Bank of England’s CBES Climate Stress Test

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The Regulatory Landscape
Mounting Costs From Climate Change

Global losses due to natural disasters, Bil 2020$

Sources: Reinsurance Association of America, AON, Moody’s Analytics
Regulatory Environment

- Climate risk stress testing has begun. The Hong Kong Monetary Authority (HKMA) announced a climate risk stress test in April. The Bank of England (BOE) has just released its first climate risk stress test. More regulators will follow suit.

- Network for Greening the Financial System (NGFS) and Task Force on Climate-related Financial Disclosures (TCFD) are leading voices for a call to action in the financial system.
  - NGFS is a group of over 35 central banks and regulatory agencies worldwide established at the Paris “One Planet Summit” in December 2017. BoE, ECB/EBA, Banque De France, The Peoples Bank of China, EIOPA, the FED, etc.
  - TCFD is a taskforce set up by the Financial Stability Board, comprised of over 785 influential global organizations.

UK- BoE/PRA
- SS3/19: Enhancing banks’ and insurers’ approaches to managing the financial risks from climate change April 2019
- Climate Change Committee/Climate Change Act

US-Fed
- Climate becomes mentioned in the Fed’s Financial Stability Report, November 2020
- Statement by Governor Lael Brainard
- September 2020 – an advisory panel to the Commodity Futures Trading Commission released a report ‘Managing Climate Risk in the U.S. Financial System.’
We don’t have a secondary mandate to support the economic policy of the government as many European banks do. So we view climate-related financial risk as a risk that falls under our existing mandates. There are a lot of reasons to think that climate stress and climate scenario analysis can contribute in a very positive way. It can be used to illustrate what different sets of government policies might bring forth in terms of results for climate, so there’s a lot to like.

JEROME POWELL
Federal Reserve Chair
Why Climate Risk Scenarios?

Maybe winter isn’t coming…
Climate Risk Scenarios Motivation

» Climate risk is becoming more evident, and governments around the world are taking action.

» Central banks and regulators urging financial institutions to take climate risk into account when calculating losses and making business decisions. Pilot stress tests kicked off this year.

– Hong Kong Monetary Authority
– Monetary Authority of Singapore
– Bank of England
– Bank of France
– Upcoming in 2022: European Banking Authority, BoE again, Brazil, Canada, Australia Central Banks?
**Investors Are Demanding ESG Options**

**Annual issuance, $ bil**

![Bar chart showing annual issuance of Green Bonds, Social Bonds, and Sustainability Bonds from 2013 to 2021F.](chart)

Sources: Moody’s Investors Service, Climate Bonds Initiative and Dealogic
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BOE’s Climate Biennial Exploratory Scenarios (CBES)
Paris Climate Targets Reached…

Change in global temperature relative to pre-industrial levels, °C

- Early Action
- Late Action
- No Additional Action

3 climate risk scenarios based on NGFS:
- Early policy action: Net-zero CO\(_2\) emissions by 2050. Transition begins in 2021
- Late policy action: Net-zero CO\(_2\) emissions by 2050. Transition begins in 2031
- No additional action: No climate policies except those implemented before 2021

- Early and late policy action feature massive carbon taxes to achieve Paris temperature goal
- No additional action features limited transition risk and maximum physical risk
- Physical risk that are expected to materialize in 2050-2080 are assumed to occur on day 1 of the no additional action scenario

Sources: BoE, Moody’s Analytics
…Through Substantial Policy Action

Carbon price, 2010 $ per metric ton

Sources: BoE, Moody’s Analytics
Assessing the CBES Scenarios

Pros

» Mobilizes action towards financial industry quantification of climate risks
» The most comprehensive and thoughtful approach to climate risk stress testing to date
» Extensive amount of macroeconomic, financial, physical and transition forecasts provided limits ambiguity
» Creative approach to quantifying long-term physical risks

Cons

» 2050 forecast horizon is too short to adequately assess climate change risks
» Less variable coverage than provided by NGFS
» Subject to misinterpretation…assumptions vulnerable to challenges
BOE: Act Early And Often

U.K. GDP, cumulative decline from counterfactual scenario, %

Source: CBES, Moody’s Analytics
U.S. Unemployment Rate Comparison

Sources: CBES, Moody’s Analytics

» CBES assumptions

» Persistently high unemployment in the no additional action scenario at the beginning of the forecast horizon

» Late action scenario causes a severe recession

» Scenarios do not feature hysteresis
Expanding the CBES
What Did We Do And Why Did We Do It?

» **Quarterization**
  » Quarterized all annual data provided by the BOE

» **GDP disaggregation**
  » Created GDP pathways for every country in every scenario

» **Carbon pricing and energy composition**
  » Supplemented the CBES scenarios with NGFS carbon price and energy composition data

» **Gross Value Added methodology**
  » GVA forecasts incorporate both model equations and BOE input

» **Inflation methodology**
  » Supplemented the CBES scenarios with NGFS data, smoothed NGFS data

» **Financial market variable expansion**
  » Sectoral equity indices, corporate spreads, sovereign CDS, swap rates, fx rates
Real GDP, % Decline, No Additional Action Scenario, 2050

Europe = -17.1

- > -13.7
- > -17.1 to -13.7
- -18.5 to -17.1
- < -18.5

Sources: Moody’s Analytics
Moody’s Analytics Enhanced Global Macroeconomic Model
Transition risk integrated via carbon pricing
Aggressive Carbon Pricing Reshapes the Economy

U.S. energy consumption, 2020=100, late policy action scenario

Sources: CBES, NGFS, Moody’s Analytics
Early Action Limits Manufacturing Losses

Germany, GVA in manufacturing, cumulative decline from counterfactual scenario, %

Sources: CBES, Moody’s Analytics
What Would The Fed Do?

U.S. consumer price index, smoothed, annualized % change

Sources: BoE, Moody’s Analytics
Early Policy Action Limits Financial Stress

U.S., 5-yr Treasury CDS, bps

Source: Moody's Analytics
What’s Next
## Economic Climate Scenarios Roadmap

<table>
<thead>
<tr>
<th>Program Milestones: Phase 1</th>
<th>Description</th>
<th>Target Date</th>
<th>Status</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCP climate risk scenarios</td>
<td>July 2019</td>
<td>Complete</td>
<td>Chronic physical risk only through 2030</td>
<td></td>
</tr>
<tr>
<td>NGFS Phase 1 climate risk scenarios</td>
<td>December 2020</td>
<td>Complete</td>
<td>Prototype climate risk scenarios</td>
<td></td>
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<tr>
<td>HKMA macroeconomic climate risk scenarios</td>
<td>April 2021</td>
<td>Complete</td>
<td>Includes climate modules for 7 countries</td>
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<tr>
<td>Climate modules completed for 12 countries</td>
<td>May 2021</td>
<td>Complete</td>
<td>Climate models completed and imbedded in Global Macro model for Tier 1 countries</td>
<td></td>
</tr>
<tr>
<td>Climate modules completed for 15 countries (+3)</td>
<td>June 2021</td>
<td>Complete</td>
<td>Climate models completed and imbedded in Global Macro model for Tier 1 &amp; 2 countries</td>
<td></td>
</tr>
<tr>
<td>BOE’s CBES macroeconomic climate risk scenarios</td>
<td>June 2021</td>
<td>Complete</td>
<td>Global coverage with climate modules for 15 countries</td>
<td></td>
</tr>
<tr>
<td>Climate modules completed for 22 countries (+7)</td>
<td>September 2021</td>
<td>Not Complete</td>
<td>Adds coverage for 19 of the top 24 CO2 emitters</td>
<td></td>
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</tbody>
</table>
| NGFS Phase 2 Climate Risk scenarios + continuous updates | September 2021 | Not Complete | • This will serve as our flagship climate risk scenario offering. 2 updates per year.  
• Other scenarios available as custom consulting |
| Climate modules completed for 28 countries (+6) and regularly updated | March 2022 | Not Complete | Expands country coverage to cover 80% of global CO2 emissions. |
Acronym Key

» BOE = Bank of England
» HKMA = Hong Kong Monetary Authority
» NGFS = Network for Greening the Financial System
» GVA = Gross Value Added
» CBES = Climate Biennial Exploratory Scenario
» TCFD = Task Force on Climate-related Financial Disclosures
» RCP = Representative Concentration Pathways
» IAM = Integrated Assessment Model
» NiGEM = National Institute Global Econometric Model
Questions?
Contact us at:
help@economy.com
MOODY’S ANALYTICS

Bank of England’s CBES Climate Stress Test, August 3, 2021