BANK OF ENGLAND-MET OFFICE WORKSHOP ON CLIMATE RISK AND FINANCIAL STABILITY

15 JULY 2016

The Bank of England and the Met Office jointly held a workshop on climate risk and financial stability on 15 July 2016. The workshop was held under the Chatham House Rule. This report summarises the key points made by the participants at the workshop**: the views expressed in the report do not necessarily reflect those of the Bank, the MPC, the FPC, the PRA Board or the Met Office**.

Session 1: Physical risks and climate-related issues over a month to one-year horizon (Session chairs: Nicolas Pondard, Lead Catastrophe Risk Expert, Bank of England/PRA and Nick Moody, Head of Insurance and Capital Markets, Met Office)

This session identified the shortcomings associated with climate risk modelling over a one-year horizon, and their significance for the stability of the financial system (appropriate capital requirements, exposure monitoring, insurance pricing, etc.). The session participants also discussed technical aspects such as the frequency, the severity and the dependency of extreme events under current climatic conditions, and identified research priorities for regulators.

All participants agreed that the most critical issue is the lack of understanding by the financial industry of the uncertainties associated with climate risk modelling. Climate-related events are complex and models are crucial to make informed decisions. However, models are an approximation of reality. Underlying assumptions have a major impact on loss estimates, and resulting risk management strategies, but are not very visible so sensitivity to changes in assumptions is not easily understood. For example, the most basic models assume extreme weather events to be independent, but other models suggest that capital requirements for insurers might need to be higher once correlations are taken into account.

There is also a problem of non-modelled risk.[1] Non-modelled elements, including domains not yet modelled, or secondary perils such as storm surge, can impact loss estimates significantly: examples include inland windstorm and flood following Hurricane Ike, and flooding following Superstorm Sandy. Significant expertise already exists in environmental science which could be used to fill these gaps.

Underlying the modelling uncertainties is the lack of transparent, publicly available hazard analysis that enables validation and improvement of these models. Thus, greater availability of open benchmark data and models produced through transparent methodologies could help better inform decision makers. The latest techniques for the simulation of perils through dynamic modelling are encouraging, since they model extremes which have not yet happened but are physically plausible. UK government was able to use such techniques for the National Flood Resilience Review (2016).

Session 2: Transition risks in the next decade, including those driven by longer term climate change (Session chairs: Misa Tanaka, Senior Research Manager, Bank of England and Dan Bernie, Senior Scientist in Earth Systems and Mitigation, Met Office)

This session discussed the key risks associated with the transition to a low carbon economy over a medium- to long-term horizon, including: i) how the energy mix and use will need to evolve over this period in order to maintain warming to below 2ºC during this century (or the more stretching goal of 1.5ºC proposed at COP21); ii) what transition scenarios might represent risks to the financial system; and iii) how best to design stress tests of

[1] See Association of British Insurers (2014), "Non-modelled Risks".

the financial system to examine its resilience against transition risks. The participants also discussed the role of the financial sector in facilitating an orderly transition to a low carbon economy.

It was noted that several "2ºC scenarios" (including some that were considered by IPCC) are technologically unrealistic, as they assume that high levels of greenhouse gas (GHG) emissions in the near term can be offset by significant negative emission in the second half of the 21st century via large-scale use of bio-energy with CCS (BECCS)[2] and other carbon dioxide removal (CDR) technologies, such as direct air capture. Large-scale deployment of BECCS may not be viable once other sustainability considerations are taken into account (e.g. competition for land and water with food production), while air capture technology is not yet viable for deployment. The regulators might wish to assess the preparedness of the financial system to achieve an orderly transition by considering the implications of 2ºC scenarios that incorporate shocks to carbon price, fossil fuel prices, and technology (e.g. positive productivity shocks to renewable energy production), and potentially also their macroeconomic repercussions.

There were two sets of views on what form climate-related disclosures (by individual companies) with regard to transition risks might take. The first group argued in favour of having detailed disclosure of asset specific, verifiable 'hard' information (e.g. locations, technological characteristics and financial conditions) that enable researchers and analysts to conduct their own analysis. The second group favoured disclosure of forward-looking information which may be more easily understood, such as i) quantitative scenario analysis (e.g. how carbon price, fossil fuel prices and technological shocks affect shareholder value) and ii) 'soft' information (e.g. how firms are adapting their business models and strategy to make themselves resilient to a shift to a low-carbon economy). The main drawback of the first approach was that it requires extensive data analysis which not all investors are willing and capable to conduct, whereas the second approach could suffer from the lack of credibility, as forward-looking information is harder to verify and compare across companies.

Session 3: Emerging risks in coming decades – 'Breaking the Tragedy of the Horizon' (Session chairs: Matt Scott, Environmental Risk Specialist, Bank of England and Jason Lowe, Head of Climate Services for UK Government, Met Office)

Session 3 identified the financial and economic implications of potential changes in climate over the longer-term, and their relevance to Central Banking mandates and forward-looking prudential supervision. This session also explored analytical tools and techniques, cross-sector collaboration, and other relevant issues which could support the integration of longer-term financial risks into shorter-term decision making.

It was evident that the climate science, insurance and other financial communities use different languages and approaches to analyse climate-related risks. Participants commented on the current 'bottom up' approach to modelling climate risk, starting with physical drivers and leading to a range of climate impacts, and probability of different economic losses. Some members questioned whether a 'top down' approach could also be useful, identifying key 'trigger', or 'breaking points' (e.g. permafrost melt and accelerated sea-level rise) and essentially working backwards. The analogy of 'reverse stress testing' was highlighted, a similar 'top down' approach used by firms and financial regulators to consider financial risks.

Discussions highlighted the need to consider uncertainty in climate response, vulnerability and exposure. The latest tools and estimates to quantify uncertainty in climate science, such as using multiple realisations of the recent past from hindcast simulations or perturbed parameter modelling approaches of the future, appear not to be incorporated into many of the risk assessments used for looking at economic impacts. Likewise, techniques

[2] BECCS can potentially achieve 'negative CO_2 emissions' by using biomass that has removed atmospheric carbon while growing, then storing the carbon emissions from combustion underground. One of the key challenges facing the BECCS technology is that the production of bioenergy would encounter competition with other uses of land (e.g. food production) under large-scale deployment scenarios.

from catastrophe risk modelling could usefully inform approaches used within the climate science community. There were differing views about the credibility of converting physical impacts, such as number of people affected by changing water availability, into financial impacts. However, there was agreement that, alongside quantitative risk-based metrics, more narrative information is needed to improve communication on the limitations to current information and prospects for improvement.

Relating to uncertainty, participants commented on how the insurance industry could provide useful insight in this area. Attention was drawn to use of modelling techniques and '1 in 200' regulatory requirements which have helped to transform the resilience of the insurance sector to extreme events, including those from severe floods and storms. As outlined in the '1 in 100' initiative proposed at the UN Climate Summit in 2014, applying similar techniques more widely could support a more climate resilient financial system[3]. As part of this, further work on event attribution was also flagged as well as more fully integrating climate science and modelling to help quantify frequency of extreme, but plausible, events.

It was noted that certain sectors in the financial system, such as life insurers and pension funds, have liabilities which can extend to multiple decades, with assets often held to maturity on similar time horizons. Given these time horizons, and likely impacts of climate change, participants questioned whether those responsible for managing long-term assets were sufficiently integrating climate-related factors into their decision making, and whether the tools to help communicate these climate factors to this audience could be improved. Participants commented on the importance of 'levelling the playing field' so first movers were not disadvantaged by taking a more progressive approach than their peers.

[3] *blog.willis.com/2014/**11**/un-climate-summit-**1-in-100-initiative***