



Creating Opportunities

What are the challenges to assess climate and sustainability risks?

Sustainable Finance Research Forum

EU Science Hub

BBVA Research, October 27 2022

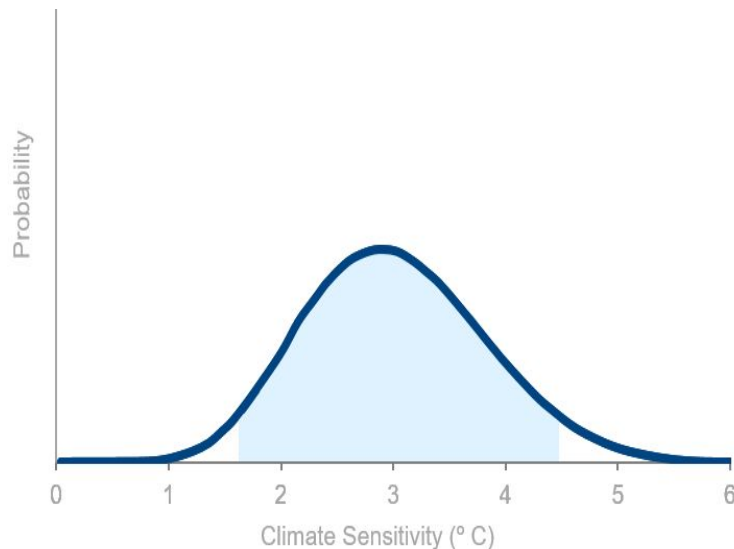
Uncertainty is the signature feature of climate change in measurement, modelling,

...

Measurement uncertainty

CLIMATE SENSITIVITY TO CO₂

(Meta analysis; area: 90% of probability interval)

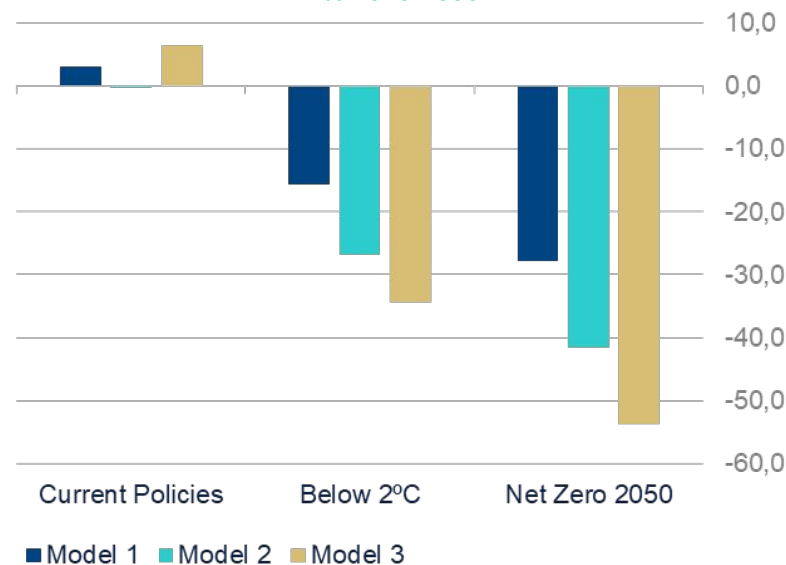


Source: [Andrés y Doménech \(2020\)](#) based on Knutti, Rugenstein and Hegerl (2017).

Modelling uncertainty

GHG EMISSIONS

% 2020-2030



Source: BBVA Research, [NGFS Scenarios](#)

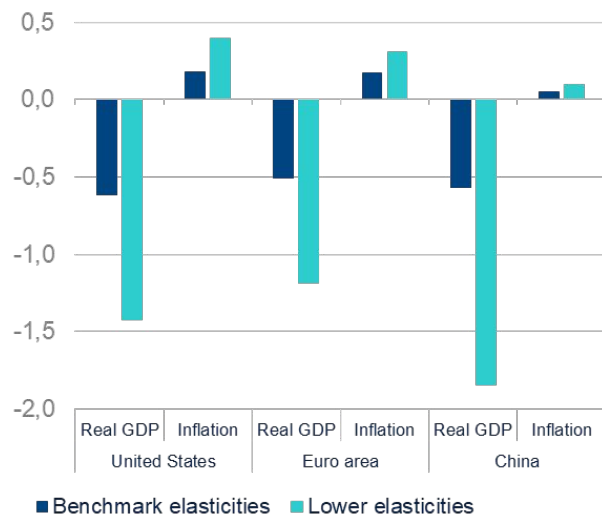
... and in deriving impacts on the economy

Economic Impacts

SUBSTITUTION ELASTICITIES

Impact in 2030 of a GHG Tax under Different Elasticities

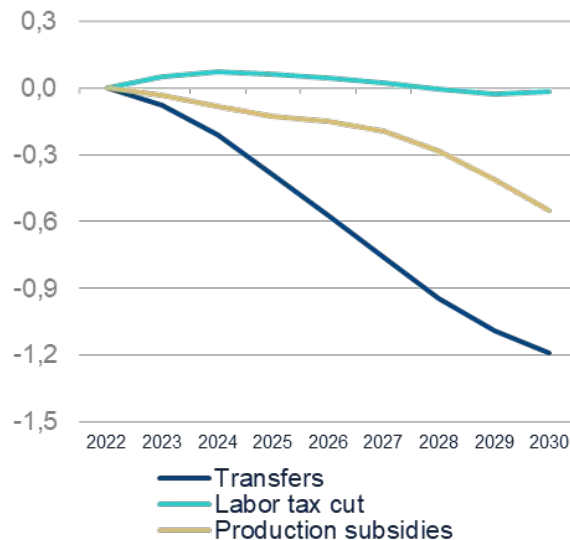
(% and pp, deviation from baseline)



CARBON TAX RECYCLING OPTIONS

Impact of Recycling Options in the United States

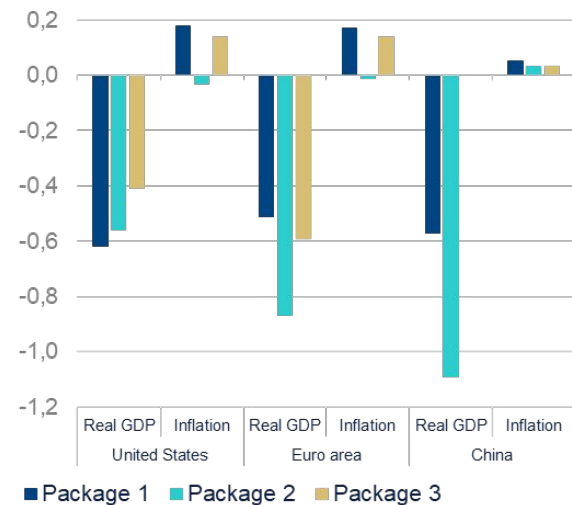
(% deviation from baseline)



POLICY PACKAGES

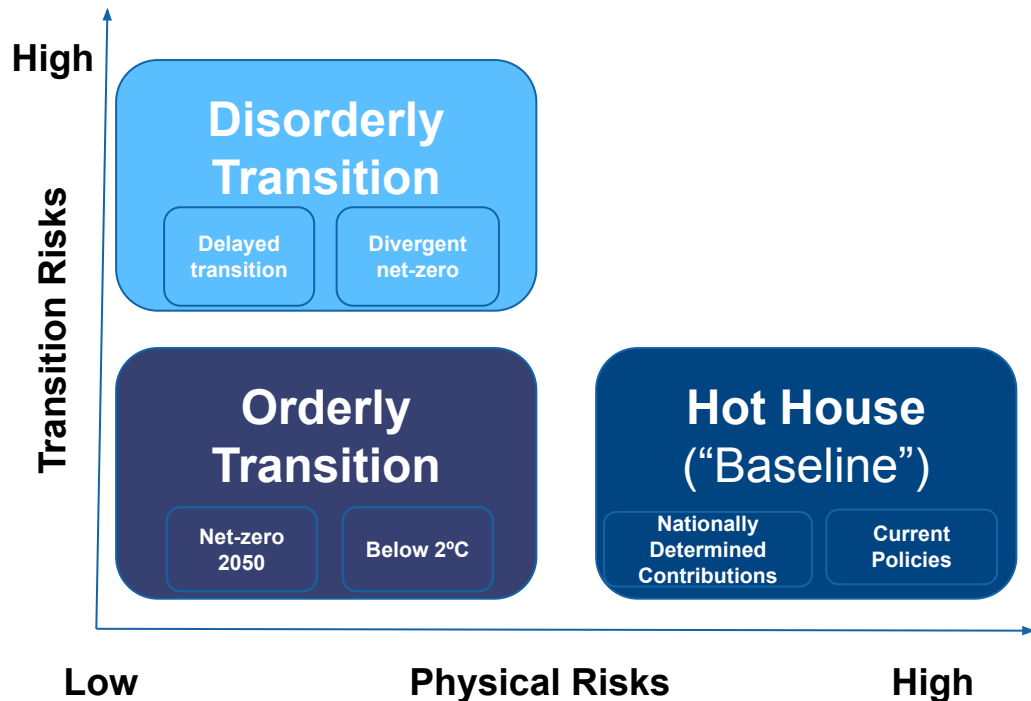
Macroeconomic Impact of the Three Policy Packages in 2030

(% deviation from baseline)

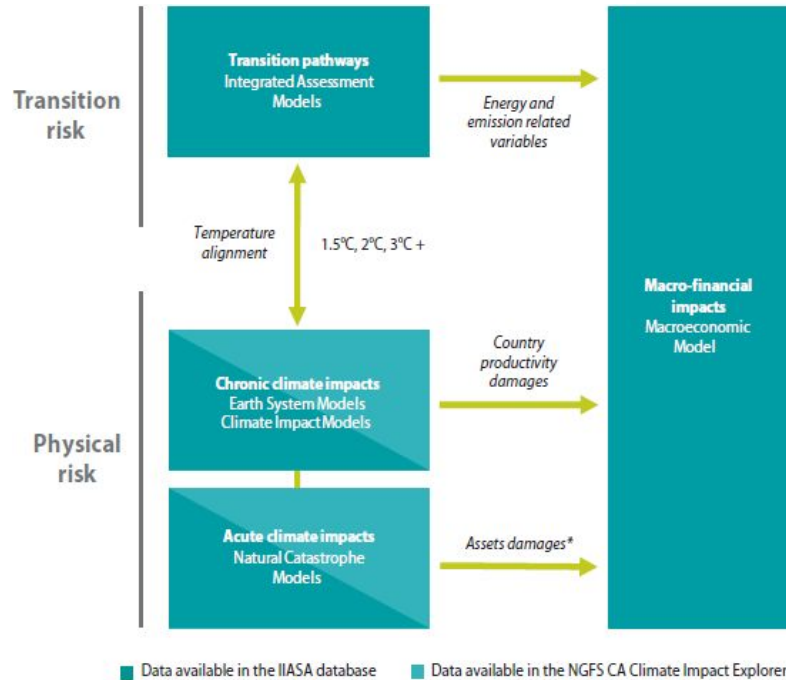


The challenge: The **multiplicity** of alternative futures with compounded risks and the **complexity** of climate and economic integrated modelling

SET OF REPRESENTATIVE SCENARIOS

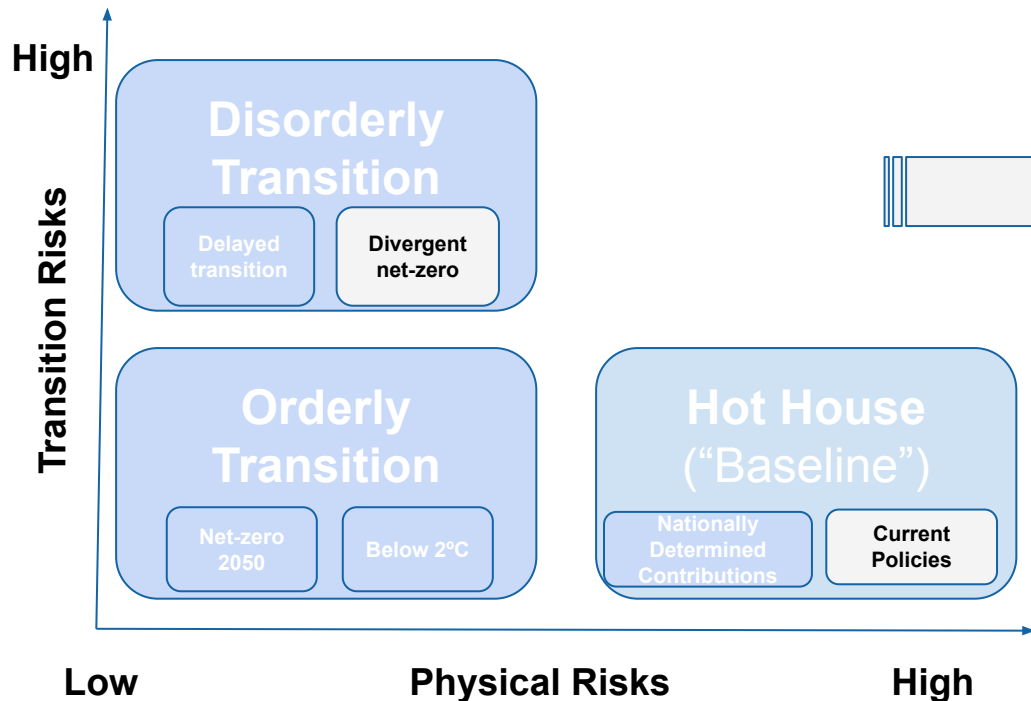


NGFS SUITE OF MODELS APPROACH

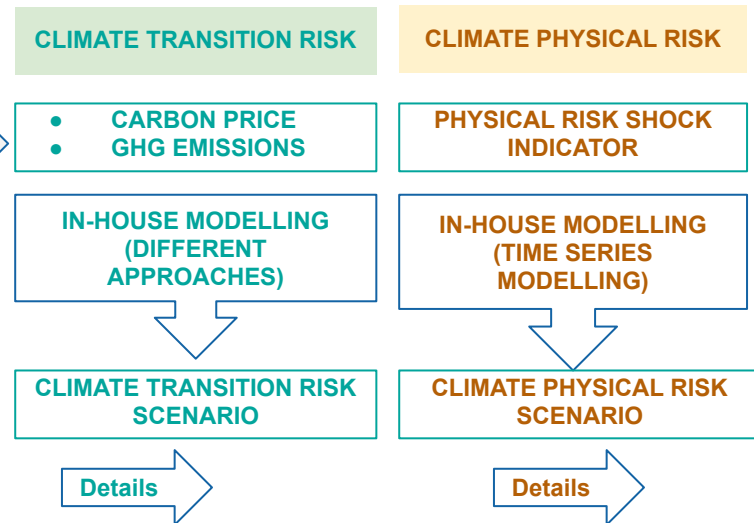


A practitioner's approach to climate analysis: A few alternative futures, "pure" climate variables anchor, and in-house modelling for bounding uncertainty

SET OF REPRESENTATIVE SCENARIOS



BBVA RESEARCH APPROACH TO CLIMATE RISKS



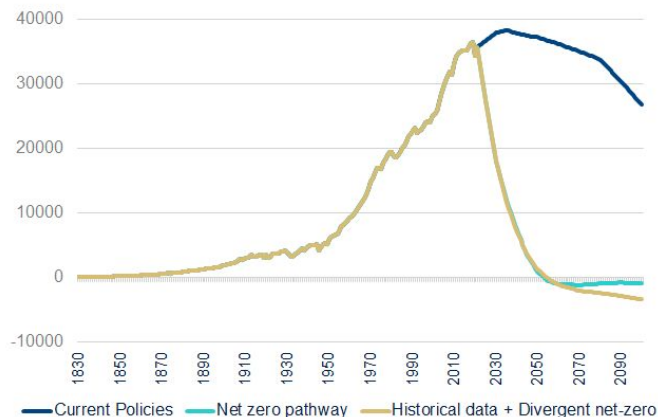
Takeaways on main challenges to assess climate and sustainability risks

- **Uncertainty** is the signature feature of climate change in measurement, modelling, and in deriving economic impacts on the economy.
- **The challenge: Defining a workable playing field for the economic analysis of climate.** The **multiplicity** of alternative climate scenarios and the **complexity** of integrated climate modeling (IAMs) make it necessary to delimit both the options to be analyzed and the range of explanatory ambition. **The NGFS climate scenarios provide a very useful public good for common understanding.**
- **As a practitioner:** Scenarios anchored on industry-accepted climate variables, limited to "economic variables" to **limit complexity**, and with alternative modeling or severity of shocks to **incorporate and delimit uncertainty**.
- **In short: be humble.** A **learning-by-doing process** in pace with measurement improvements, modeling developments and climate policies implementation.

Climate transition risk: the same impulse, different responses depending on modelling venues, a way to show (and delimit) uncertainty

WORLD. CO2 EMISSIONS

(GigaTM)

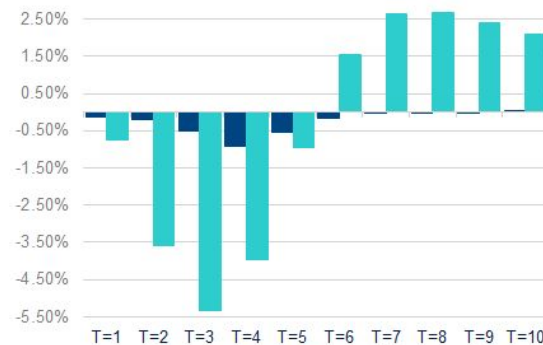


Source: BBVA Research from [NGFS Climate Scenarios for central banks and supervisors](#)

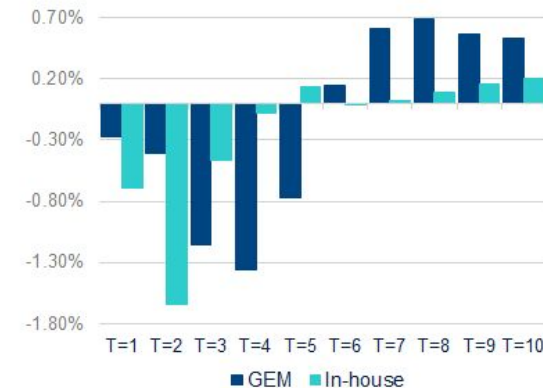
Global Economic Model
(Oxford, GEM)

In-House SVAR Model

Economy A, growth gap (pp)



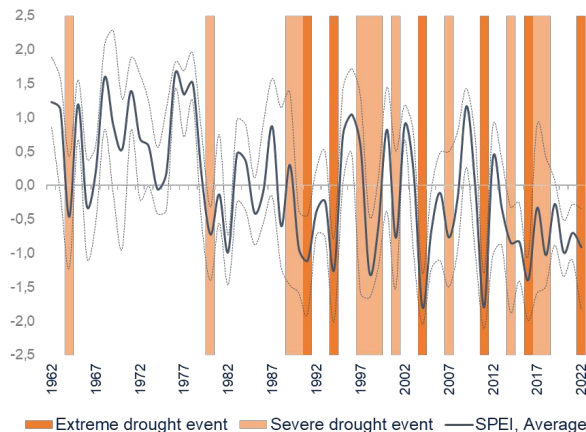
Economy B, growth gap (pp)



Source: BBVA Research

Climate physical risk: Impulse-response to catastrophic climate events such as droughts

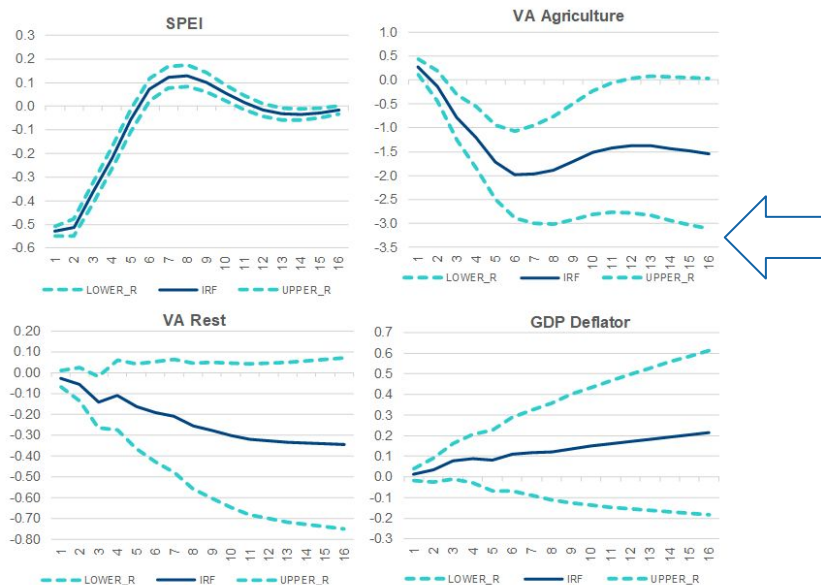
SPAIN. SPEI, DROUGHT SYNTHETIC INDEX (Standardized Precipitation Evapotranspiration Index)



*In-House SVAR
Model (*)*

Droughts. Impulse Response Functions

One standard deviation -negative- shock on SPEI.
Quarterly data. Percentage deviation from the baseline.



Source: BBVA Research, data from [EM-DAT database](#) and [WB Climate Change Knowledge Portal](#). SPEI details can be found: [A High Resolution Dataset of Drought Indices for Spain](#). Lower levels imply a more severe drought.

(*) A VARX model, with Cholesky decomposition, has been used to capture the impact of an exogenous SPEI shock on Agriculture, GDP and inflation (GDP deflator).

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