

SIZING THE RISKS AND RAISING AWARENESS: THE BANQUE DE FRANCE / ACPR EXPERIENCE IN DESIGNING CLIMATE STRESS-TESTING EXERCISES

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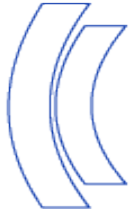
STRUCTURE

- 1. Objectives and main features**
- 2. Scenario design**
- 3. The ACPR Pilot exercise**



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BACKGROUND AND OBJECTIVES

■ Background:

- 2015: French Act on Energy Transition and Green Growth includes an innovative extra-financial reporting framework and requires the implementation of a regular stress test scenario representative of climate change-related risks
- 2018: ACPR survey aiming at monitoring climate-related exposures and gauging the progresses accomplished by firms

■ Objectives:

- For the Banque de France/ACPR:
 - Sizing the vulnerabilities and the risks, including possible mispricing
 - Raising awareness: assessing and making sure firms are equipped with or will adopt or develop appropriate methodologies and data to manage climate-change risks
- For the financial industry:
 - Developing a better understanding of the transmission channels
 - Relying on a common set of assumptions and scenarios for comparability



SPECIFICITIES OF CLIMATE SCENARIOS

	Standard scenarios	Climate change scenarios	
		Transition risks	Physical risks
Horizon	Short to medium run	Short, medium and long run	Short, medium and long run
Scenario drivers	Economic and financial	Climate policy and technological change	Conditional on outcomes of transition scenarios and/or environmental dynamics
Shock values	Guidance from historical data	Little to no guidance from history	Little to no guidance from history
Aggregation	National	Sectoral	Sectoral and geographical
Feedback loops	Work in progress (e.g. macro models with financial frictions)	Work in progress (e.g. interaction between policy and economy)	Interaction climate - economy



MAIN FEATURES

- Time period: **2020 – 2050**
- A **bottom-up** approach
- Both **banks** and **insurance companies**
- International: France + EU + US + Rest of the World (material exposures)
 - 80-85% of exposures for banks and insurances
- A **granular sectoral approach** with 55 sectors
- Transition risks and physical risks
- Combines **static** (2020-2025) and **dynamic balance-sheet** assumptions (2025-2050)
- Consistency checks and second round effects
- Voluntary « pilot » exercise : not a capital exercise



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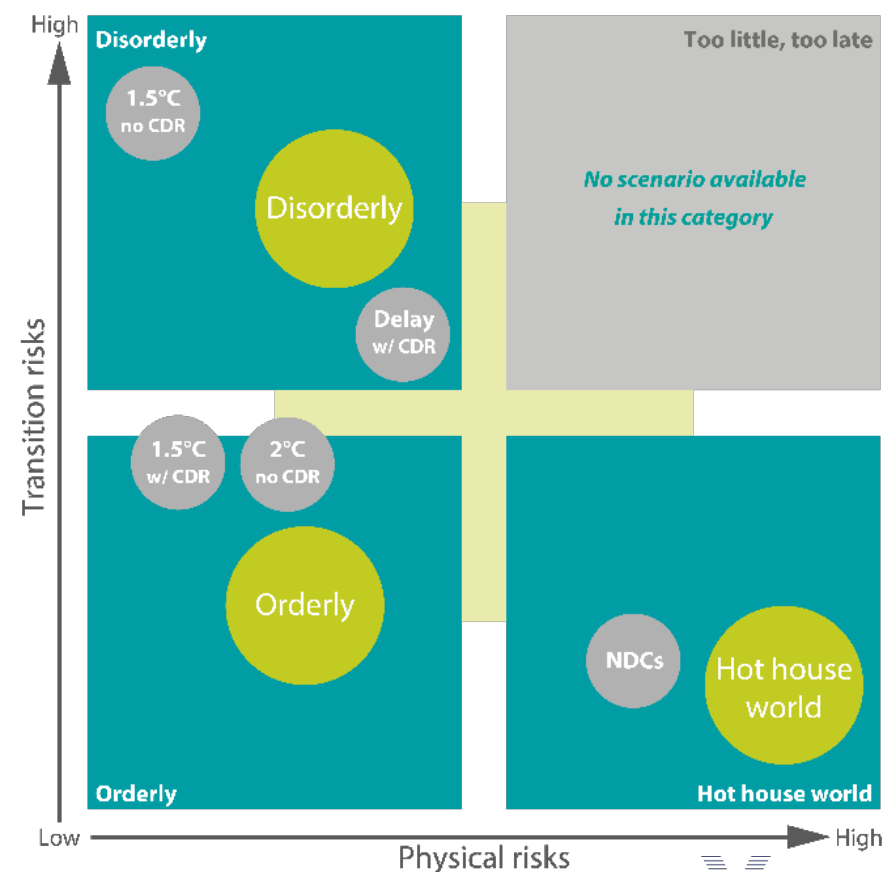


NGFS SCENARIOS

- NGFS released a **set of high-level reference scenarios** in June 2020, produced jointly with an academic consortium
- The first phase explores **8 scenarios** consistent with the NGFS framework
- They explore futures in which:
 - Different **temperature outcomes** are reached (e.g. 1.5°C, > 2°C, 3°C+)
 - **Emissions reductions** commence soon or are delayed (to 2030)

All **technologies** are available or not

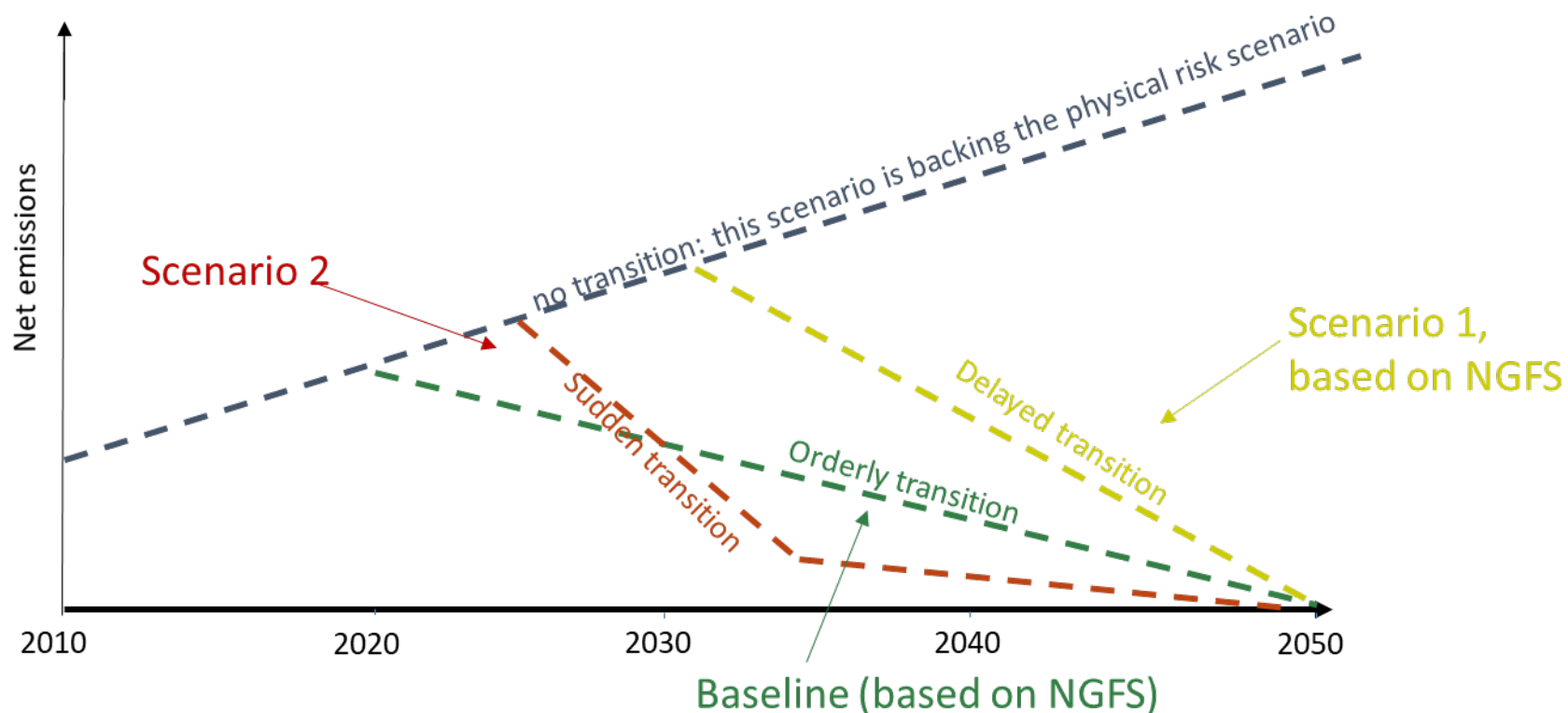
NGFS Scenarios Framework



BUILDING ON THE NGFS

What type of transition to reach zero net emissions by 2050?

Orderly (**baseline**) and disorderly scenarios (**2 adverse variants**) + **physical risk scenario** based on the “business as usual assumption”





SHOCKS

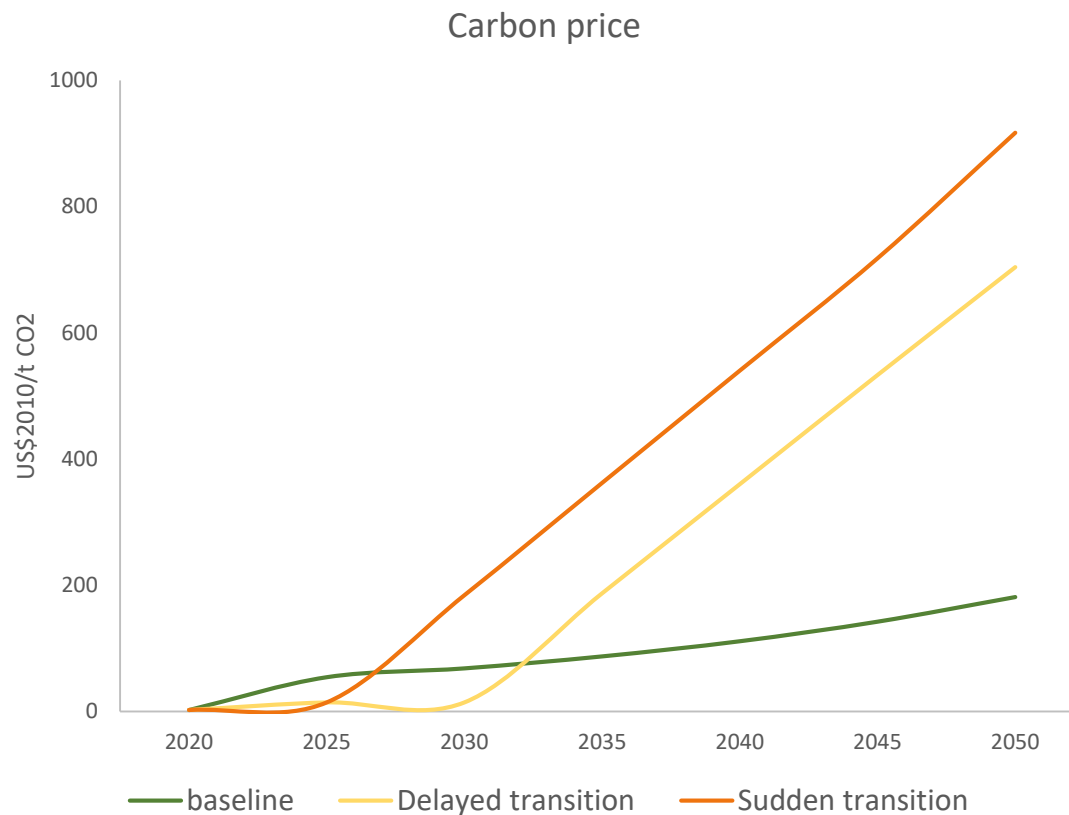
- **Carbon prices:**

3 trajectories aligned with the NGFS *high-level* reference scenarios

- Variant 1: from \$14 in 2030 to \$704 in 2050 (/t CO₂)
- Variant 2: from \$14 in 2025 to \$917 in 2050 (/t CO₂)

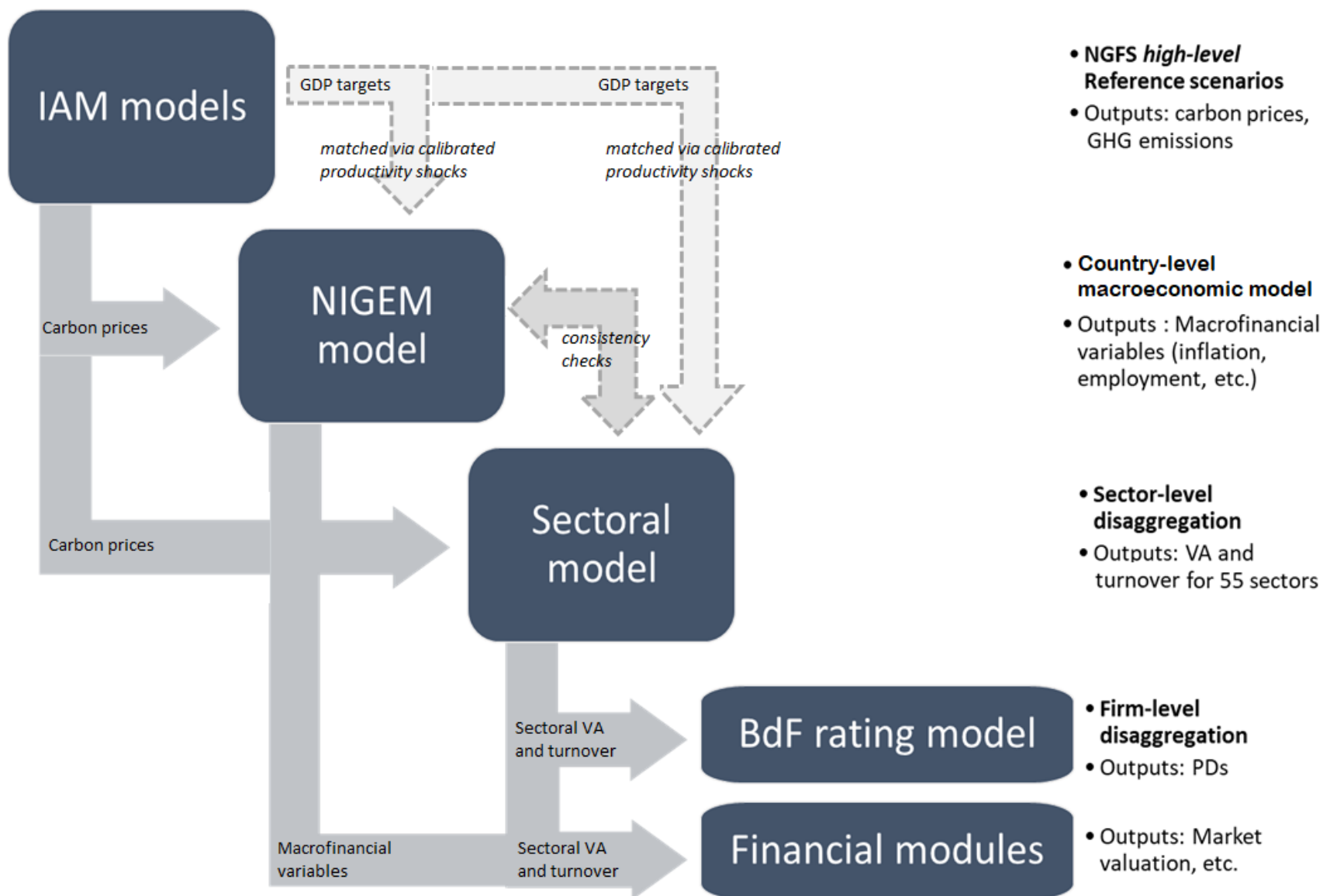
- **Calibration:**

- *Delayed transition*: Calibrated on the NGFS GDP outcomes, assuming positive productivity gains (and postponed increases in carbon prices)
- *Sudden transition*: Constant productivity – no calibration on the NGFS GDP outcomes





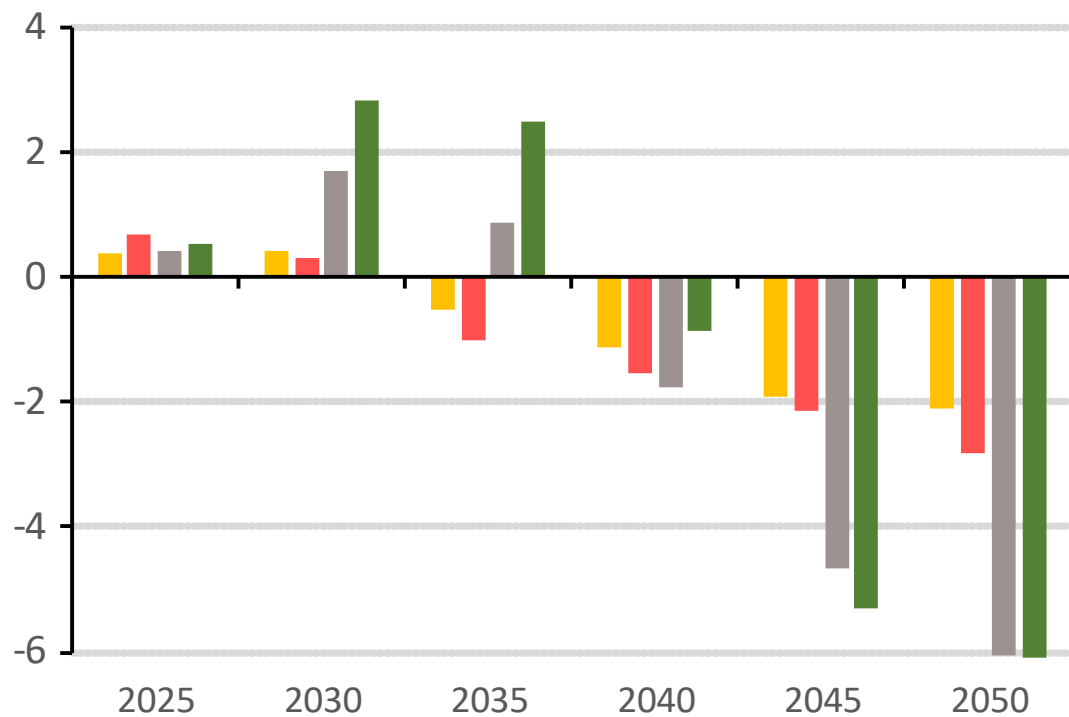
MODELING ARCHITECTURE



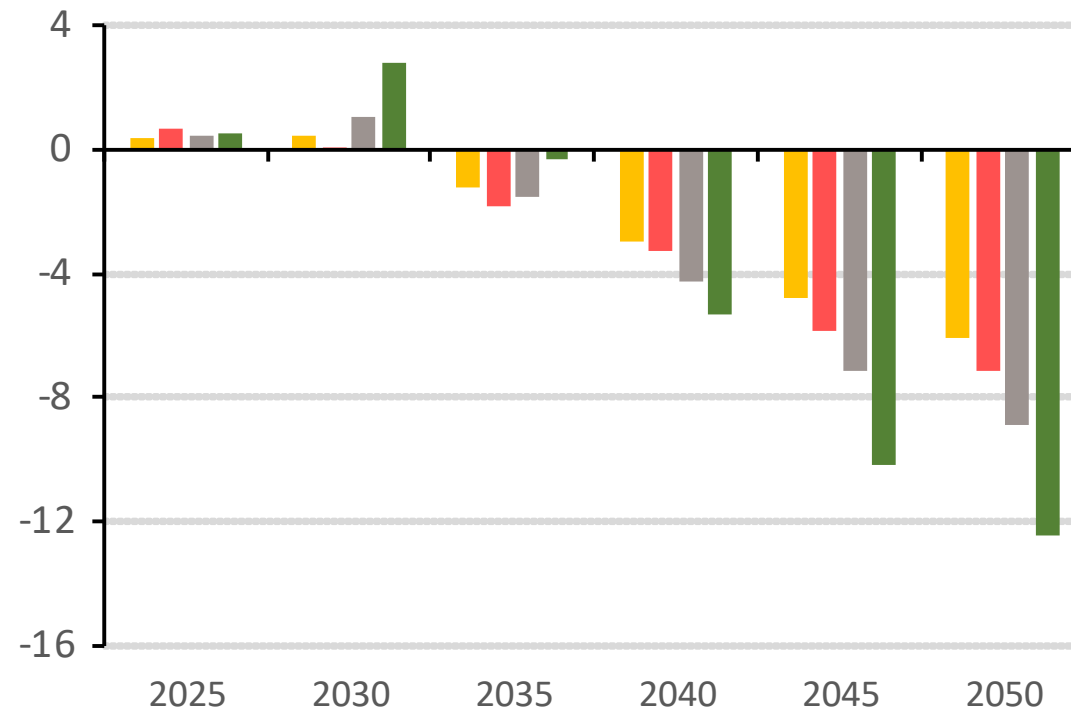


MACROECONOMIC IMPACTS

Scenario 1 - Delayed transition



Scenario 2 - Sudden transition

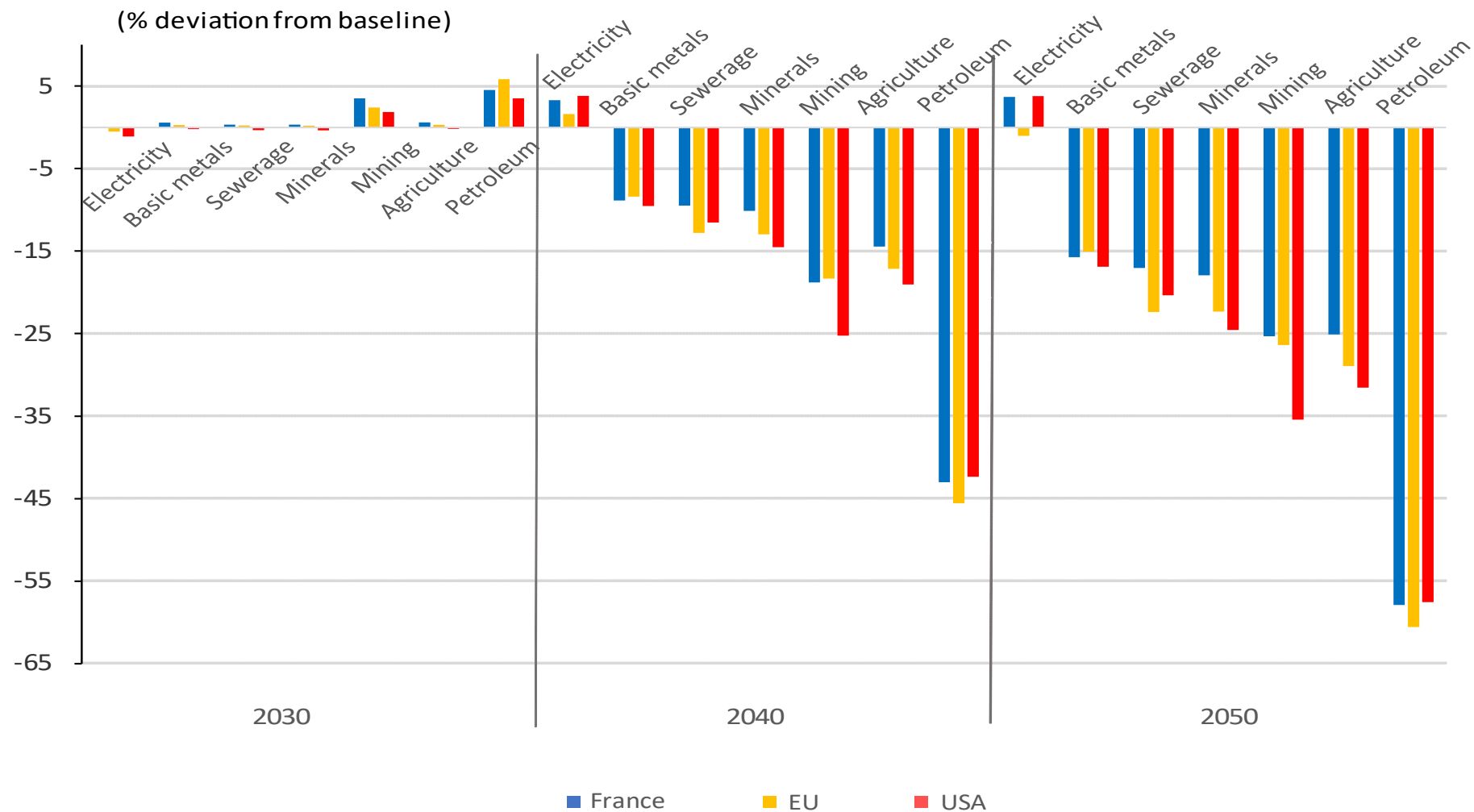


■ Europe ■ US ■ China ■ RoW

Real GDP levels (% deviation from baseline)

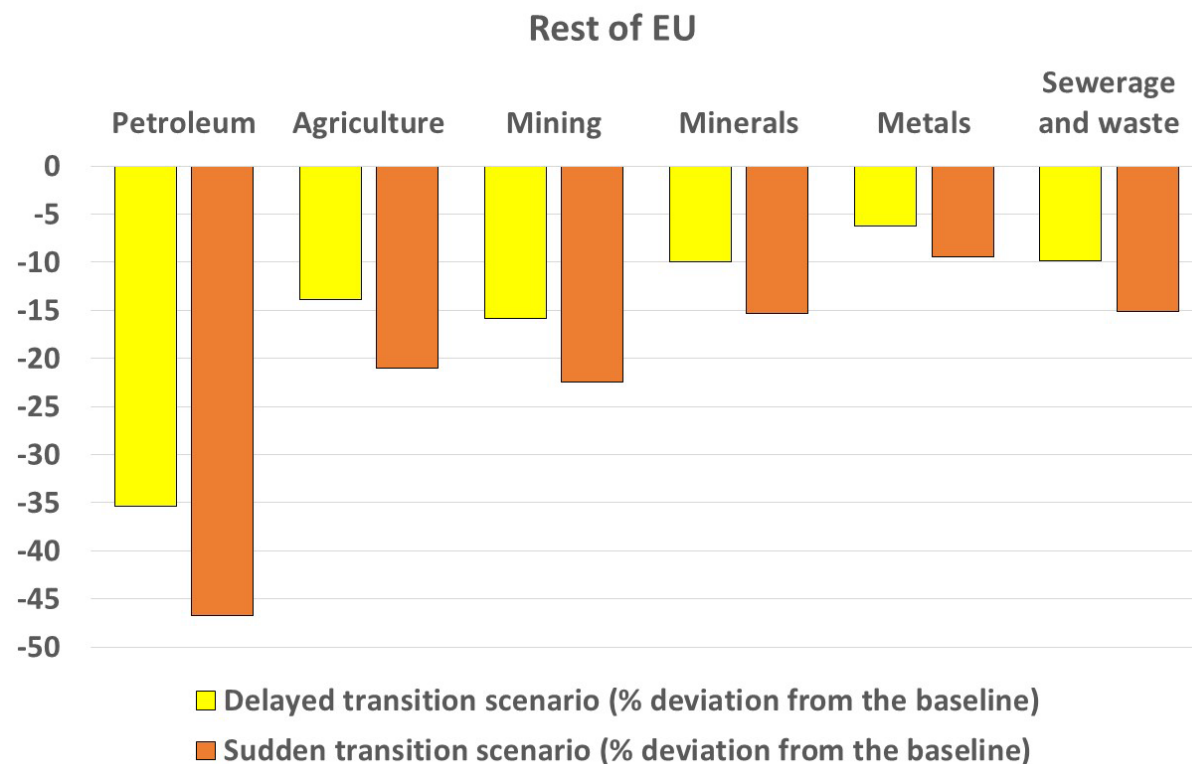
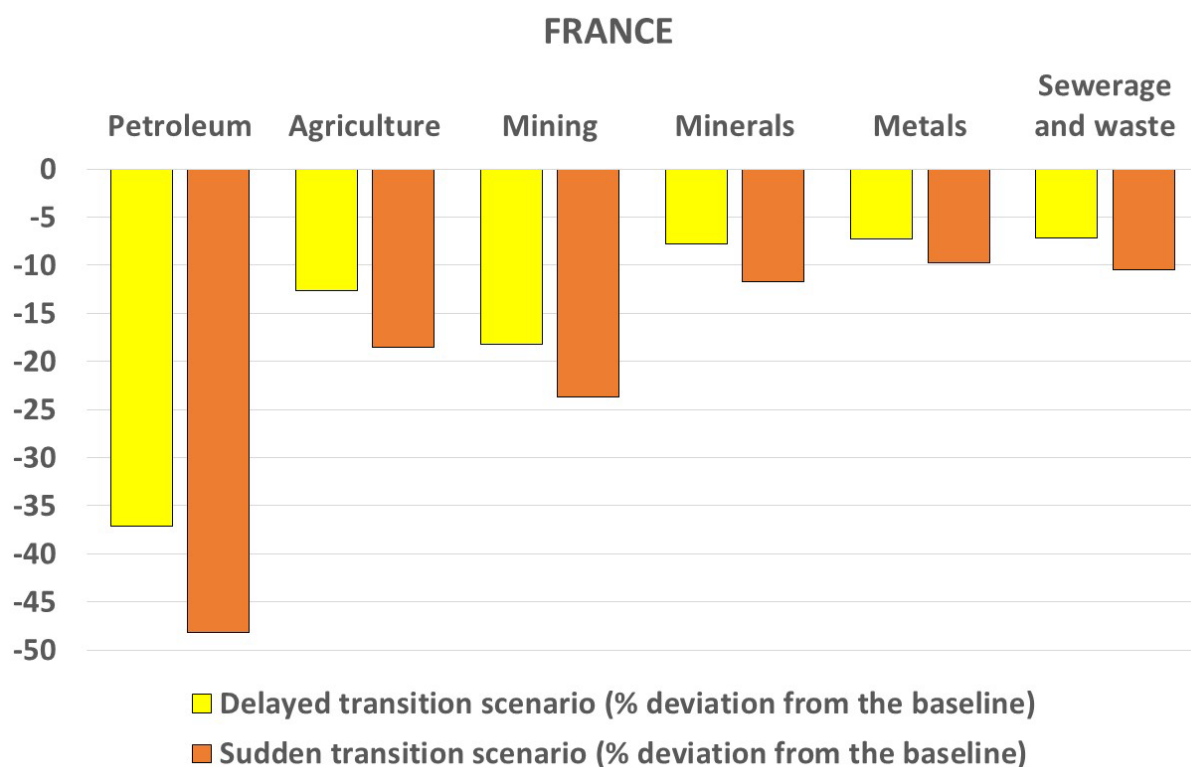


SECTORAL IMPACTS





ASSET PRICE SHOCKS



Stock price shocks by sector (% deviation from baseline)



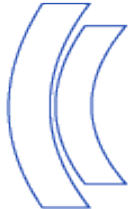
PHYSICAL RISK SCENARIO

- **Scenario consistent with IPCC Representative Concentration Pathway (RCP) 8.5**
 - Projected increase in global surface temperatures of 4.3°C by 2100
 - High emissions “business as usual” scenario: increasingly plausible?
- **Four NATCAT perils studied:** floods, drought, marine submersion and windstorms
- **Simulations carried out by public French re-insurer *Caisse Centrale de la Réassurance (CCR)***
 - *Météo France* “ARPEGE” model used to project incidence of perils
 - 23% increase in drought, 38% increase in flooding, 82% increase in submersions
 - 35% increase in all physical perils within projections consistent with RCP 8.5
 - CCR processes exposures (at 20 km² granularity), provides losses by *département*
- **Rest-of-world exposures to be modeled using NGFS physical risk data (ISIMIP)**
 - Undertakings adopt internal mapping of climate variables to financial impacts
 - ACPR asks for coverage of 80-85% of exposures in exercise (representative of business)



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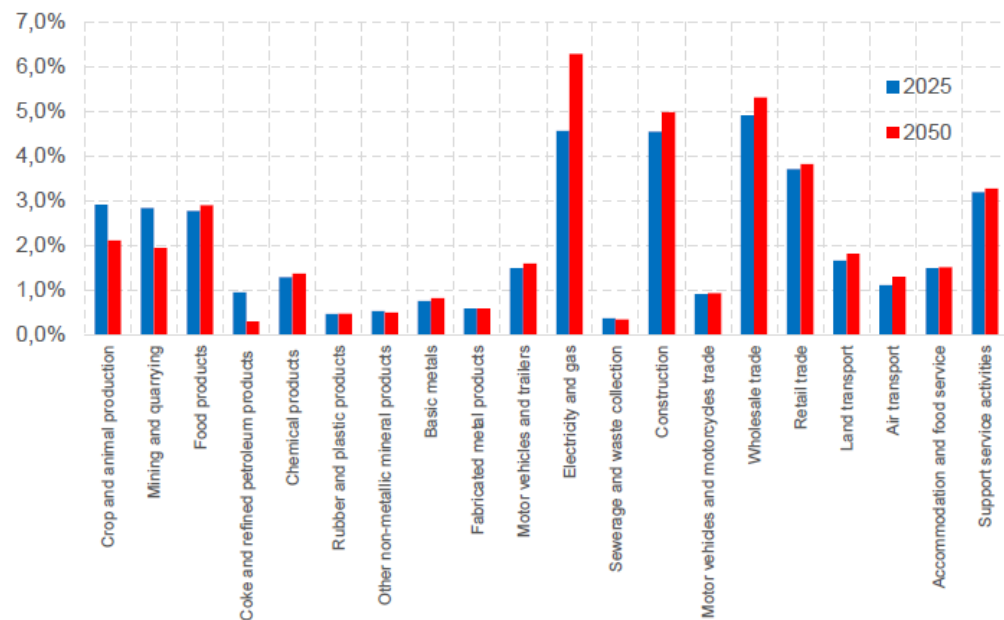
MAIN TAKEAWAYS

- A very **strong participation**: 9 banking groups (accounting for 85% of total banking assets) and 14 groups of insurers (20 insurance companies - covering 76% of the sector's technical provisions);
- The methodological notices provided by the financial institutions show **in-depth analyses of the climate-change risks** developed in the context of this exercise; include qualitative assessments.
- Banking institutions appreciated the provision of **granular sectoral and geographical data**. They also recognized the usefulness of climate-related variables.



INSIGHTS FROM THE DYNAMIC BALANCE SHEET ASSUMPTION

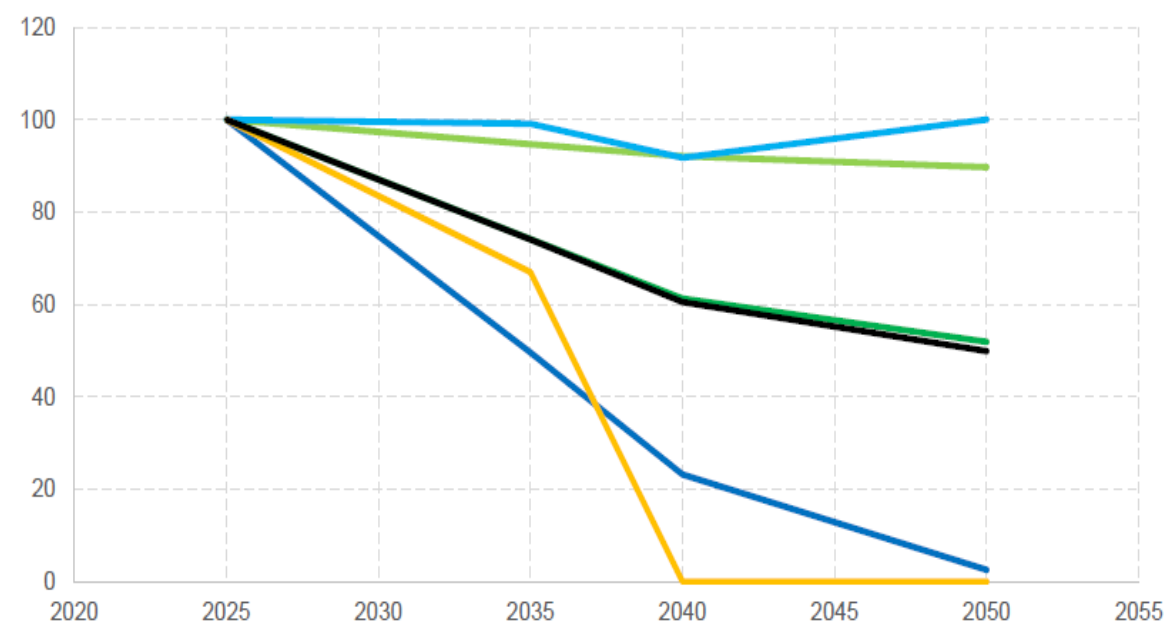
Chart 2 - Sectoral structure of credit exposures



Note: across geographical areas for all banks participating in the exercise under the sudden transition scenario

Source: ACPR

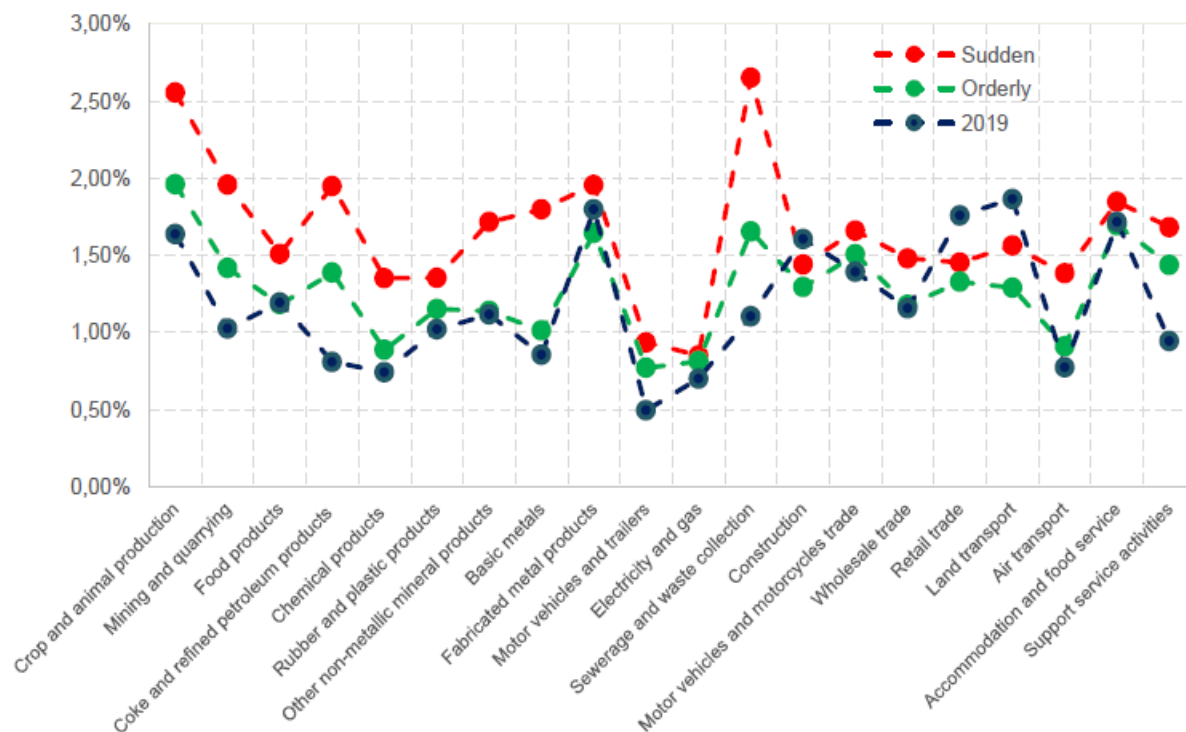
Chart 3 - Evolution of credit exposures in the sector of manufacture of coke and refined petroleum products





IMPACT ON CREDIT RISK

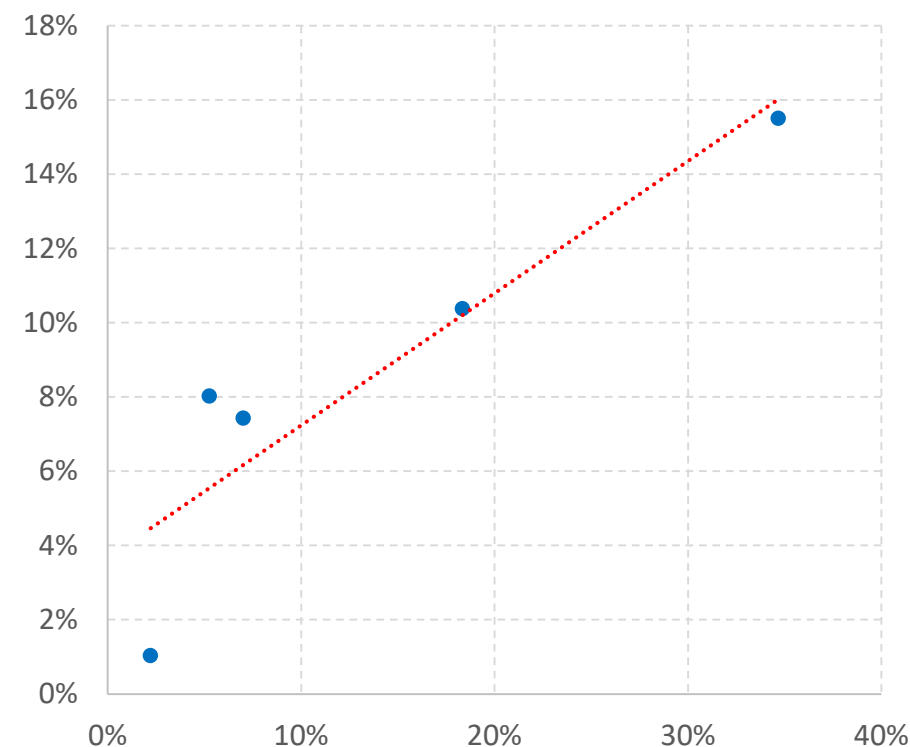
Chart 7 - Evolution of the probability of default broken down by sector



Note: the graph below represents the weighted average (weighted using total corporate exposures) of the one-year probabilities of default by sector of the 6 main French banking groups. The levels shown for the orderly and sudden transition scenarios correspond to those observed in 2050.

Source: ACPR

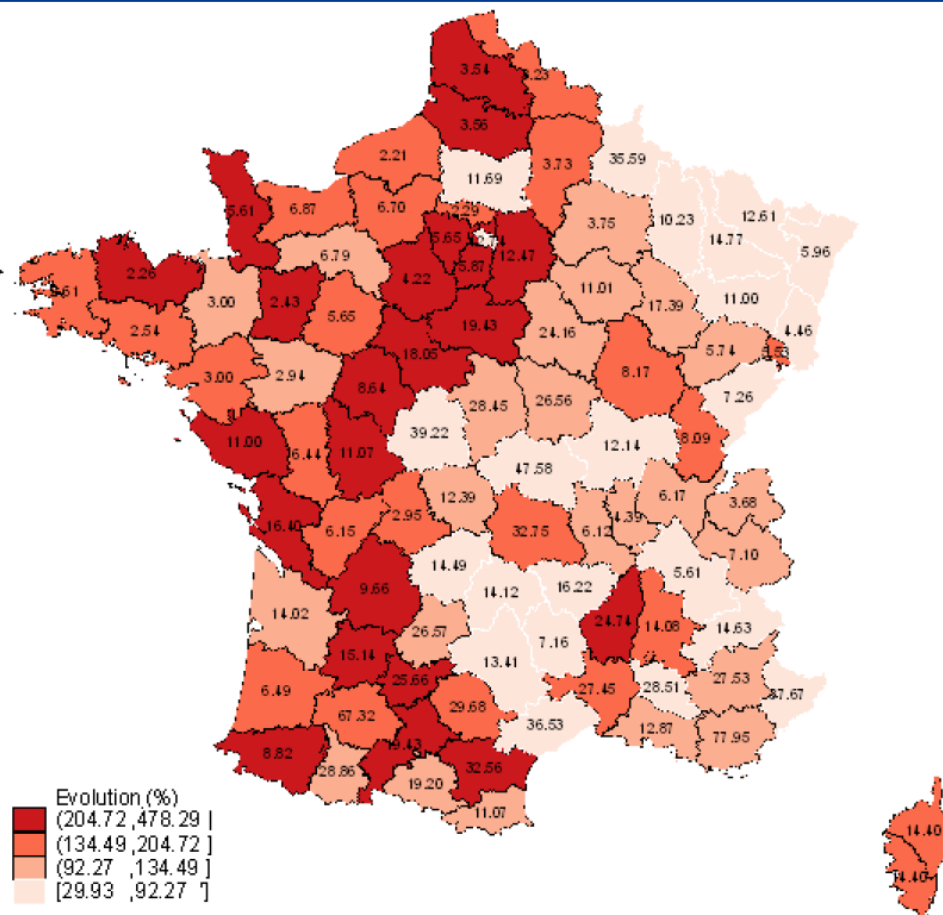
Correlation of the rate of change of the CoR corporate between baseline and adverse and share of corporate exposures to sensitive sectors



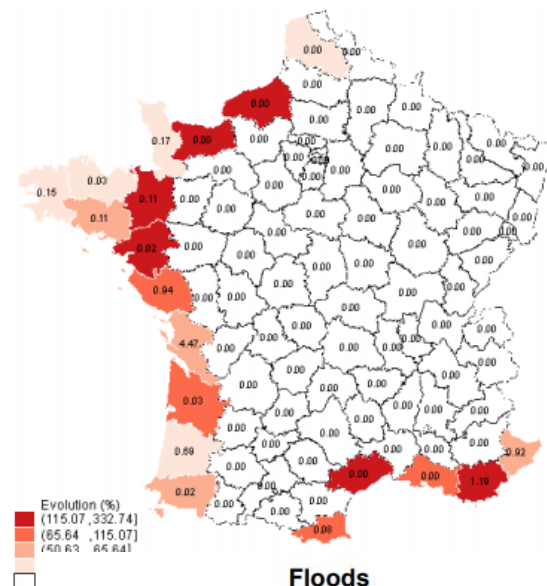


PHYSICAL RISKS: 3 PERILS IN MAINLAND FRANCE & CYCLONES OVERSEAS

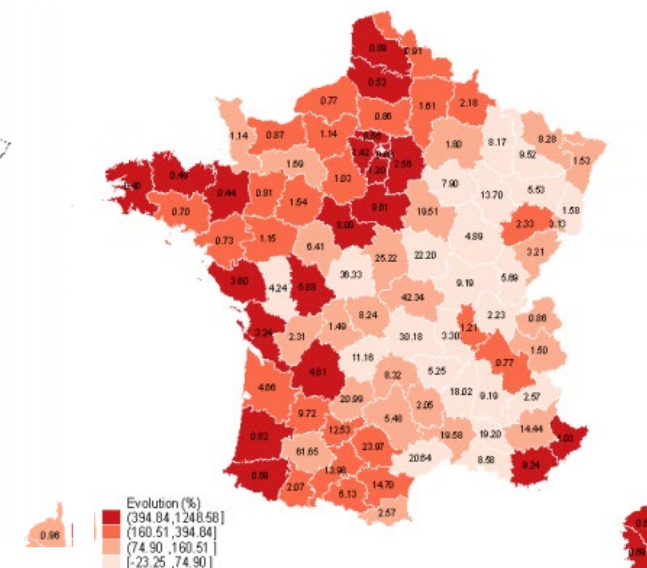
Chart 17 – Claims for all perils (2019 - 2050)



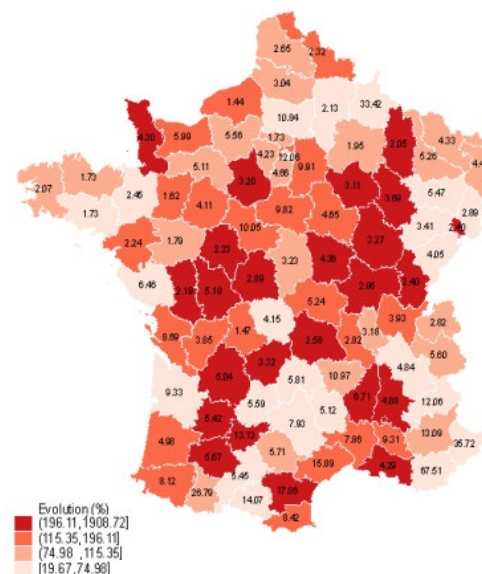
Marine Submersions



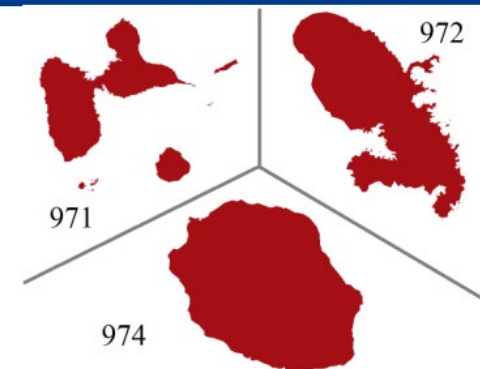
Droughts



Floods



All perils - Martinique, Guadeloupe, Reunion islands





CONCLUSIONS

- Strong engagement from participants and significant methodological developments despite challenges; this exercise was considered as a catalyst
- Identified challenges:
 - Scenarios: not enough variability across NGFS scenarios; issue of the identification of sensitive sectors and granularity
 - Methodological issues: handling long-term horizons, sectoral differentiation and integration into internal models...
- Basis for future work :
 - Identifying best practices regarding the different methodological approaches
 - Improving the analysis on certain segments (market risk, households...)
 - Physical risk remains a challenge: inability to precisely locate exposures for banks; sizing insurance protection gap

Thank you

Annexes



BACKGROUND

- In 2018, the ACPR conducted a survey to update the first Government report with the aim of monitoring exposures and gauging the progresses accomplished by firms.
- The outcome was mixed with some notable progresses on transition risks, but heterogeneous across firms, less on physical risks (due to low perceived exposures and data gaps); liability risk was largely overlooked.
- The ACPR set up working groups with the industry:
 - One on the governance of climate change risks with banks;
 - Two others on scenario analysis (one with banks, the other with insurance companies). The Pilot exercise was designed in the context of these working groups. It took about a year to prepare this exercise



PROCESS

- **2 working groups with the industry** (banks and insurers) set up by the ACPR to discuss scenario selection and pilot exercise
- Workshops and exchange with the **academic community** to discuss available transition scenarios for France, available models and variables, and assumptions
- Reference to **France's commitments and strategy** and alignment with/calibration on the **NGFS scenarios**



SCENARIO NARRATIVES

The exercise analyses 4 scenarios

3 Transition risk scenarios:

- 1 **baseline** scenario and 2 **adverse variants**
- 2 shock variables related to transition risks:
 - **carbon price**
 - **productivity**
- Adverse variants depending on:
 - **Timing** of the shocks
 - **Size** of the shocks
 - Assumptions about technology – **productivity**

1 Physical risk scenario: based on “RCP 8.5”

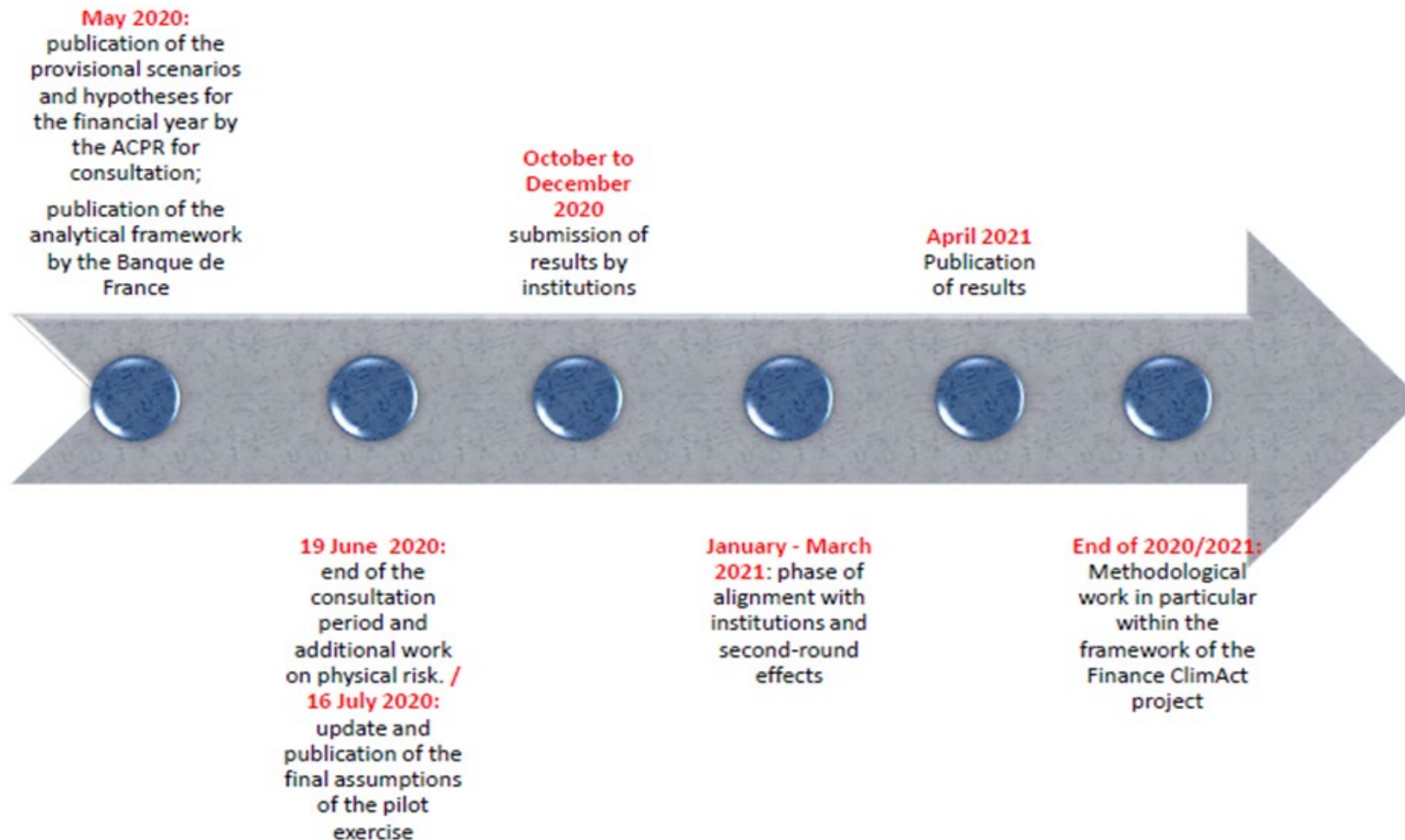


HEALTH INSURANCE SCENARIOS

- **AON models evolution of health claims due to:**
 - Spread of vector-borne diseases
 - Climate-driven migration of mosquitos or other insects
 - Impacts given by *région* (13 in France)
 - Scenario based on report Drif, Roche & Valade (2020)
 - Increase in air pollution in major metropolitan areas (concentration + peak)
 - Ozone (O₃), Dioxide nitrogen (NO₂), fine particles PM 2.5 + PM 10
 - Impacts given for 10 largest French metropolitan areas
 - Scenario based on report Drif, Messina & Valade (2020)
- **Mortality and sinistrality tables are projected (from 2020 to 2050) for:**
 - Death benefit guarantees
 - Healthcare coverage (hospitalizations and consultations)
 - Work stoppage guarantees



TIMELINE



References

- [Scenarios and main assumptions](#)
- [Modelling framework and scenario details](#)
- [Guidance and scenario data](#)
- [Governance and climate-related risk management](#)
- [French insurers facing climate change risks](#)
- [French banking groups facing climate change-related risks](#)