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INSIGHTS FROM
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Climate data currently available to investors suffers from two primary issues: a focus on historical emissions and incomplete coverage. IMAGE: AFP

Using machine learning for smarter net-zero investing

Limitations of existing climate data demand innovative approaches

CLIMATE considerations are becoming increasingly important to investors as they seek to manage risks, capitalise on opportunities, and identify engagement targets related to climate change in their investment strategies.

These strategies often hinge on the availability and quality of climate data. Yet existing datasets frequently fall short.

Net-Zero Investing: Harnessing the Power of Unstructured Data, a recent report published by CFA Institute and co-authored by a team from Acadian Asset Management, discusses how limitations in climate data pose challenges to net-zero investing. It also highlights how investors can overcome such limitations by leveraging natural language processing (NLP) and other machine learning (ML) techniques, as well as techniques to account for uncertainties.

Net-zero investing generally refers to investment practices that have an ultimate impact on reducing carbon emissions and mitigating climate risks. This could mean financing projects that support or lead to achieving net-zero emissions, or investing in businesses that have significantly reduced emissions or are in the process of doing so.

The report notes that with no single, consistent source of net-zero investment data, investors must be prepared to combine different datasets and various statistical techniques in devising net-zero investment strategies. Even then, investors will still face substantial uncertainty around the estimates they produce. The report advocates for new approaches to reflect this reality in the investment process.

The problem with current climate data

Climate data currently available to investors suffers from two primary issues: a focus on historical emissions and incomplete coverage.

While historical data offer a snapshot of past performance, they fail to account for how companies might adapt to future decarbonisation demands. For example, metrics such as carbon intensity are point-in-time measurements of emissions, but are not reliable predictors of a company's long-term alignment with net-zero goals.

In addition, the lack of comprehensive data coverage creates challenges and inconsistencies for asset owners managing diverse portfolios. Data providers often prioritise large-cap issuers in developed markets, leaving significant gaps for small-cap and emerging market issuers.

This discrepancy complicates efforts to fully assess climate risks and opportunities in the entire portfolio, even as many asset owners aim for systemic climate alignment across all holdings.

Furthermore, existing climate alignment measures often lack transparency and credibility. Proprietary metrics developed by data providers can vary widely in methodology, leading to inconsistent outcomes. For instance, implied temperature scores provided by different providers often exhibit low correlation, making it difficult for investors to determine which source to trust.

Moreover, many of these metrics give a false sense of precision, presenting results with deci-

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mal-point accuracy despite significant uncertainties. These issues undermine confidence in the data and pose challenges for investors seeking reliable indicators of net-zero alignment.

Greenwashing – the practice of overstating environmental commitments – further complicates the reliability of climate data. Many companies make bold claims about decarbonisation, but with varying credibility. Corporate disclosures often lack specificity, making it difficult for investors to evaluate the feasibility and sincerity of stated goals. Without robust tools to parse and analyse these narratives, investors risk relying on overly optimistic or misleading data.

ML and NLP to the rescue

Machine learning offers a transformative solution to the challenges of climate investing in two ways.

First, understanding a company's decarbonisation strategy and assessing its net-zero alignment rely on unstructured data – such as corporate narratives, stated commitments, external commentary and qualitative disclosures. These forms of data are difficult to analyse with traditional statistical methods. ML techniques, particularly NLP, overcome this challenge by processing such data at scale to extract meaningful patterns and provide a more nuanced view of a company's climate strategy.

Second, ML provides the scalability that manual analysis lacks. While human analysts can evaluate individual issuers, this approach is not feasible for portfolios with thousands of securities. ML enables consistent, repeatable analysis across a wide range of issuers, providing investors with actionable insights.

Consider range of outcomes, not single-point estimates

The inherent uncertainty of predicting long-term outcomes remains a central challenge for net-zero investment strategies. The report advocates for a probabilistic approach that incorporates a range of potential scenarios. Rather than relying solely on single-point estimates, investors should consider a spectrum of possible outcomes to better manage risks and opportunities. This approach aligns with the realities of climate investing, where future developments are highly uncertain.

Integrating ML with other techniques

While ML is a powerful tool, it is not a standalone solution. The report emphasises the importance of combining ML with other datasets and statistical techniques.

For instance, Bayesian updating (a method that revises probabilities based on new evidence) can incorporate new data into climate measures, providing a dynamic view of a company's net-zero alignment. Furthermore, this approach offers not just point estimates, but also confidence intervals for parameters.

By integrating ML with these methods, investors can build more comprehensive and reliable climate measures.

Putting it all together

Taking into account the above recommendations, here is an example of how investors can apply ML and NLP to assess a company's decarbonisation alignment. This approach highlights the value of blending diverse data types and analytical methods to build robust climate measures. The process involves:

- **Data collection:** Gather textual data from corporate disclosures, news media and other sources
- **Model training:** Use supervised learning to fine-tune an NLP model, teaching it to interpret climate-specific language
- **Integration of additional data:** Combine textual insights with other data sources, such as financial forecasts, to create a holistic measure of net-zero alignment
- **Dynamic updating:** Apply Bayesian techniques to account for new data and uncertainties, enabling a range of possible outcomes

Conclusion

Climate investing, in particular net-zero strategies, presents a complex but essential challenge as the limitations of existing climate data demand innovative approaches. By leveraging ML and NLP, investors can overcome these challenges, extracting actionable insights from unstructured data to build more comprehensive climate measures.

No single solution can address all the needs of climate investing. Instead, investors must adopt a multifaceted approach that combines diverse datasets, advanced techniques, and probabilistic frameworks that embrace uncertainty. While climate investing remains both an art and a science, the tools and methodologies outlined here provide a solid foundation for building effective and credible net-zero portfolios.

This article was adapted by CFAS Advocacy Committee. The original version first appeared on the CFA Institute Research & Policy Center's website.

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The inherent uncertainty of predicting long-term outcomes remains a central challenge for net-zero investment strategies. PHOTO: AFP