BANK OF ENGLAND

16 December 2020

Update on the Bank's approach to the Climate Biennial Exploratory Scenario in selected areas

On 13 November 2020, the Bank announced a program of planned engagement with firms participating in the Climate Biennial Exploratory Scenario (CBES). The aim of this early engagement is to support firms by improving their readiness for the exercise. This publication is part of that engagement plan.

The CBES will be launched in early June 2021. At that point a document describing the key elements of the exercise, scenario variable paths and detailed guidance for participants will be published.

In advance of finalising those materials, this document sets out (1) several key areas where the Bank has revisited the proposed approach described in the 2019 Discussion Paper, including in response to feedback on that paper; (2) an indicative list of variables to be provided as part of the CBES scenarios. The Bank would appreciate any further feedback on these items by end-January 2021, either by email to ClimateBES@bankofengland.co.uk or through the Stress Test Q&A process via the participants' usual Supervision contacts.

As part of its engagement with firms, the Bank will release draft data templates for feedback in February 2021. The finalised CBES qualitative questionnaire and data templates will be released in April 2021.

1) Early information on the CBES approach in selected areas

Counterparty-level analysis for corporate exposures

The Bank is mindful of the importance of counterparty-level analysis for assessing financial impacts from climate change. Participants are encouraged to engage directly with their corporate counterparties, to collect data and form judgements about how companies would be positioned in light of both their underlying risks and opportunities, and to assess corporates' current mitigation and adaptation plans. Firms are expected to start this engagement in advance of the publication of CBES scenarios in June 2021.

Table A sets out the Bank's minimum expectations of the coverage for corporate counterparty-level analysis, though firms are encouraged to extend the detailed analysis to more corporate counterparties, consistent with expectations set out in Supervisory Statement 3/19 and the Dear CEO letter dated 1 July 2020 setting out that these expectations should be embedded by end-2021. Table A applies to all corporate assets for insurers and to the corporate exposures on the banking book for banks.

Table A Minimum expectations for the analysis of corporate counterparties

Tier	Coverage	Approach
Tier 1	At least: • Top 100 non-financial corporate exposures. • Plus 3 largest companies in each of the sectors most impacted in the CBES scenarios (e.g. airlines; oil and gas, car manufacturers) if not already in the top 100. • Plus 5 largest financial exposures	Counterparty-level analysis. Participants are encouraged to use, for example, cash-flow analysis, publicly reported firm-level data, data counterparties publish to meet the recommendations by the Task Force on Climate-related Financial Disclosures, detailed climate scenario variables for physical and transition risks, and judgements based on directly engaging with the counterparties.
Tier 2	Corporate exposures not captured in Tier 1.	Some extrapolation and portfolio-level analysis would be expected. For example, firms may split their exposures into segments of corporates facing similar risks. Within each segment, firms would conduct client engagement for a subset of counterparties; and extrapolate their findings to the rest of the segment. Some thematic modelling would also be allowed for smaller exposures and SMEs.

This tiered approach is more flexible than the proposal set out in the Discussion Paper (whereby firms would be expected to conduct counterparty-level assessment for 80% of participants' corporate exposures)**.** This revision recognises the feedback to the discussion paper, which emphasised that completion of the analysis at such detailed level for 80% of corporate exposures would be very resource-intensive within the CBES timelines, especially in the face of significant data gaps.

The CBES qualitative questionnaire will include a question about the number of counterparties – and the proportion of their corporate exposures – that participating firms were able to analyse at a detailed, counterparty-level. An assessment of each firm's coverage in this regard will form part of the assessment of their risk management capabilities. The Bank will not publish the projected financial impacts of individual firms. However, the Bank will assess whether there is value in disclosing firm-level metrics to help illustrate differences in risk management capabilities that can drive improvements across the sector. One such example might be the firms' ability to assess individual counterparty impacts.

Portfolio alignment

When conducting counterparty-level data collection and analysis for the CBES, participants will assess their counterparties' current activities, which will include estimating their contributions to climate change. This assessment will bring participants a step closer towards estimating portfolio alignment metrics, which aim to measure the alignment of a portfolio with climate targets or a specified benchmark.

The Bank recognises, however, that making portfolio alignment metrics robust will require significant improvements in data and other inputs, as well as further development of methodologies. This point was also raised in the feedback on the Discussion Paper. Hence, in recognition of the feedback on the Discussion Paper, firms will not be expected to estimate temperature alignment metrics for their portfolios as part of the CBES.

The Bank expects firms to continue working to address the methodological and data gaps and intends to use the CBES qualitative questionnaire to ask participants about their progress towards estimating portfolio alignment metrics. The questionnaire will also ask about any outstanding challenges faced by firms and the expected timeline for when they would be able to disclose portfolio alignment metrics. The Bank will publish an assessment of progress in this area alongside the results of the exercise.

As set out in the recent report from the Portfolio Alignment Team in the COP 26 Private Finance Hub, while the existing portfolio alignment measures serve an important purpose for financial community, they are not yet as forward-looking, robust, decision useful and comparable as they need to be to measure portfolio alignment. The report brings together different approaches to measuring portfolio alignment with net zero into a coherent framework, identifies key building blocks of the degree warming metrics, sets out an initial view on potential best practice and identifies the data needs and methodological questions that require further work to make these metrics robust.

Approach to traded risk for banks

The Bank has decided to exclude traded risk from the scope of the CBES. Because of the dynamic nature of the trading book, point in time balance sheet exposures have limited relevance in long duration climate scenarios, like those used in the CBES. Thus, a meaningful analysis of climate-related risks to the trading book would need to adopt a different approach to that used in the rest of the exercise. Leaving the trading book out of scope should also allow firms to focus their efforts on assessing credit risk in the banking book, including through detailed counterparty-level analysis. This decision does not, however, rule out the inclusion of traded risk in any future climate change focussed stress tests.

Approach to climate litigation risk

Several respondents to the discussion paper referred to litigation risk as the third major category of climate risk (alongside transition and physical risks). The Bank acknowledges this and will explore litigation risk through the CBES. The Bank is proposing a quantitative approach for general insurers, which will be focused on assessing exposure and supporting risk management in relation to seven possible adverse legal rulings, without tying these specifically to any one of the three scenario paths. For other participants, the Bank expects to include a set of qualitative questions only.

Balance sheet cut-off date

The Bank has decided that the balance sheet cut-off date for the CBES will be end-2020, having given feedback to the Discussion Paper on this subject due consideration.

2. Indicative variable list for CBES scenarios

As set out in the Bank's 2019 Discussion Paper, participating firms will be expected to perform financial analysis of their most important individual counterparty exposures using physical and transition risk variables as key inputs (see accompanying guidance on corporate counterparty-level analysis). A standard macroeconomic modelling exercise will not be sufficient, and understanding how specific climate risks can be damaging to individual counterparties is essential. Engaging directly with counterparties will be crucial.

The Bank intends to provide macroeconomic variable paths but only to the extent that they help firms to stay focussed on the physical and transition risks at a granular level.

Consistent with this, the number of variables published by the Bank may vary in each of the three scenarios, depending on their usefulness.

Table B sets out a full draft set of variables that the Bank could publish as part of the Climate BES launch in June 2021. In the Early Policy Action scenario the Bank does not expect the paths of macroeconomic variables to differ much from trend, so they are not expected to have a material impact. By contrast, structural changes to the economy related to the transition from reducing emissions will be crucial. The Late Policy Action scenario will include some macroeconomic disruption, but structural changes will continue to be important. For both those scenarios, physical damages will be part of the scenario. The No Additional Policy Action scenario will involve both macroeconomic changes and physical damages from climate change. Further details about the scenarios are given below.

The Bank is seeking feedback on which variables are essential in each of the scenarios (even if they stay close to trend), as well as whether there are any omissions from this proposed list which are likely to be crucial in firms' modelling, including at an individual counterparty level. **The Bank requests feedback from participants by the end of January 2021**.

Further detail:

The same set of variables is applicable to all participating firms. For banks, the variables must be used to focus on the evolution of credit risk on banking book assets. Insurers must calculate the impact of the scenarios on both assets and best estimate insurance liabilities, as an instantaneous sensitivity analysis on today's balance sheet, in a similar way to the Insurance Climate Stress Test 2019. General Insurers will provide Annual Average Loss (AAL) and 1-in-100 Aggregate Exceedance Probability (AEP) for relevant business lines. Life Insurers will have to extend analysis to liabilities in a way which is consistent with the asset shocks, including policyholder assets and ring-fenced funds.

As a reminder, the Discussion Paper stated that the BES would not provide every variable that participating firms would need to model the scenarios. In line with other Bank stress tests, participating firms may have to undertake scenario expansion to extrapolate or interpolate additional scenario variables needed to estimate impacts on individual counterparties. Therefore, feedback from participants should be focussed on identifying variables which are essential in firms' modelling process.

To aid in this assessment, a broad narrative of the three climate scenarios to be specified as part of the exercise is provided below:

- **Early Policy Action** (EPA): the transition to a carbon-neutral economy starts early so is more gradual and moderate. Carbon prices and other policies are introduced slowly and the increase in global temperature stays below 2ºC, in line with the Paris Agreement. There will be an increase in the frequency and severity of physical perils such as flooding, but the overall level of physical risk remains subdued. The Bank expects the effect on global GDP to be moderate (although there will be some regional variation) and it will be close to trend. There will be significant variation in sectoral Gross Value Added (GVA) paths. Transition policies and sectoral GVA paths will be the key inputs.
- **Late Policy Action** (LPA): the global climate goal is met but the transition is delayed until 2030 and must be more sudden and substantial to compensate. The Bank expects this to result in a material short-term macro disruption. It is likely to feature a large fall in GDP, as well as falls in property prices, equity prices and changes in interest rates. Transition policies and sectoral GVA paths will continue to be important in this scenario, but macroeconomic paths should also drive results. Physical risks are the same as in the EPA scenario.
- **No additional policy action** (NAPA): no policy action beyond that which has already been enacted is delivered. Thus, the transition is insufficient for the world to meet its climate goal, leading to severe physical risks. This stress will materially lower trend growth rates, especially on a global level, and will affect a range of asset prices. A combination of physical risk and macroeconomic variables will be needed to measure the total impact on firms' balance sheets. Absent a rapid transition, some physical risks will crystallise in the period to 2050, but the most material shocks would occur later in the century. To ensure the NAPA scenario captures these severe risks but avoid lengthening the modelling period, the Bank will calibrate the 30-year scenario based on risks anticipated for the period 2050 to 2080.

The Bank is considering publishing a narrower set of variables for the EPA scenario, with participants instructed to assume aggregate macroeconomic variables remain close to trend. The Bank intends to revisit questions related to these variables in February, when participants will be invited to discuss draft data templates, but ahead of that any initial views would be appreciated.

Where physical variables are a driver of financial impacts, firms will be requested to take into consideration both the mean and the tail of the peril distribution in undertaking their assessment. This reflects the expectation that climate change will not simply change the average frequency or severity of a peril (e.g. flooding) but rather change the shape of the distribution, often materially impacting the extremes. This is particularly relevant when assessing financial impact to assets from acute events. The Bank will provide firms with physical variable input information that describes part or whole of the peril distribution, permitting firms to expand those accordingly when undertaking the climate assessment. The Bank expects participants to use those variables when undertaking counterparty-level modelling (either in isolation or in conjunction with macro variables as outlined in the accompanying guidance on corporate counterparty-level analysis).

Table B Indicative list of variables for the Climate BES

#	Variable	Format
Macro variables: UK		
1	Real GDP	Index
2	UK nominal GDP	Index
3	Unemployment	%
4	UK CPI	Index
5	UK Bank Rate	%
6	UK Corporate profits	Index
7	Household income	Index
8	Sterling ERI	Index
9	Residential property prices	Index
10	CRE prices	Index
Macro variables: International		
11	EA real GDP	Index
12	France real GDP	Index
13	Germany real GDP	Index
14	Ireland real GDP	Index
15	EA consumer price index	Index
16	EA unemployment rate	%
17	ECB policy rate	%
18	EA house price index	Index
19	EA CRE index	Index
20	US real GDP	Index
21	US unemployment rate	%
22	US policy rate	%
23	US house price index	Index
24	US CRE price index	Index
25	China real GDP	Index
26	China household income	Index
27	China house price index	Index
28	Japan real GDP	Index
29	Canada real GDP	Index
30	HK real GDP	Index
31	HK unemployment	%
32	HK Policy rate	%
33	HK CRE prices	Index
34	HK house price index	Index
35	Singapore real GDP	Index
36	PPP-weighted Non-China EME real GDP	Index
37	PPP-weighted Rest of World real GDP	Index
38	PPP-weighted World real GDP	Index
Macro variables: Financial markets		
39	Volatility index	Index
40	UK equity prices	Index
41	US equity prices	Index
42	UK government bond yields: 1yr, 5yr, 10yr	%
43	US government bond yields: 1yr, 5yr, 10yr	%
44	German government bond yields: 1yr, 5yr, 10yr	%
45	EME bond yield index 1yr, 5yr, 10yr	%
46	Sterling Libor/Sonia swap rates: 3m, 1yr, 5yr, 10yr, 20yr	%
47	Euribor swap rates: 3m, 1yr, 5yr, 10yr, 20yr	%
48	US dollar Libor swap rates: 3m, 1yr, 5yr, 10yr, 20yr	%
49	Sterling IG corporate bond spread (split by rating into AAA, AA, A, BBB and guidance by sector)	Basis points
50	Sterling HY corporate bond spread	Basis points
51	US dollar IG corporate bond spread	Basis points
52	US dollar HY corporate bond spread	Basis points

Transition risk variables (split by geographic region where relevant and feasible)		
53	GVA by SIC/NACE sector	Index
54	Greenhouse gas emissions by sector	Mt CO_2-equiv/yr
55	Emissions price (carbon price)	US$
56	Cropland	mln ha
57	Pasture land (incl. for livestock farming)	mln ha
58	Primary energy price: Oil	US$
59	Primary energy price: Coal	Index
60	Primary energy price: Gas	Index
61	Primary energy price: Biomass price	Index
62	Secondary energy price: Electricity	Index
63	Secondary energy price: Natural Gas	Index
64	Total primary energy	EJ/yr
65	Primary energy mix: share of coal	%
66	Primary energy mix: share of gas	%
67	Primary energy mix: share of oil	%
68	Primary energy mix: share of nuclear	%
69	Primary energy mix: share of biomass	%
70	Primary energy mix: share of non-biomass renewables	%
71	Total energy consumption (final energy)	EJ/yr
72	Ratio of Electric Vehicle sales to Internal Combustion Engine Vehicle sales	%
73	Transportation capacity: aviation (freight; passenger)	Bln tkm/yr; bln pkm/yr
74	Transportation capacity: maritime (freight; passenger)	Bln tkm/yr; bln pkm/yr
75	Transportation capacity: rail (freight; passenger)	Bln tkm/yr; bln pkm/yr
76	Transportation capacity: road (freight only)	Bln tkm/yr
77	Government policy: energy efficiency standards for buildings	[tbd]

Direct Physical risk variables (split by geographic region where relevant and feasible) [1]		
78	Temperature	For the UK, US and Japan the Bank will provide local downscaled climatic model temperature outputs (˚C) For other regions the Bank will provide an overall temperature (˚C)
79	Flood risk	For the UK, US and Japan the Bank will provide local downscaled climatic model outputs that provide inputs to hydrologic models (e.g. MetOffice UKCP18 projection). The outputs typically are in the form of precipitation intensity (in mm/hr). For other regions that have a material climate signal (Continental Europe, China, Hong Kong, Canada) the Bank will provide hazard data (e.g. undefended fluvial water depth (m) across a range of possible event severities (i.e. probability distributions)). For all other territories the Bank will provide outputs from ISIMIP5 global circulation model that best match the three scenarios and invite firms to expand the precipitation variable projections. To reflect different adaptation scenarios, the Bank will provide participants with assumptions relating to property-level protection and regional flood defences. For banks, the Bank will also provide an estimate of coverage for residential property insurance coverage at UK level.

[1] The level of detail specified for each region is preliminary and based on the strength of climate signals as well as the level of UK financial system exposures.

80	Storm surge	For some targeted regions the Bank will provide undefended hazard data (e.g. undefended water depth (m) across a range of possible event severities). For the majority of regions, firms will need to make assumptions about storm surge based on the sea level rise variable (refer item 81 below)
81	Sea level rise	For the UK, US and Japan the Bank will provide local downscaled climatic model outputs that provide mean sea level rise information (e.g. MetOffice UKCP18 projection). The outputs typically are in the form of rise above mean sea level (in mm). For other territories the Bank will either provide coarse hazard data (e.g. mean sea level rise) or invite firms to expand relevant variables from ISIMIP5 global circulation model
82	Severe weather/ convective storm risk	Convective Available Potential Energy (CAPE) across a range of possible event severities (full probability distribution)
83	Storm (tropical/ extra-tropical)	For the US and Japan the Bank will provide local downscaled climatic model outputs that provide inputs to atmospheric models. For other territories the Bank will either provide selected hazard data (e.g. 3 sec peak gust) across selected probability distributions or invite firms to expand relevant variables from ISIMIP5 global circulation model
84	Drought	Average soil moisture change across a range of possible event severities (probability distributions)
85	Heatwaves	For the US and Europe the Bank will provide local downscaled climatic model outputs that provide inputs to heatwave models. The outputs typically are in the form of average daily temperature (in ^{o}C) For other territories, the Bank will either provide coarse hazard information on changes in wet bulb temperatures for key points across the range of possible event severities (probability distribution) or invite firms to expand relevant variables from ISIMIP5 global circulation model
86	Wildfire risk	as in 'heatwaves' above
87	Impact on agricultural yields	Change in agricultural productivity

Insurance-specific risk variables (split by geographic region where relevant and feasible)		
88	Volatility Adjustment (applies to all currencies)	Basis points
89	Deaths attributed to Heat (NAPA only)	Absolute number, and per 100,000 population.
90	Deaths attributed to Cold (NAPA only)	Absolute number, and per 100,000 population.