Pilot Project on Climate Scenario Analysis in Japan

Azusa Takeyama (Bank of Japan)

Virtual Course on Macro Stress Testing

10 December, 2021

The views and opinions expressed by the presenters do not necessarily reflect the views of the institutions they belong to.

Outline of the exercise

Objectives of the Scenario Analysis

This Project is a joint work between JFSA and BoJ. We are using bottom-up approach with large Japanese financial institutions.

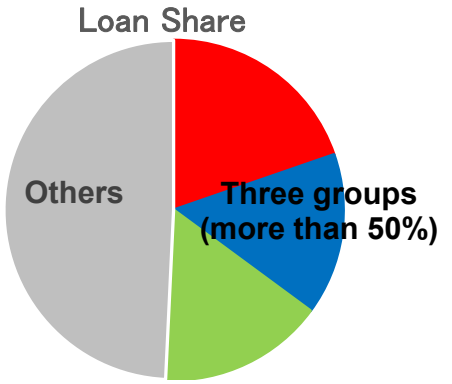
Risk assessment	• Examine how climate-related financial risks may affect large financial institutions
Method/ ability	• Understand each financial institution's method and ability of analyzing the risk • Recognize the challenges for the governance, collecting data, and gathering borrower's information
Dialogue	• Use the outcome as a springboard for further discussion • Understand challenges that regulators and institutions face • Acknowledge the potential management action each financial institution will take as a result of the findings

Target of Scenario Analysis

Pilot bottom-up analysis targets **large banks** and **large non-life insurers**.

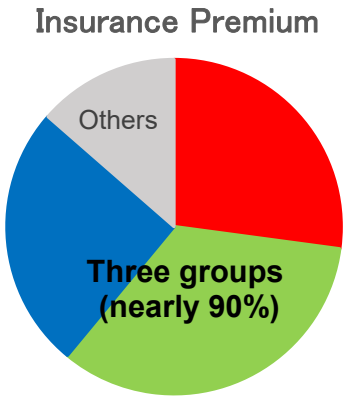
Three large banking groups

- ✓Mitsubishi UFJ Financial Group (MUFG)
- ✓Mizuho Financial Group (MHFG)
- ✓Sumitomo Mitsui Financial Group (SMFG)



Three large non-life insurance groups

- ✓MS&AD Insurance Group Holdings
- ✓Sompo Holdings
- ✓Tokio Marine Holdings



Main Features of Analysis

	Banks		Non-life Insurers
Approach	Bottom-up (Banks & Insurers assess scenario impact)		
Balance Sheet	Static (freezed over the horizon)		
Risk	**Transition Risk**	**Physical Risk**	**Physical Risk**
Scenario	Net Zero 2050 Delayed Transition Current Policies	Net Zero 2050 Current Policies	Net Zero 2050 Current Policies
Model/Variable	REMIND, NiGEM	NGFS data RCP2.6 RCP8.5	NGFS data RCP2.6 RCP8.5
Horizon	30 years (2021-2050)	80 years (2021-2100)	80 years (2021-2100)
Geographic Coverage	Both foreign/domestic	Domestic only	Domestic only

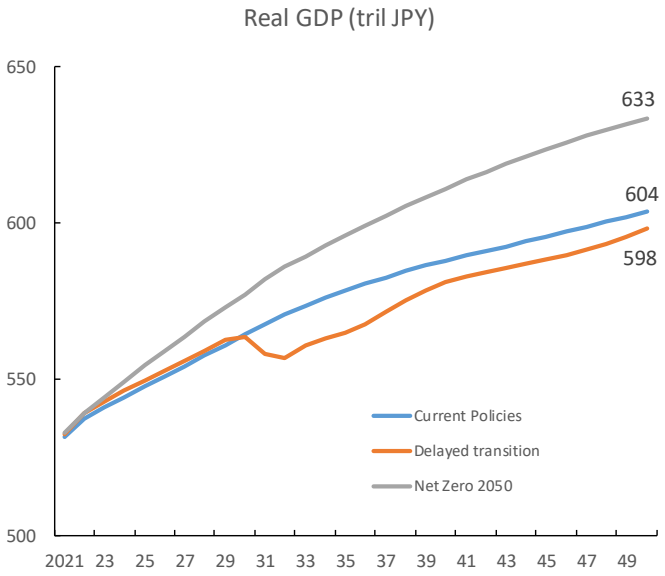
Analysis for Banks

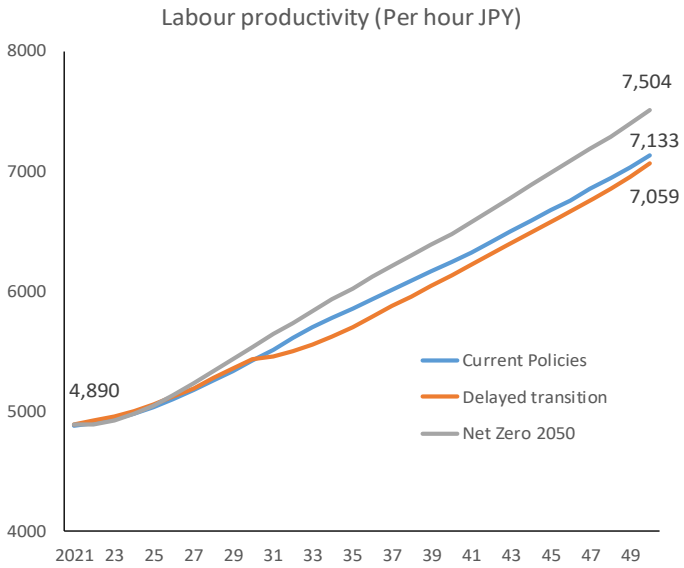
- ✓ **Jointly utilize counterparty-level analysis (for high carbon intensity sector) and sector-level analysis (for middle and low carbon intensity sector)**
  - Take advantage of both approach to consider firm specific impacts on high carbon intensity sector (cf. steel and automobile manufacturers) as well as the impact of structural changes of the whole economy.
  - **Bank of Japan provides additional scenarios of financial and macroeconomic variables, including sectoral GDP and stock indices, that accord with NGFS scenarios, by using a computable general equilibrium model calibrated to Japan's economy and econometric models.**
- ✓ **Qualitative information**
  - Management action
  - Challenges
  - Impact of the assumptions

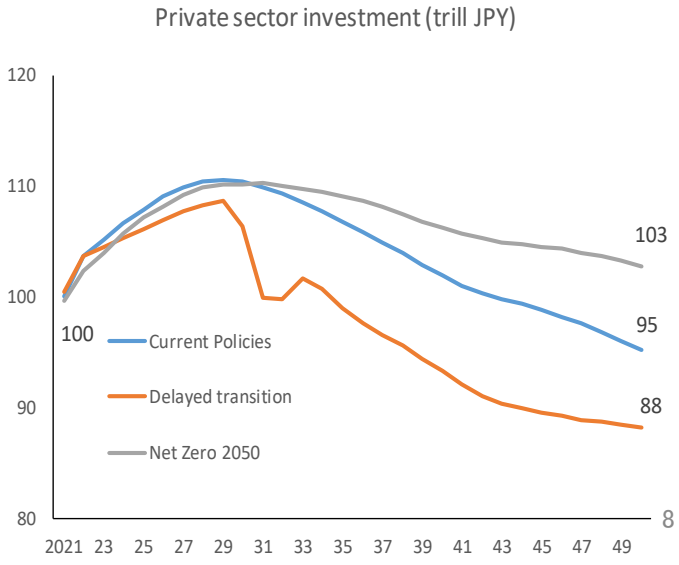
Scenarios and Our Focus

Scenarios: Macroeconomic environment (i)

- ✓ **NGFS scenarios assume that transition risk is potentially absorbable under stable economic growth path around potential growth**
  - In net zero 2050 scenario, government can recycle carbon tax revenue to boost economy. In current policies scenario, the rise in mean temperature depresses productivity growth.
  - Delayed transition scenario is the worst due to a sharp rise in carbon tax.



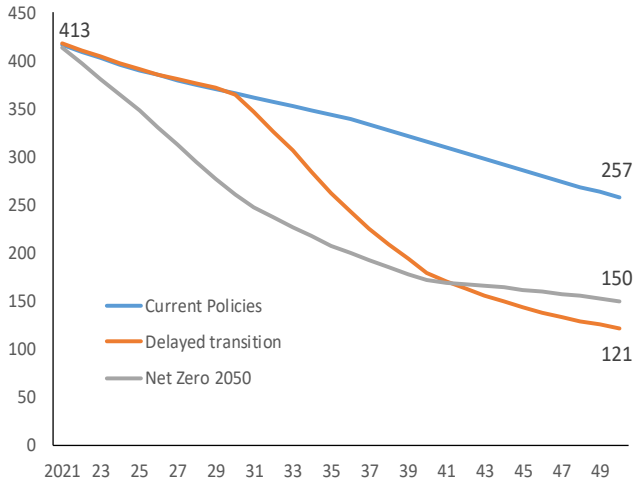




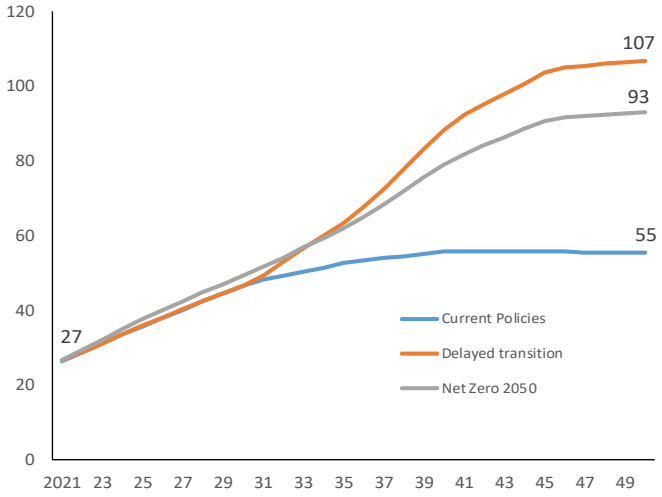
Scenarios: Macroeconomic environment (ii)

- ✓ **NGFS scenario also provides the transition of energy source configuration under a carbon neutral society**
  - In orderly and disorderly transition scenarios, fossil energy consumption will decrease while renewable energy consumption will increase.
  - **In this structural change of energy consumption, energy and utility sectors will face pressure to transform their business models.**

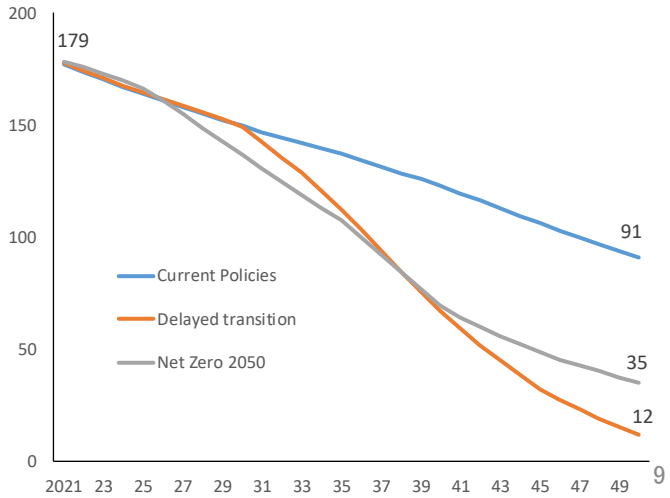
Enenrgy consumption (Mtoe)



Renewable energy consumption (Mtoe)



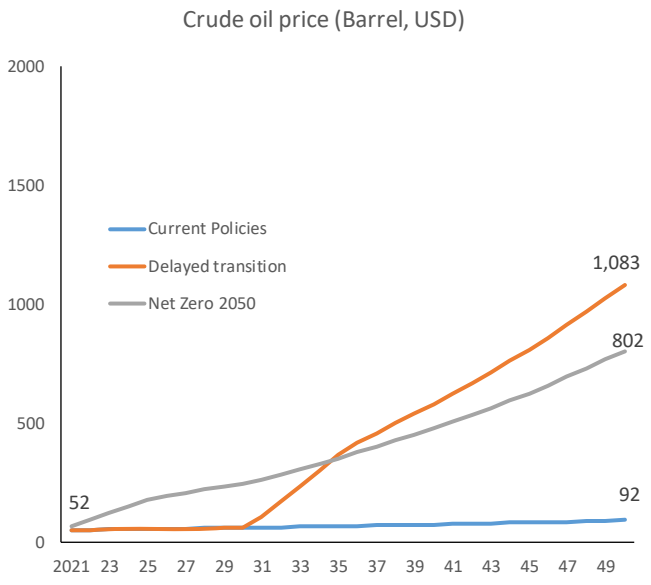
Oil consumption (Mt)

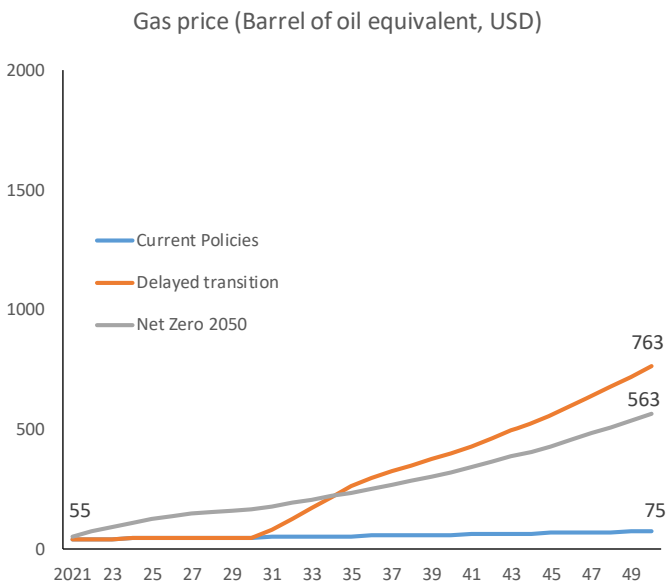


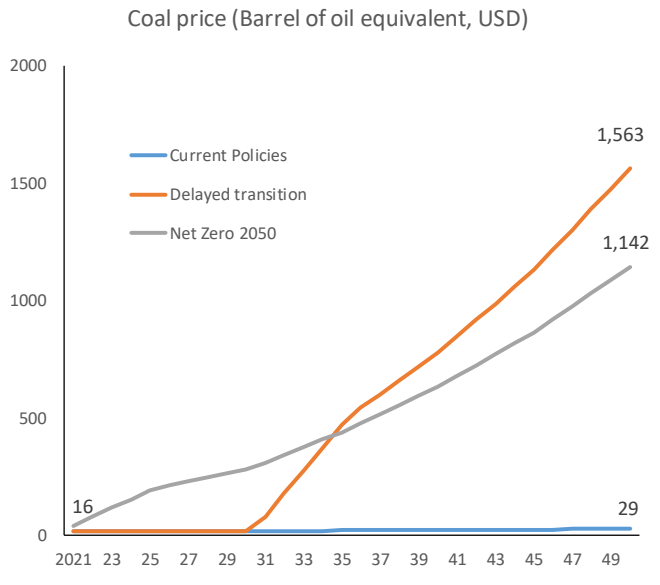
Scenarios: Macroeconomic environment (iii)

✓ Rise in fossil fuel energy price encourages energy saving innovation

- In Net zero 2050 and Delayed transition scenarios, firms and households will face the rise in fossil fuel energy price due to carbon tax.
- Economy is supposed to seek energy saving innovations.





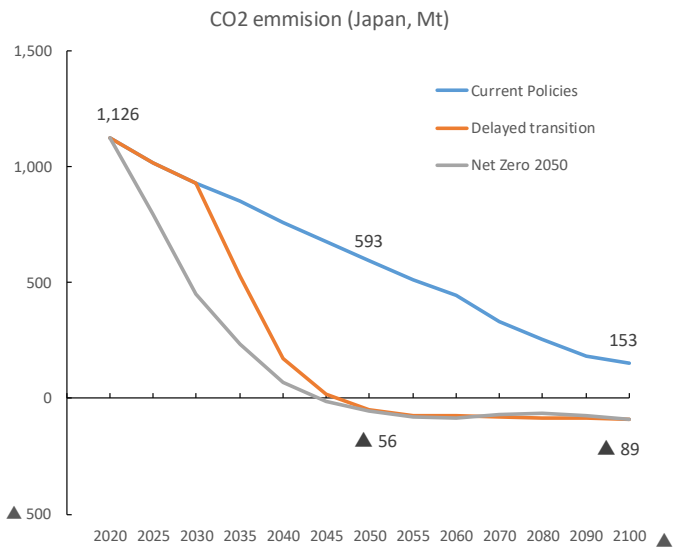


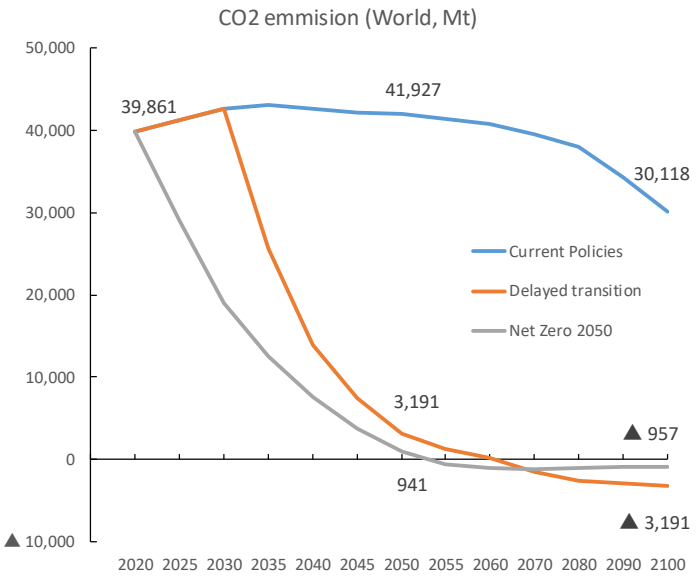
Scenarios: Sectoral and firm heterogeneity

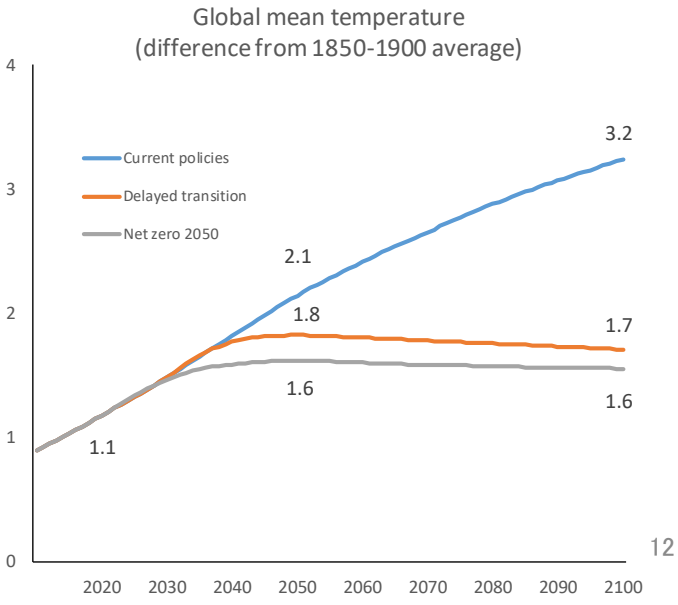
- ✓ **NGFS scenario has not provided sectoral data such as sectoral GDP or stock indices. BOJ has additionally provided sectoral scenarios.**
  - The additional sectoral scenarios are helpful to capture sector specific stress such as oil and gas sector.
- ✓ **Firm level analysis is also required to capture firm specific heterogeneity in the same sector.**
  - In Japan, one of the biggest challenges is a transition of gasoline engine automobile manufacturers to green energy automobile manufacturers.
  - 40% of automobile parts manufactures' technologies are estimated to be associated with gasoline engine production (in worst case, worthless in EV production).

Scenarios: Longer time horizon in physical risk

- ✓ **Set longer time horizon of physical risk for benefit-cost like analysis**
  - Carbon neutral by 2050 is expected to be effective to keep the rise in temperature within 1.5℃.
  - Set longer time horizon (by 2100) for physical risk.
  - Very small differences of physical risk impacts in 2050







Assumptions of analysis

- ✓ **Choose static balance sheet assumption in this pilot exercise given the technological restriction of stress testing.**
  - In static balance sheet assumption, no change in loan portfolio composition or no growth in loan amount are assumed in the analysis time horizon.
  - Prefer non-biased scenario analysis results under technological restrictions.
- ✓ **Firm level analysis (only for high carbon intensive sectors) can provide the projection of firms' total liability dynamics.**
  - Expected to provide insights to generate more realistic projections.

Timeline

Timeline

April, 2021	Established the cross-sectoral roundtable for the analysis to enhance understandings and share challenges among sectors
- July 2021	Discussed framework of the analysis with institutions
August 2021	Financial institutions initiated the analysis
December 2021	Submission of the results of the analysis (the data and qualitative information)
- Summer 2022	Dialogues with banks and insurers based on the results of the analysis

Thank you very much!