

Make or break

Challenges to NGFS scenarios and the way forward



THEIA
FINANCE LABS

DISCLAIMER (PLEASE ACTUALLY READ THIS PRIOR TO READING THE REPORT, THIS DISCLAIMER IS IMPORTANT!)

This note forms part of a new briefing series from Theia Finance Labs research programme called “MAKE OR BREAK” exploring the perspectives for key initiatives in the sustainable finance space. The first report in this series focused on GFANZ ([Link](#))

The series are “opinion pieces” authored by Theia Finance Lab staff members providing a perspective on the way forward for these initiatives and key challenges and recommendations. They are not technical research reports, even where they cite research, and do not go through the same editorial review as other Theia Finance Lab research products. The ideas and recommendations presented here are attempts at discussion inputs. Goal of these notes is to surface key issues, discuss their ramifications, and outline potential resolutions. They are designed as an input to the debate. We expect part of this debate will involve changing people’s minds just as we expect us to change our mind as well.

The documents are shared with the initiatives prior to publication and discussed. However, for the avoidance of doubt, the research presented here is not affiliated with the initiatives discussed, nor subject to their editorial control, nor in any way implicitly or explicitly endorsed by them. Nor is the research affiliated with 2° Investing Initiative France and 2DII France did not have editorial input.



About Theia Finance Labs

Theia Finance Labs (formerly 2° Investing Initiative Germany) is an independent, non-profit think tank incubating research solutions for the financial sector that help solve the climate crisis. The Theia Finance Labs name is inspired by the Greek goddess of sight, the light of the blue sky, and the value of gold, Theia, and by the Greek word Aletheia, which means “disclosure” or “truth”, literally “the state of not being hidden”. The new brand thus mirrors our goal to develop evidence-based research and tools that shed light on the intersection of finance, climate change, and long-term risks. Theia operates as a 100% non-profit organization.

Author: Jakob Thomä, jakob@theiafinance.org, Franziska Fischer

Disclosure of conflicts of interest: The lead author is the Project Director of the Inevitable Policy Response Programme, a climate forecasting consortium seeking to forecast the speed and scale of the climate transition, that also develops climate scenarios. This work is not funded directly or indirectly by IPR.

FUNDING:

The report forms part of the LIFE PACTA 2.0 project. The LIFE PACTA 2.0 project has received funding from the LIFE Programme of the European Union. The contents of this publication are the sole responsibility of Theia Finance Labs and do not necessarily reflect the opinion of the European Union.



Introduction

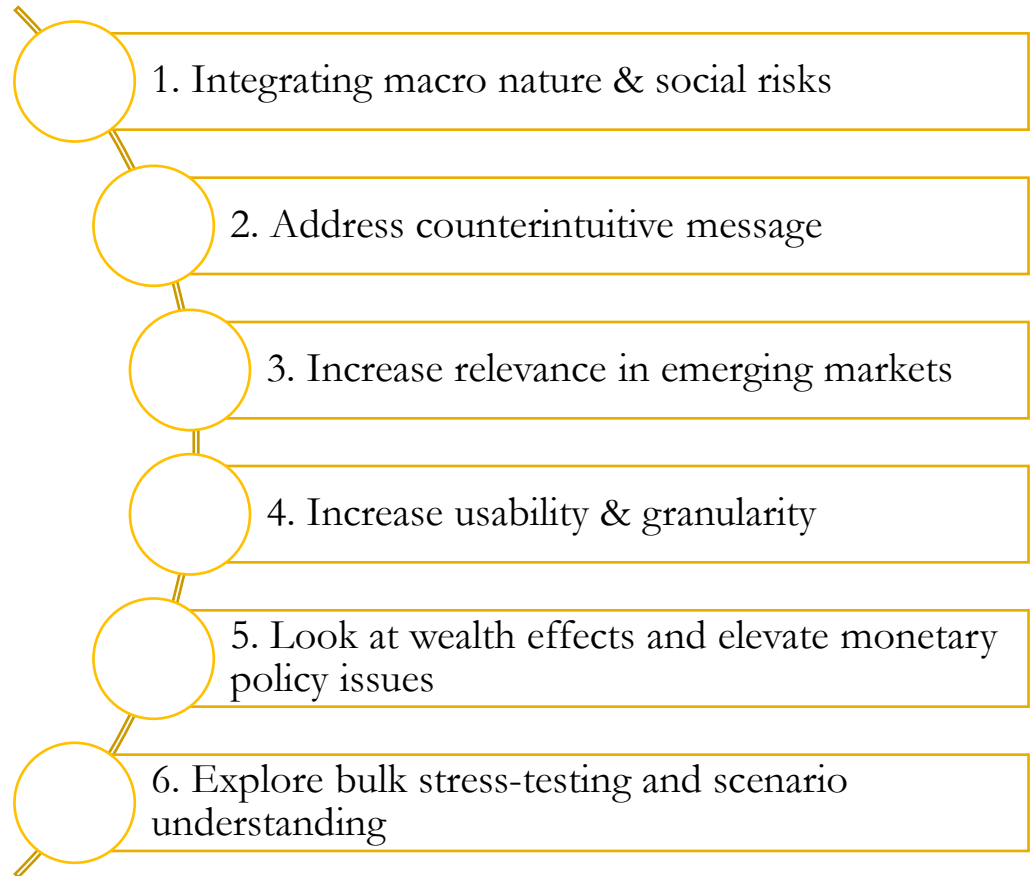
NGFS scenarios are increasingly seen as the ‘market standard’ in the climate scenario landscape

Since their launch in 2020, they have been downloaded several thousand times and endorsed as ‘market standard’ by the NGFS supervisors as well as a range of key sustainable finance stakeholders. They are referenced or used directly in stress-test or climate scenario exercises across a range of jurisdictions. Despite their reach in adoption, a growing set of concerns has materialized around their use. These concerns are increasingly a challenge to the use of these scenarios more generally, and are not limited to NGFS scenarios, but the broader community of climate scenario modellers and their outputs. The note – while focusing on NGFS scenarios in particular – thus likely also applies to a range of other scenarios.

The focus of this note is to identify the six key issues or battlegrounds that in our view will determine the success, or “make or break” moment for both NGFS scenarios and similar scenarios currently operating in the market.

Getting these issues right is critical. Our engagement with central banks suggests a growing disillusionment with these scenarios and their ability to serve climate scenario risk and stress-test exercises is critical to the underlying objective of the NGFS to increase financial resilience to climate change and the transition to a low-carbon economy.

FIG 1: SIX KEY CHALLENGES TO NGFS SCENARIOS (SOURCE: AUTHORS)



Summary of recommendations

NGFS Scenarios should integrate nature and social risks and move away from ‘middle of the road’ outcomes.

NGFS scenarios should invest in ‘scenario narratives’ addressing counterintuitive outcomes, as well as providing more transparency on scenario policy inputs.

NGFS should invest in country-specific scenarios for smaller economies that involve domestic climate experts and more fully reflect the diversity of climate perspectives beyond large emitting economies.

NGFS scenarios should work with risk modelling teams to increase the usability and relevance of indicators; and their interpretability

NGFS scenarios should consider the wealth and asset effects from climate change and elevate the challenge of risk premia in the context of monetary policy

NGFS scenarios should introduce scenario ranges that allow for bulk stress-testing

#1: NGFS Scenarios do not capture climate-related social and nature risks, potentially understating macro risks by a factor of 2-3x

The issue:

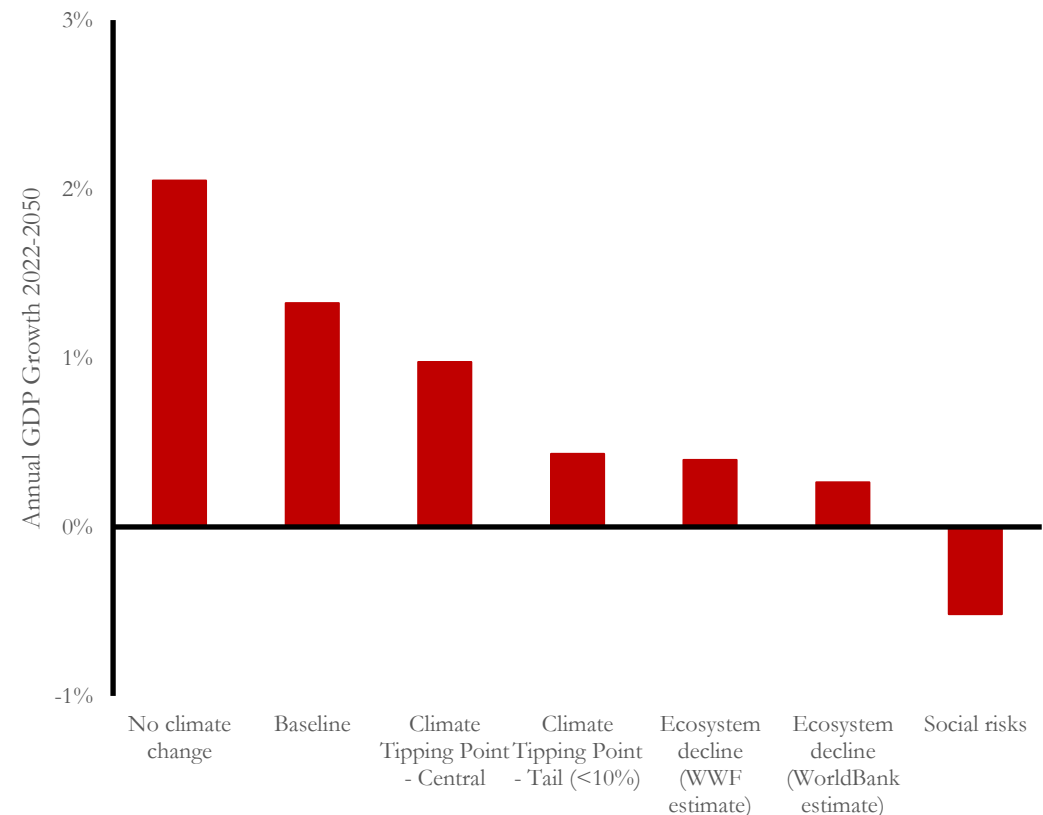
NGFS scenarios are on the whole ‘middle of the road’ scenarios based on middle of the road assumptions around long-term growth, conservative estimates related to climate damages, and typically involve a cost optimization function that minimizes economic friction. They often create equilibria as part of the model constraints that are unlikely to reflect real world realities (e.g. food demand always equals food supply).

Perhaps more importantly, they do not integrate the potential second order effects from climate impacts related to nature and social risks. This causes these scenarios to potentially understate the economic impacts of climate change by a factor of 2-3x, as upcoming research by the 1in1000 programme demonstrates (see Fig. on right).

A way forward:

Scenarios used by NGFS members must move away from middle of the road assumption real ‘risk’ or stress-test scenarios that integrate social and nature impacts from climate change and reflect more disruptive macroeconomic environments. They also should consider alternatives to narrow economic optimization and allow for more profound disequilibria. Increased focus should be placed on the potential climate risks under a below 2°C world, which are currently effectively zero from a financial system perspective.

ANNUAL GDP GROWTH PROJECTIONS UNDER CUMULATIVE CLIMATE, NATURE, AND SOCIAL RISKS (SOURCE: THOMÄ ET AL. FORTHCOMING)



#2: NGFS Scenarios provide at times extremely counterintuitive results with messages at odds with the broader transition story

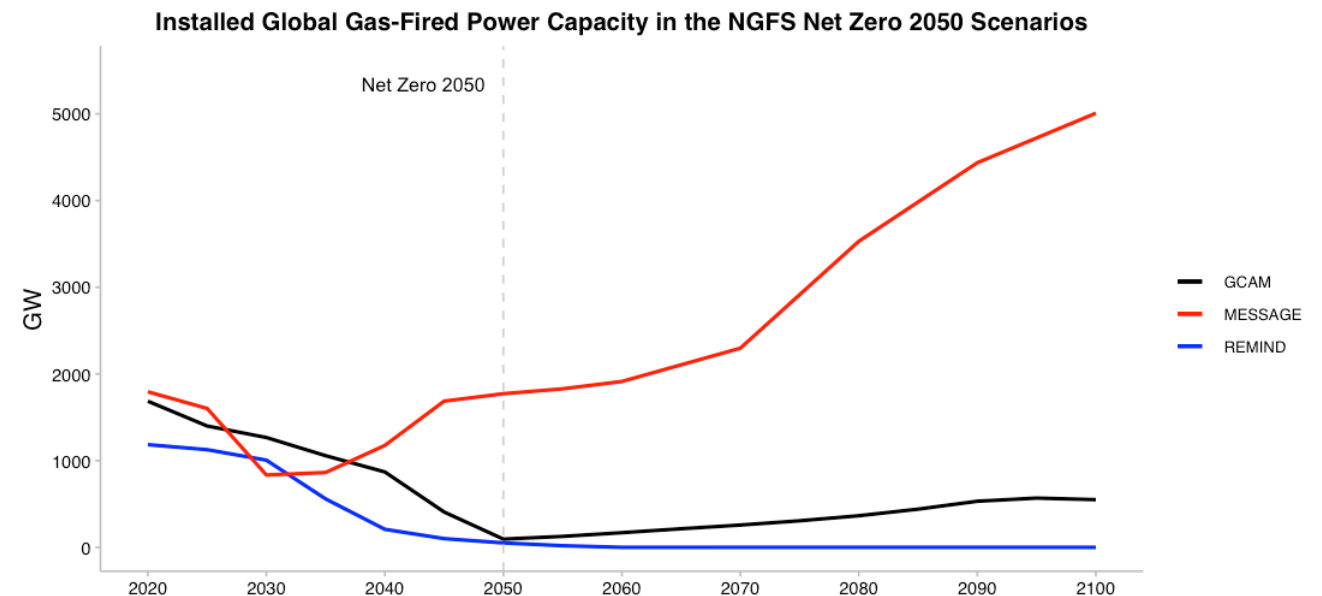
The issue:

A key objective of the NGFS scenarios is to drive ‘scenario harmonization’. However, there are dramatic differences between NGFS scenarios and thus even within the narrow universe of NGFS scenarios, little harmonization. Nowhere is this perhaps more dramatic in differences in installed gas power capacity until 2100, where the MESSAGE model sees a near tripling of capacity and REMIND winds down gas fired power capacity entirely. While the differences cannot externally be reviewed, one likely reason is the differences in definitions and scopes. It is unlikely to be productive for broader target-setting purposes for such outcomes. In addition, the ‘up and down’ nature of scenarios in their 5 year intervals can make steering counterintuitive as scenario capacity drops, increases again, and then drops again in the GCAM scenario for example.

A way forward:

Driving harmonization in scenario outcomes requires defining more narrow scenario pathways at a more granular level and increased investment in ‘scenario narratives’ and explainability, notably through transparency on scenario policy inputs. There is at the same time a broader question as to the usefulness of harmonization given the climate and transition uncertainty.

FIG 2: INSTALLED GAS-FIRED POWER CAPACITY IN THE NGFS NET ZERO 2050 SCENARIOS (SOURCE: 1in1000 2023)



#3: Emerging markets modelling teams are not sufficiently involved in the NGFS scenario process and prioritizing the modelling of large economies reduces usability for many NGFS members

The issue:

The NGFS scenario consortium consists exclusively of European and North American modelling teams. While this does not extend to the individuals working in the teams, there is a lack of diversity in the expertise and backgrounds of the teams. While this may be less significant for larger emerging markets which are both more represented across the staff itself and where the regional expertise is more pronounced, this is not the case for smaller emerging markets. For example, it seems eminently unreasonable for a smaller economy like Thailand to use NGFS scenarios when a) the scenarios only provide regional and not country level outcomes for Thailand (except for the SSP indicators), b) there is no specific Thailand expertise represented in the NGFS consortium and c) scenarios are unlikely to prioritize the key risk transmission channels inherent to a smaller export dependent economy like Thailand.

A way forward:

The NGFS members should make a dedicated investment in considering the idiosyncrasies and application of scenarios to individual countries and climate and economic experts from these countries should play an active role in the scenario design process, at the very least for the countries for which they have expertise.

#4: NGFS Scenario uptake suffers from usability and granularity constraints

The issue:

NGFS scenarios remain rooted in the original design objective of the teams developing these scenarios, specifically the modelling of decarbonization and physical risk pathways under different temperature outcomes and GHG emissions constraints. Indicators underpinning this objective are typically framed in a way that responds to this objective. However, these types of indicators are typically not directly usable in risk models and thus require conversion or translation in order to make them applicable to risk exercises.

These conversions or translations however are not standardized and thus undermine the harmonization objective, as risk modellers are required to either mix assumptions or parameters from other sources or introduce conversion rates that may not be consistent with the underlying scenario assumptions.

A way forward:

NGFS scenario consortium team should work with risk modelling experts on the required nature of indicators and seek to develop comprehensive and granular indicators necessary for scenario analysis.

A crucial part of usability also involves a more granular understanding of the scenario inputs and how they differ across scenarios. Differentiating policy, land use, and technology assumptions between scenarios in a transparent way gives financial institutions and third party research organizations a better chance to better understand which scenarios are most suited to their use case.

#5: NGFS Scenario do not consider the ‘wealth’ or ‘asset impacts’ of climate change, highlighting the need to focus more attention on the monetary policy implications of climate change

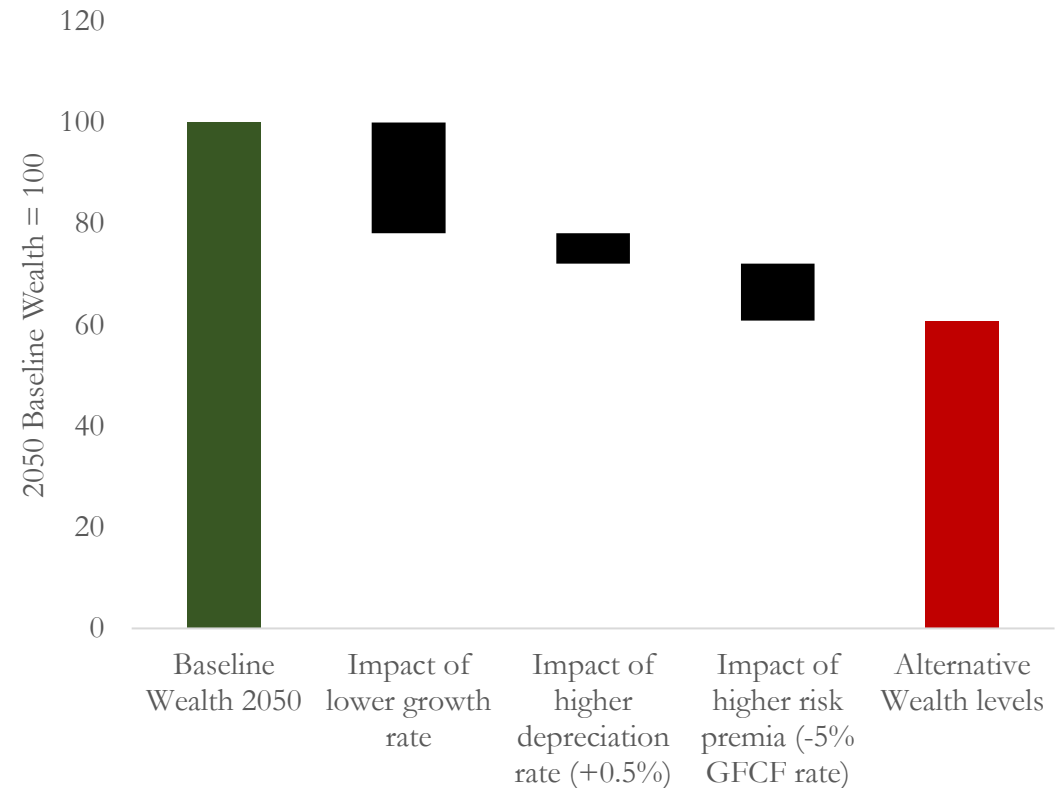
The issue:

Modelling teams seeking to assess the economic impact of climate change and the transition to a low-carbon economy typically focus on traditional economic metrics (specifically GDP). A narrow view of GDP however hides the broader impact of climate change on wealth, which nascent research suggests is likely to have a larger overall welfare impact. The relationship between crisis (e.g. war, natural disasters) and GDP is often not intuitive as the rebuilding need post crisis typically boosts GDP. However, this obviously hides the destruction of economic assets associated with the crisis and the potential additional wealth effects from the aftermath (e.g. risk premia, indebtedness). A study of German households found wealth differentials linked to the destruction of the person’s parents birth city during WW 2. Not just does wealth matter, it leaves a long shadow. While research on this topic is limited, wealth effects may have 2x the GDP effects. Finally, wealth is obviously a crucial question in the context of monetary policy (e.g. asset values, risk premia). Over time, risk premia may become one of the biggest barriers to realizing the climate transition and necessitate policy responses.

A way forward:

Economic climate scenarios and stress-test exercises for that matter should consider wealth and asset effects from climate change, including risk premia and wealth stocks. The wealth and risk premia (read: spreads) impacts are also a crucial input into monetary policy considerations, which should play a more prominent role in the NGFS work moving forward.

FIG 3: STYLIZED WEALTH EFFECTS OF CLIMATE CHANGE ON GLOBAL GDP LEVELS (SOURCE: THOMÄ ET AL. FORTHCOMING)



#6: Climate uncertainty and model sensitivity does not lend itself to discrete stylized scenarios

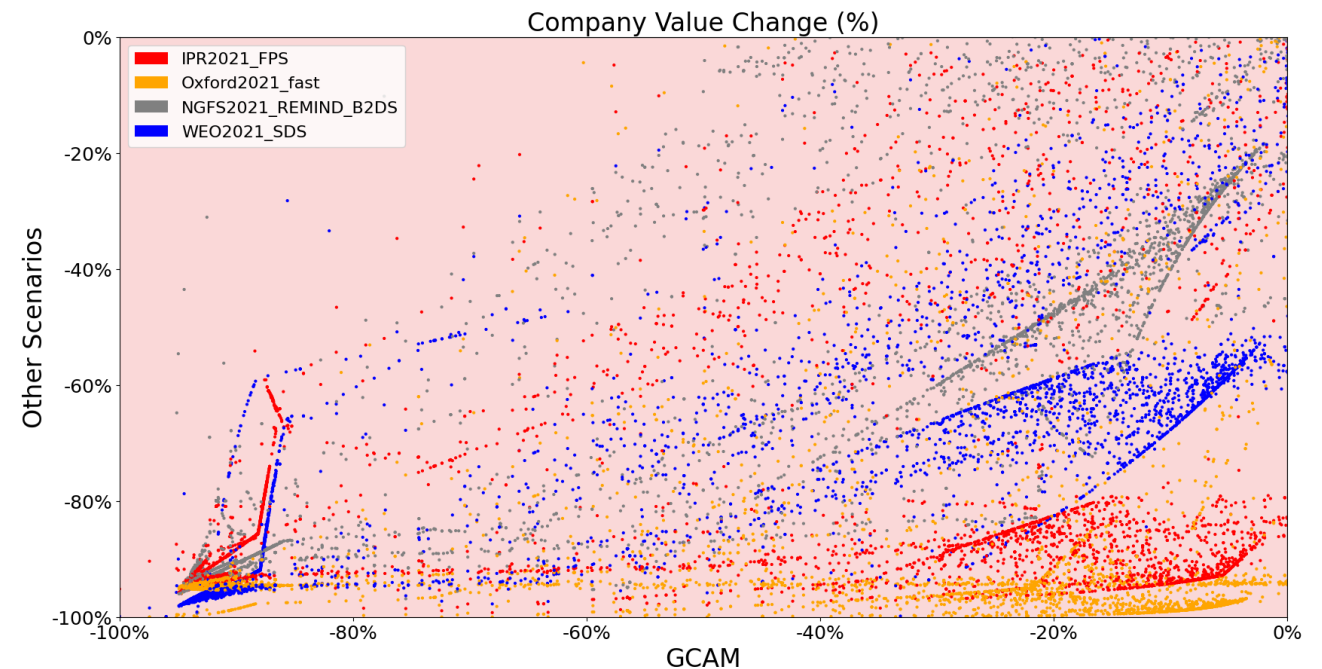
The issue:

While there is a consensus on the anthropogenic impact on climate change, the actual transition scenarios (as outlined previously) can exhibit dramatic differences. There is still significant uncertainty associated with the emissions and transition pathway, including the overshoot, potential climate restoration measures, and the speed and nature of the sectoral transition pathways. Even for the power sector, one of the most best understood ‘transition sectors’, scenario outcomes differ dramatically. By extension, climate stress-test outcomes are highly sensitive to scenario choice (see Fig. 4 on right). Risk exercises focused on a limited number of scenarios thus hide the full story.

A way forward:

The 1in1000 research programme between Theia Finance Labs and Oxford Sustainable Finance Group has been calling for the use of bulk stress-testing (i.e. stress-testing across a large number of scenarios). NGFS should explore the development of large scenario distributions to provide for bulk risk exercises and move away from single outcomes (e.g. is the portfolio resilient to this specific climate future) to multiple outcomes (e.g. under how many futures is this portfolio resilient). Related, as per recommendation #4, more work can be done to understand inputs such as scenario differences can be better interpreted

FIG 4: CORRELATION BETWEEN DIFFERENT RISK SCENARIOS IN TERMS OF VALUATION IMPACTS OF CLIMATE TRANSITION SHOCKS (SOURCE: 1in1000 2023)



About Theia Finance Labs

Theia Finance Labs (formerly 2° Investing Initiative Germany) is an independent, non-profit think tank incubating research solutions for the financial sector that help solve the climate crisis. The Theia Finance Labs name is inspired by the Greek goddess of sight, the light of the blue sky, and the value of gold, Theia, and by the Greek word Aletheia, which means “disclosure” or “truth”, literally “the state of not being hidden”. The new brand thus mirrors our goal to develop evidence-based research and tools that shed light on the intersection of finance, climate change, and long-term risks. Theia operates as a 100% non-profit organization.

Literature:

Buller et al. (2023) “This is the Way: Or is it? The impact of climate scenario choice on climate stress-test outcomes”. *1in1000 Working Paper*

Eichengreen et al., (2009) “Understanding West German economic growth in the 1950s”. *Cliometrica Vol. 3*. p. 191-219.

Halbmeier et al. (2021) “The Long-Term effects of Destruction during the Second World War on Private Wealth in Germany” . *DIW Working Paper*.

NGFS. Scenario Explorer.

Thomä et al. (2023, *forthcoming*) “The impact of social and nature feedback loops on the economic impact of climate change”.

Thomä et. Al (2024, *forthcoming*) “Capturing the wealth effect of climate change”.

