies the financial impact from the physical effects of climate change, both chronic and acute. |
| Transition Risk Climate VaR | The metric quantifies the financial impact from the effect of the policies that countries enact in order to decarbonize. |
| Technology Opportunity Climate VaR | The metric quantifies the financial impact from the opportunities born out of the changes required to meet the transition to a low carbon economy. |
| **Implied Temperature Rise** | The metric provides an indication of how companies align to global climate targets. Denoted in degrees Celsius, the metric estimates the global implied temperature rise if the whole economy had the same carbon budget over-/undershoot level as the company in question. |
| **Low Carbon Transition Score** | The metric assesses both companies' current carbon risk exposure and their efforts to manage the risks and opportunities presented by the low carbon transition. |
| **Data Vendor: ISS ESG** | |
| **Physical Risk Score** | The metric provides the issuer's total physical risk score for physical risks in 2050 in a most likely scenario. The score ranks the issuer's risk exposure in its sector on a scale from 0–100. |
| Physical Risk Management Score | This metric provides the issuer's risks management score. The score reflects the issuer's physical climate risk management practices and is expressed on a scale from 0 to 100. |
| Physical Risk Value at Risk | The metric provides the issuer's future value at risk due to physical climate risks in a most likely or worst-case scenario. The factor shows the future value at risk over the baseline period until 2050. |
| **Scenario Alignment** | |
| SDS Alignment | The metric assesses whether the firm aligns or not with their carbon budget under IEA SDS, and also delineates the percentage over-/undershoot against the allocated carbon budget under SDS scenario. |
| Climate Strategy Assessment | The metric provides a qualitative assessment of the company's reduction targets along the categories "No Target," "Non-Ambitious Target," "Ambitious Target," "Committed SBT," "Approved SBT." |
| Temperature Score | The metric examines the company's emissions over-/undershoot in the IEA SDS scenario by year 2050, and the associated temperature if the whole economy had the same level of over-/undershoot. |

| Climate Metrics | Description |
|---|---|
| **Carbon Risk Rating** | The metric provides a numeric score from 0 to 100 for the rated entity's overall carbon risk based on an assessment of over 100 industry-specific indicators and a carbon risk classification at the industry and sub-industry levels. |
| Climate Performance Category | The metric provides an overall performance category based on the company's Carbon Risk Rating. The climate performance categories include "Climate Laggard," "Climate Medium Performer," "Climate Outperformer," and "Climate Leader." |
| **Carbon Risk Classification** | This metric provides a rated entity's numeric score from 1 to 4 for its industry's or sub-industry's exposure to carbon risk based on GHG emissions within the value chain and share of clean tech solutions. |
| **Carbon Performance Score** | The metric provides a rated entity's numeric score from 1 to 4 for its overall carbon performance based on the application of over 100 carbon performance indicators, including efficiency, risk management, and measures taken to reduce the carbon footprint across the full value chain. |
| **S&P Trucost** | |
| **Physical Risk Score** | The metric assesses company exposure to physical risk related to climate change under low, moderate, and high future climate change scenarios. |
| **Carbon Earnings at Risk** | The metric quantifies the company's earnings at risk due to the increased carbon prices under three different climate scenarios. |

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

Exhibit 2
**Forward-Looking Climate Metrics by Topic**

| Climate Metrics | Description |
|---|---|
| **Physical Risk** | |
| **ISS Physical Risk Score** | The metric provides the issuer's total physical risk score for physical risks in 2050 in a most likely scenario. The score ranks the issuer's risk exposure in its sector on a scale from 0 to 100. |
| Physical Risk Management Score | This metric provides the issuer's risks management score. The score reflects the issuer's physical climate risk management practices and is expressed on a scale from 0 to 100. |
| Physical Risk Value at Risk | The metric provides the issuer's future value at risk due to physical climate risks in a most likely or worst case scenario. The factor shows the future value at risk over the baseline period until 2050. |
| **Trucost Physical Risk Score** | The metric assesses company exposure to physical risk related to climate change under low, moderate, and high future climate change scenarios. |
| Physical Risk Climate VaR | The metric quantifies the financial impact from the physical effects of climate change, both chronic and acute. |
| **Climate Value at Risk (Climate VaR)** | |
| **MSCI Climate Value at Risk (Climate VaR)** | The metric provides a forward-looking and return-based valuation assessment to measure companies' climate related risks and opportunities, categorized into following three core pillars. |
| Physical Risk Climate VaR | The metric quantifies the financial impact from the physical effects of climate change, both chronic and acute. |
| Transition Risk Climate VaR | The metric quantifies the financial impact from the effect of the policies that countries enact in order to decarbonize. |
| Technology Opportunity Climate VaR | The metric quantifies the financial impact from the opportunities born out of the changes required to meet the transition to a low carbon economy. |

| Climate Metrics | Description |
|---|---|
| **Trucost Carbon Earnings at Risk** | The metric quantifies the company's earnings at risk due to the increased carbon prices under three different climate scenarios. |
| **Scenario Alignment (and Associated Temperature)** | |
| **MSCI Implied Temperature Rise** | The metric provides an indication of how companies align to logbal climate targets. Denoted in degrees Celsius, the metric estimates the global implied temperature rise if the whole economy had the same carbon budget over-/undershoot level as the company in question. |
| **ISS SDS Alignment** | The metric assesses whether the firm aligns or not with their carbon budget under IEA SDS, and also delineates the percentage over-/undershoot against the allocated carbon budget under SDS scenario. |
| **ISS Climate Strategy Assessment** | The metric provides a qualitative assessment of the company's reduction targets along the categories "No Target," "Non-Ambitious Target," "Ambitious Target," "Committed SBT," "Approved SBT." |
| **ISS Temperature Score** | The metric examines the company's emissions over-/undershoot in the IEA SDS scenario by year 2050, and the associated temperature if the whole economy had the same level of over-/undershoot. |
| **Transition Risk/Consolidated Risk Rating** | |
| **MSCI Low Carbon Transition Score** | The metric assesses both companies' current carbon risk exposure and their efforts to manage the risks and opportunities presented by the low carbon transition. |
| **ISS Carbon Risk Rating** | The metric provides a numeric score from 0 to 100 for the rated entity's overall carbon risk based on an assessment of over 100 industry-specific indicators and a carbon risk classification at the industry and sub-industry levels. |
| Climate Performance Category | The metric provides an overall performance category based on the company's Carbon Risk Rating. The climate performance categories include "Climate Laggard," "Climate Medium Performer," "Climate Outperformer," and "Climate Leader." |
| **ISS Carbon Risk Classification** | This metric provides a rated entity's numeric score from 1 to 4 for its industry's or sub-industry's exposure to carbon risk based on GHGemissions within the value chain and share of clean tech solutions. |
| **ISS Carbon Performance Score** | The metric provides a rated entity's numeric score from 1 to 4 for its overall carbon performance based on the application of over 100 carbon performance indicators, including efficiency, risk management, and measures taken to reduce the carbon footprint across the full value chain. |

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

## Endnotes

1 Credit Suisse, as of 2Q 2019. See: Making an Impact: Earning Returns on Sustainable Terms | Credit Suisse Switzerland (credit-suisse.com).

2 Please refer to Climate Metrics a Primer for Investors (ssga.com) for more details on the metrics SSGA employs in their investment solutions.

3 In addition to direct investment in sustainable projects via instruments such as loans and green bonds, capital allocation to public equities via climate-aware strategies has also been a common approach, evidenced by the proliferation of climate-aware indexes.

4 **Net zero** means that the total greenhouse gas (GHG) emissions being emitted should be lower than or equal to the total GHG emissions being removed or absorbed (ie, no positive emissions). On a net basis, no additional emissions should be released into the Earth's atmosphere. **Net zero strategies** Investment strategies that seek to align investments with a net-zero goal by a particular point in time (e.g., 2050).

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* Pensions & Investments Research Center, as of December 31, 2021.
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