

Press Release

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40% Chance of Exceeding 3°C: EDHEC Study Assigns Probabilities to Climate Scenarios

A new study from the EDHEC Climate Institute proposes **a model to assign probabilities to climate scenarios**—addressing a long-standing limitation in the tools used by financial institutions, regulators, and policymakers to assess climate-related risks. The findings suggest a high chance (35–40%) that global temperatures will exceed 3°C by the end of this century.

The paper, "**How to Assign Probabilities to Climate Scenarios**", authored by Riccardo Rebonato, Lionel Melin, and Fangyuan Zhang, introduces a **framework for quantifying the likelihood of different climate outcomes**. This approach complements existing scenario narratives by adding a probabilistic dimension, which is essential for effective asset pricing, stress testing, and strategic planning.

The analysis draws on a comprehensive dataset comprising 5,905 estimates of the Social Cost of Carbon (SCC), gathered from 207 academic studies. Using two complementary approaches—one grounded in expert estimates of carbon pricing, the other based on a minimum-assumption (maximum-entropy) method—the authors estimate the likelihood of climate outcomes under realistic policy and economic constraints.

Key findings:

• The chance of remaining below the 1.5°C target is very low:

The likelihood of limiting end-of-century temperature increases to 1.5°C is very small. Whilst technologically still achievable, reaching this goal would require a dramatic and sudden alignment of abatement policies with expert views.

• The median global temperature rise is found to be around 2.7°C by 2100:

This average temperature anomaly is well above the end-of-century target of 2.0°C, and achieving this target is highly unlikely.

• There is a high chance (35–40%) that temperatures will exceed 3°C by 2100:

This is a worrying result, as such high temperatures would push the planet into uncharted territory. This could increase the likelihood of tipping points.

The study also finds that the physical damage caused by higher temperatures may outweigh the economic costs of transition—a key insight for risk planning.

The study also applies its probabilistic model to the Oxford Economics climate scenarios. By aligning its model with the structure of the Oxford framework, the EDHEC team estimates the likelihood of each scenario. More than 90% of the probability is assigned to three scenarios with limited or delayed emissions abatement: Climate Catastrophe, Climate Distress, and Baseline.

"Investors cannot price assets without expectations of future cash flows," explains Professor Riccardo Rebonato, Senior Advisor of EDHEC Climate Institute. "But expectations require probabilities. Without them, any valuation exercise is, quite literally, stillborn. Our goal is to provide a practical framework to make scenario analysis usable for financial decision-making."

The proposed methodology offers a tool for decision-makers seeking to incorporate the likelihood of outcomes into climate-related risk analysis, investment strategy, and regulatory planning.

Download the full publication here: How to Assign Probabilities to Climate Scenarios

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About EDHEC Climate Impact Institute

Transforming Climate Research into Actionable Solutions

Institutional context

Operating from campuses in Lille, Nice, Paris, London and Singapore, EDHEC Business School is ranked in the top ten European business schools. With more than 110 nationalities represented in its student body, some 50,000 alumni in 130 countries, and learning partnerships with 290 institutions worldwide, it is truly international.

EDHEC Business School has been recognised for over 20 years for its expertise in finance. Its approach to climate finance is founded on a commitment to equipping finance professionals and decision-makers with the insights, tools, and solutions necessary to navigate the challenges and opportunities presented by climate change. EDHEC has developed a significant research capacity on the financial measurement of climate risk, which relies on the best researchers in climate finance, and brings together experts in climate risks as well as in quantitative analysis.

The DNA of EDHEC's work has also resided, since its origin, in the ability to generate business ventures, by encouraging spin-offs based on the research work of its teams. EDHEC is currently involved in three ventures: Scientific Portfolio, Scientific Infra and Private Assets, and the soon-to-launch Scientific Climate Ratings.

Mission and ambitions

The EDHEC Climate Institute (ECI) focuses on helping private and public decision-makers manage climate-related financial risks and make the most of financial tools to support the transition to a low-emission economy that is more resilient to climate change.

It has a long track record as an independent and critical reference centre in helping long-term investors to understand and manage the financial implications of climate change on asset prices and the management of investments and climate action policies.

The institute has also developed an expertise in physical risks, developing proprietary research frameworks and innovative approaches. ECI is also conducting advanced research on climate transition risks, with a focus on supply chain emissions (Scope 3), consumer choices, and emerging technologies.

As part of its mission, ECI collaborates with academic partners, businesses, and financial players to establish targeted research partnerships. This includes making research outputs, publications, and data available in open source to maximise impact and accessibility.

The EDHEC Climate Institute gratefully acknowledges the support that the Monetary Authority of Singapore (MAS) has provided to its green infrastructure research.