Response to Bank of England Discussion Paper:
"The 2021 biennial exploratory scenario on the financial risks from climate change"

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1. General Comments

The 2021 biennial exploratory scenario (BES) discussion paper proposes an innovative approach to measuring and exploring climate-related financial risks (CRFR) that goes beyond anything we have yet encountered at the supervisory level. There are a number of pioneering changes within the framework. The focus on multi-decade, multi-scenario, forward-looking analysis consciously moves away from the historical, probabilistic risk modelling that characterises traditional supervisory stress testing – an 'epistemological shift' necessary, in our opinion, in order to overcome the 'Tragedy of the Horizon' and better account for CRFR.

It is particularly encouraging to see well-thought through methods to identify systemic interactions and potential feedback loops. We welcome the use of a qualitative component to identify financial institution expectations and reactions, and the suggestion of a two-step submission process in order to investigate potential second order effects and interdependencies within the financial system. Overall, we consider the BES to represent a 'step change' among supervisory approaches to climate scenario analysis.

Nevertheless, several aspects of the proposal reveal some questions as to the feasibility of achieving both ease-of-implementation alongside reliable and meaningful results. The comments below deal with these critical points.

The BES emphasises that CRFR are unprecedented, irreversible, systemic, and will emerge over multi-decade time horizons. These characteristics render climate risks, in our view, subject to radical uncertainty rather than probabilistic risk – a distinction (not articulated in the paper) that is crucial to understanding challenges to measuring CRFR (NGFS 2019; BIS, 2020; Chenet et al., 2020). Financial and economic quantitative models typically employ probabilistic (or 'Knightian') risk frameworks, where future outcomes are considered to have knowable probabilities calculated from past trends. These are ill-suited to dealing with radical uncertainty, where there is no basis upon which to form any calculable probability, and the future in inherently unknowable and unpredictable. Given this, we question whether stress testing and scenario analysis, in general, are able to capture the inherent complexity of CRFR in order to produce reliable and meaningful quantitative estimates.

Firstly, analysis results will be highly sensitive to the assumptions underlying the chosen scenarios. The financial impacts of climate change involve multiple, complex systems (ecological, social, economic, financial) and their subsystems, interacting through interconnected mechanisms involving technology, policy, behaviour, and geopolitics. The multiplicity of possible futures (the IPCC works with a selection of 222 scenarios compatible with 1.5°C or 2°C alone) is another source of significant uncertainty. Whilst we appreciate the Bank does not wish to overburden respondents, the discussion paper does not give any basis by which the chosen scenarios were deemed relevant and representative, and also does not clarify their underlying assumptions (e.g. the exact reliance on negative emissions technologies, which is especially relevant for the *Late Policy Action* scenario).

We also query the usefulness of assuming fixed 2020 balance sheets (in both size and composition) over the 30-year[1] analysis horizon. Bank balance sheets have doubled in size and shifted dramatically in composition (from firm to household lending) since 1980 (Jordà et al., 2017). Given we can reasonably expect material

[1] 50 years for physical risks

portfolio changes under any scenario, especially as physical risks emerge in the long run[2], we question to what extent fixed balance sheets are relevant assumptions for climate stress testing over such a long period. Such an extreme *ceteris paribus* condition is effectively akin to analysing the effect of the smartphone and internet revolution upon a 1980 balance sheet. A rapid low-carbon transition can perhaps be captured in a shorter timeframe which would allow such a condition to seem more realistic.

Further questions are raised by the mechanism to translate aggregate macro-financial impacts onto firm-level impacts, which the paper proposes is undertaken by individual financial institutions. Whilst we recognise the importance of building capabilities for bottom-up climate analysis within FIs, allowing heterogenous approaches to modelling cashflows and collateral values could risk divergent and contradictory results. On the flipside, FI-led methodologies could also engender monoculture approaches to analysis and practice, resulting in highly correlated errors and shared risk blind spots (Bronk and Jacoby, 2016). Such concerns, in our opinion, warrant greater oversight and guidance by the Bank as to what suitable approaches FIs should follow.

Such guidance may also help to allay potential moral hazard. Under the current proposal, there is no incentive for FIs to provide voluntarily prudent and conservative estimations (i.e. overestimations) of their existing risk exposures, given the potential materiality of such information on regulatory responses. The incentive to provide robust and reliable responses is also lessened by potential issues in implementing the analysis. The proposal assumes a level of knowledge and resource capacity that, to our knowledge, is beyond that existing in most financial institutions. Indeed, the paper suggests that FIs should implement comprehensive, multi-asset, bottom-up analysis of 80% of their corporate exposure, which will likely constitute many thousands of counterparties. Whilst this high-ambition expectation is a commendable supervisory signal, it is also relevant to ask when, if ever, the Bank expects FIs to be feasibly in a position to undertake such analysis. Is there any relevant, reliable, credible and replicable approach already existing even at the single counterparty level? Indeed, we think (sell-side) financial analysts have the capacity to undertake sophisticated and granular analysis that would be relevant for such exercise. But how much time would it need? Maybe this incapacity to deliver is the expected answer, which will justify a more interventionist approach by supervisors. But without strong readiness for such an ambition there is a risk of slowing and deflating the research endeavour on the topic.

Taken all together, we consider that the BES represents the best available framework for climate-related scenario analysis/stress testing. Yet, the fact that even this pioneering approach struggles to reconcile feasibility-of-implementation with the capacity to reliably capture climate-related uncertainty perhaps reveals that the BES is insufficient as a tool for managing systemic climate risks. Indeed, with the proposal explicitly stating that firm submissions will not be used to set capital requirements (paragraph 6.2), it is unclear how the outputs of the whole exercise will actually be used to manage relevant risks once they are identified.

Evidence suggests that the measurement of long-term risks alone is not sufficient to generate effective management of those risks – a phenomena that has been observed for climate disclosures (BCAM, 2019; Christophers, 2019). What will supervisors do if FIs come back with a limited risk perception well below that expected by supervisors?

Given it is widely acknowledged that delayed climate action increases the severity of impacts, it is unnecessary to have precise measurements of climate risks in order to understand them. We have argued that a precautionary, market-shaping approach is required for effective risk mitigation (Chenet et el., 2019). Instead of mathematical models, such an approach relies on qualitative frameworks using heuristics and general direction-setting for markets and is hence better suited to managing conditions of radical uncertainty (Kay and King, 2020). We propose the integration of climate-risk based rules into capital adequacy requirements, monetary policy operations, and quantitative credit guidance with 'worst-case' scenarios being assumed to

[2] And especially given the proposed approach assumes physical risks by 2050 correspond to outcomes predicted for 2080

ensure the long-term resilience of the financial system and economy (see Chenet et al, 2019 for a more detailed discussion).

Overall, we commend the bank for pioneering a material step forward in supervisory approaches to climate scenario analysis. Our comments here urge the BoE to critically assess whether such approaches are able to immediately stimulate material capital reallocation within the pressing timeframes remaining for preventative action.

2. Responses to specific questions

Questions on Chapter 3: Scenario narratives

Q4. Do the scenario timeframes strike the right balance between allowing a full assessment of these risks while also being tractable for firms' modelling?

- All scenarios end in 2050 – it is not clear how the framework will draw meaningful temperature conclusions. Temperature rise estimates are based on 2100 and rely heavily on the assumptions used in the post 2050 period (e.g. negative emissions technologies).
- Whilst the framework states it takes a prudent view on use of CCS, negative emissions technologies are not explicitly specified for the *Late Policy Action* scenario – which begs the question of how this scenario has been rendered feasible.
- The three chosen scenario pathways follow NGFS reference scenarios, but the underlying climate science source (model/approach) has not been specified.
- As per our comments above, we question the usefulness of applying fixed 2020 balance sheet analysis across a 30-year analysis horizon.

Questions on Chapter 4: Scenario specification

Q5. Does the scenario specification adequately capture the risks in each scenario? Are there additional risk channels or scenario variables that should be considered as part of the BES?
It is not clear how the scenarios account for the following risks/effects:

- Tipping points from biogeochemical processes (e.g. permafrost melt, arctic winter sea ice)
- High uncertainty ranges associated with using carbon pricing as a proxy for climate policy (IPCC, 2014, p.422)
- High uncertainty ranges associated with development and diffusion of new technologies
- Financial contagion effects of climate-related asset repricing upon non-climate sectors (Reynolds, 2015)
- Emergent risks: e.g. development of new asset classes such as weather derivatives (NGFS, 2019b, p14)
- Rebound effects – where energy/resource efficiency gains through green innovation paradoxically stimulates greater consumption (Hoekstra and Wiedmann, 2014)

There is also some confusing language regarding the probability or plausibility of scenarios. The framework states that the BoE will add a high-level view on the probability that the impacts of each scenario will occur (paragraph 2.7). However as mentioned above, scenarios are subject to a high degree of uncertainty. The BIS (2020) cautions that climate-risk scenarios cannot be assigned probabilities as they do not reflect a comprehensive range of actual forecasts or potential outcomes.

Q8. Are there particular external sources or approaches that the Bank should consider when relating long-term macro-financial variables to climate variables?

- It is not clear if the framework is relying on equilibrium-based or non-equilibrium based macroeconomic and financial models. The two types can diverge in their conclusions on the economic impacts of climate policies (Mercure et al., 2019).

- It is also not clear how the framework will reflect the high uncertainty ranges of climate impacts (e.g. as represented in IPCC report) when translating the possible range of macro-financial outcomes.
- The framework specifies that the models attempt to isolate climate impacts independently from macroeconomic shocks. This approach is understandable for tractability, but it risks neglecting climate-related risks that may arise endogenously from changing economic conditions.
- Alternative models the framework could consider would be those that are non-equilibrium, account for uncertainty, and include dynamics of political economy, money, and finance - e.g. Dafermos et al 2018, Mercure et al 2019, Monasterolo et al 2019.
- Alternative approaches the framework could consider would be those that emphasise radical uncertainty and need for structural transformation: e.g. qualitative & politically grounded approaches: e.g. Aglietta and Espagne 2016, Chenet et al 2019, Ryan-Collins 2019.

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