

Financial risks arising from climate change

Scenario testing

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The Prudential Regulatory Authority (“PRA”) has issued its discussion paper, “[the 2021 biennial exploratory scenario on the financial risks from climate change](#)”, seeking feedback on its proposed approach for testing the resilience of UK Financial Services firms to the financial risks arising from climate change. The paper makes stark the rather different approaches required and the need to “develop cutting-edge risk management approaches.”

In his speech¹ on 17 December 2019, Bank of England Governor, Mark Carney, talked about the need to address the “climate crisis”, and made the plain statement that “we must go much further if the world is to reach net zero carbon emissions. Disclosure must become comprehensive. Risk management must be transformed. Sustainable investing must go mainstream. In short, every financial decision must take climate change into account.” This lays out a very clear direction of travel for financial services firms in the UK – they must integrate considerations of climate change effects into the business-as-usual risk management activity. In calling for disclosures to go “beyond the static to the strategic” he highlighted the role of stress testing and that the Bank’s current thinking about how to move this forwards was the subject of the discussion paper² issued on 18 December 2019.

The discussion paper is a development of the Bank’s thinking following the expectations set out in the April 2019 Supervisory Statement SS3/19³ which called for UK banks and insurers to build climate risk management into their risk frameworks, with a clear statement that this should include scenario analysis. The objective of the 2021 biennial exploratory scenario (“BES”) is to test the resilience of the core UK financial system to the physical and transition risks arising from climate change. The Bank makes it clear that the exercise is intended to provide information about the size of the risk rather than attempting to test capital adequacy. It is also important to note that the Bank clearly considers this work to go beyond the methods and tools that financial firms currently employ – it states that “the BES

will provide a vehicle for financial firms to identify and address data gaps and to develop cutting-edge risk management approaches.” The Bank highlights that the BES will differ from traditional approaches in several areas:

- Multiple scenarios will be used to test resilience of individual firms and the financial system
- Broader participation means that the BES tests both the UK’s largest banks and insurers
- Extended modelling horizon using a 30-year period as the risks being explored will unfold over a much longer timeframe than for traditional stress testing
- Integrated climate and macrofinancial variables to ensure consistency between pathways for temperature, emissions and climate policies and the relevant macrofinancial variables required to complete the modelling
- Counterparty-level modelling expectations mean that firms will need to assess the vulnerability of individual counterparties’ business models to climate-related risks

The discussion paper poses a number of questions (listed in Annex 1 of the discussion paper) which seek to test the extent to which the BES is feasible and whether there are material gaps in the assessment. Responses are sought by 18 March 2020 and the final BES scenarios will be published in the second half of 2020, giving firms 3 to 4 months to run the exercise. A second round of submissions may be sought, to test system-wide impacts further, with the final results being published in 2021.

This remainder of this briefing describes the proposals in more detail.

Key Features of the 2021 BES

PARTICIPATION

Due to the fact that climate change affects all parts of the financial system, the BES is testing UK banks and insurers

¹ Remarks at a farewell dinner in honour of Benoît Cœuré: <https://www.bankofengland.co.uk/-/media/boe/files/speech/2019/remarks-by-mark-carney-at-the-ecb-farewell-board-dinner-for-benoit-coeure.pdf?la=en&hash=BDBC6615D58090E002EAE209D5DE619CD6F2D71D>

² Discussion paper, 18 December 2019: <https://www.bankofengland.co.uk/-/media/boe/files/paper/2019/the-2021-biennial-exploratory-scenario-on-the-financial-risks-from-climate-change.pdf?la=en&hash=73D06B913C73472D0DF21F18DB71C2F454148C80>

³ SS3/19: <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2019/ss319>

(consolidated at the UK group level) to capture the spillover between different sectors. Large insurers will participate in the BES through the use of BES-aligned climate scenarios added to the PRA's 2021 Insurance Stress Test. The Bank is primarily seeking feedback on proposals from firms within the scope of BES (i.e. large banks and insurers) but has indicated that other firms' views are welcome and that out-of-scope firms may also find the BES scenarios a useful input to their own risk management processes.

THE SCENARIOS

Noting that physical and transition risks are interrelated, but potentially affect firms in different ways, three scenarios will be tested. Chapter 3 of the discussion paper provides details about how the scenarios are derived from the reference scenarios being developed by the Network for Greening the Financial System, but in summary they are:

- **Early policy action:** transition to a carbon-neutral economy starts early, giving markets time to price in the transition in an orderly fashion and take advantage of opportunities that transition presents. There is a structural reallocation but no macroeconomic shock. The global climate goal¹ is met, but there will still be higher physical risks.
- **Late policy action:** transition is delayed by 10 years, meaning a deeper adjustment is required. The behaviours of consumers and companies adjusts and a sharp repricing in asset prices leads to a macroeconomic shock. The climate target is met but physical risks rise more quickly than in the prior scenario and transition risk is severe.
- **No additional policy action:** No further policy intervention leads to behaviours remaining the same and limited technological transition. Climate targets are not met and temperature increases substantially by 2080. This scenario tests resilience to both chronic weather changes and more frequent extreme weather events, with limited transition risk but significant physical risk.

In Chapter 4, the discussion paper describes how the climate risk variables and macrofinancial variables will be determined and related. For each scenario, the BES will provide variables for the underlying physical and transition risks and map them to relevant macroeconomic and financial variables which reflect the relevant impacts of the scenarios. It is noted that they will not overlay any macroeconomic shocks resulting from non-climate related sources and there will be no explicit allowance for social or political feedback effects (for example, migration or political upheaval). The discussion paper is also clear that the BES will not provide every variable required – firms will need to expand the variable set to enable them to generate the relevant results.

¹ In line with the Paris Agreement

Physical variables focus on factors such as the frequency and severity of weather events and would be expressed in terms of mean and tail outcomes. They will include effects, identified in external research, of acute and chronic weather events, split by geography and peril. Banks will also consider the impacts of changes in insurance provision for certain physical risks during the second round submissions.

Transition variables seek to test the impact of risks and opportunities including:

- Policies to reduce greenhouse gas emissions
- Technological change
- Consumer preferences for lower-emission products

Climate variables will include factors such as:

- Global and regional temperature pathways
- Longevity
- Agricultural productivity
- Frequency and severity of certain climate-related perils
- Energy mix
- Carbon price pathways
- Emissions
- Commodity prices

Macrofinancial variables will include factors such as:

- Real GDP
- Unemployment
- Inflation
- Household income
- Corporate profits
- Residential and commercial property prices
- Central bank rates
- Government bond yields
- Corporate bond yields
- Equity indices
- Exchange rates

In order to specify the BES variables, the BES will specify pathways for climate variables to illustrate the impact of climate risks at regional and global levels. This would recognise that the ultimate financial impacts will be a combination of both physical and transition risks. The macroeconomic and financial variables would reflect the impact of climate-related risks and opportunities at the global, country, region and sector levels.

MODELLING APPROACHES

This is an area that the Bank recognises as requiring development in firms' capabilities. Chapter 5 of the discussion papers suggests some approaches which seek to balance the requirement to have comparable results from participants and wanting to encourage participants to assess the vulnerability of

individual exposures. The Bank acknowledges that “This approach would place new modelling demands on participants, requiring the development of new methodologies, the sourcing of new data sets, the interpretation of research and using expert judgement” and provides a limited number of suggested tools in Annex 2 of the discussion paper.

In relation to assets, firms are required to consider the following levels of granularity for different sectors:

- Corporate exposures, at the level of individual companies, covering 80% of participants’ nominal exposure to corporates. For the remaining 20% a less granular approach would be permitted
- Household exposures, specifying country-level impacts and allowing for adaptation by households over the scenario. For UK exposures physical risk exposures must be analysed at a regional granularity of no less than four digit postcode.
- Government exposures would use bond yields specified for major countries and derived from a sovereign risk analysis for countries not specified in the scenario.

The discussion paper notes that scenario variables would specify average impacts by sector or region, so firms will need to consider how the more granular analysis distributes around these values. Firms are also asked not to assume a level of technological innovation beyond the evolution of transition technologies (such as renewable energy deployment and carbon capture/storage) specified in the BES scenarios. Where firms feel that specified variables under or overestimate potential risks, they are asked to “quantify the sensitivity of their results to adjusted assumptions.”

In order to obtain the 30-year view required, participants are asked to fix their balance sheets at 30 June 2020 and then assess the impact of the scenarios at 5 year reporting points, ignoring the impact or actions taken at any earlier reporting point. This gives rise to “snapshots of risk” at each 5 year reporting point. Participants should, however, take a forward looking view when assessing each reporting point to take account of the shocks which occur over the future exposure as a result of the scenario. The “no additional policy action” scenario will be calibrated assuming that the more material risks anticipated in 2050-2080 will occur by 2050.

FIRM SUBMISSIONS

The BES is not seeking detailed regulatory metrics, such as capital ratio or solvency capital requirement, but the Bank may ask for some high level indicative estimates. There are two main parts to the feedback requested: sizing financial impacts and understanding challenges to business models.

Sizing financial impacts

Part 1 of the BES will assess the shocks to firms’ 30 June 2020 balance sheets at the 5 year reporting points in each scenario. Key metrics for banks will include:

- **Banking book:** the impairment charge (capturing provision increases and write-offs) is the main metric
- **Trading book:** the change in the fair value of the assets

For insurers the key metrics are:

- **Liabilities:** for non-life insurers the main metrics are the annual average loss and the 1:100 year Return Period Aggregate Exceedance Probability. For life insurers the key metrics are best estimate liabilities, risk margin, transitional measures on technical provisions and other liabilities
- **Assets:** the change in the market value of investments/ total investment returns, surplus change and change in eligible own funds are the key metrics
- **Other:** any relevant effects on Matching Adjustment Portfolios, with-profits funds and Solvency II transitionals also need to be approximated where relevant.

To the extent that portfolios include counterparties and/or sectors which are not aligned to the Paris Agreement target, firms will need to assess their contribution to climate change and estimate an overall “temperature alignment” for the portfolio. The discussion paper suggests a possible approach utilising technology pathways of counterparty activities but the BES would not be prescriptive in this regard.

Results for the BES will need to be more granular than in traditional stress tests. For exposures to the most at-risk sectors and regions, more detail will be requested for:

- **Geographic:** a breakdown of exposures in key countries into sub-national regions
- **Sectoral:** more detail may be requested for sectors that are most vulnerable to climate-related risk
- **Perils/territories:** insurance firms would break down changes in asset and liability values by peril/territory
- **Key exposures:** detailed breakdowns of modelling and assumptions (including judgements used) would be required for the Top 50 counterparties (ranked by size and risk exposure)

Challenges to business models

Part 2 of the BES looks at the challenges to business models as a result of climate change. This explores what actions would be taken to mitigate risks and respond to new opportunities. This specifically includes the impact of risks not covered in Part 1.

For management actions, participants are asked to choose from a menu of possible actions (set out in Table 6.A of the discussion paper) which may include pricing adjustments and changes to the size of exposures. Firms are to report the motivation for the action as well as the impact, and also the reporting point at which they would take the action. The discussion paper provides some examples in Table 6.B of the paper.

The Bank will add up the management actions to gain a system-level view to assess the potential impacts including:

- Changes in the provision or pricing assumptions of key services to the real economy
- Inconsistencies in assumptions
- Potential fire sales of at-risk assets
- Capacity to support the transition to a carbon-neutral economy

In addition, the Bank wants to hear firms' views about the most likely climate-related outcomes and how resilient they believe their business model is to those. Conversely, they also want to hear about the set of climate-related risks which firms believe would undermine their business model.

A qualitative assessment is to be provided for any risks not tested in Part 1 but which are relevant to their business models. This might include operational and reputational risks as well as risks arising from the interaction of banks and insurers.

Improving risk management

A key aim of the BES is to understand the modelling approaches firms are using, the insurance coverage of climate-related risks being assumed and the gaps in data that firms are facing in attempting the exercise.

Milliman conclusions

The discussion paper is clearly not a final BSE specification but it does provide a strong indication of where the Bank is looking to go. Typically, to date, traditional stress testing has been completed but in a simpler way, by looking at single factors and at outcomes in less granularity than what is proposed here. The Bank rightly identifies that the methods used today will not cope well with multi-factor scenarios at high levels of granularity. However, it is also clear that these types of risks are precisely the ones firms should be looking at more carefully, and developing new "cutting-edge" risk management approaches and tools to support it. It does provide a short list of information sources to help firms, but it is highly likely that firms will need to go beyond those in order to produce meaningful outputs.

Given that that Bank has been quite consistent in its direction of travel with this work, firms would do well to start developing the necessary tools and identifying the relevant data sources to deliver the required outputs. Feedback to the discussion paper may influence the Bank to make some changes, but it seems pretty clear that final proposals will not be too different to what is proposed and, whatever the final BES specification, it is likely to involve an upgrade to existing tools and techniques.

How Milliman can help

Milliman consultants have considerable experience helping firms to develop their risk management frameworks. We are well-placed to benchmark firms' approaches against the rest of the industry, and provide insight and advice that is tailored to your individual circumstances and needs.

We have helped numerous clients to introduce robust processes for identifying and assessing emerging risks ranging from building up a narrative through to the use of new analytical techniques and artificial intelligence.

If you have any questions or comments on this paper, on the subject of climate change, or on any other aspect of your risk management framework, please contact any of the consultants below or your usual Milliman consultant.



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