4most
ANALYTICS CONSULTING

The Next-Generation of Climate Risk Models

Improving efficiency and extracting business advantages

D. Smith – Edinburgh CRC Conference 30th August 2023

Background

Developing modelling solutions for the *2021 Climate Biennial Exploratory Scenario* ("CBES") Stress Testing exercise presented a range of novel challenges to the banking industry.

With an absence of historical data and modelling precedent; firms were required to forecast the previously uncaptured physical and transition risks, which required the use of techniques and data types which were not standard to credit risk analysis. In addition, these new risk models needed to integrate with the complex Credit Risk model and data infrastructure which already exists at firms for their capital and impairment purposes. As a result, some of the first-generation Climate Risk models were inefficient in one or more dimension – either failing to capture the totality of the risk, unable to support business decisions/strategies, or being prohibitively expensive to run.

The results of the CBES exercised confirmed that existing Credit Risk processes do not allow firms to fully mitigate and measure the impact of Climate Risk in their acquisition, customer management, pricing, and reporting processes; and inefficiencies in the first-generation models generally render them unsuitable for supporting enhancements to these processes. Following this exercise, the PRA sent an open letter to CEOs in October 2022 containing thematic feedback on climate related financial risks, and outlined a regulatory expectation that models would continue to be enhanced and that climate results would need to be embedded in business decisions.

As a result, there is a business incentive and regulatory pressure to develop more efficient Next-Generation models which improve model coverage and accuracy; reduce business costs, and which can feed directly into other areas of the business.

Abstract

This presentation discusses three major elements of Next-Generation models that firms may want to consider:

- The design requirements for Next-Generation climate risk models, and how they are differentiated from First-Generation models,
- A discussion of potential technical solutions to the key challenges which limited the efficiency of First-Generation Climate Risk models, and
- The business advantages which can be gained from Climate Risk models, and how Next-Generation models could be designed to support these processes.

This is supported by the results of a *4most Climate Risk Models Benchmarking Survey*, which asked firms to self-assess the current state of their climate risk models, and their view of the key challenges they face with respect to their models.

4most Climate Benchmarking Survey

The Climate Benchmarking Survey asked 3 questions:

1. How well understood and integrated is Climate Risk in different modelling areas?
2. What are the firms short-medium term plans in terms of model development?
3. What technical areas are causing the most challenge for modelling?

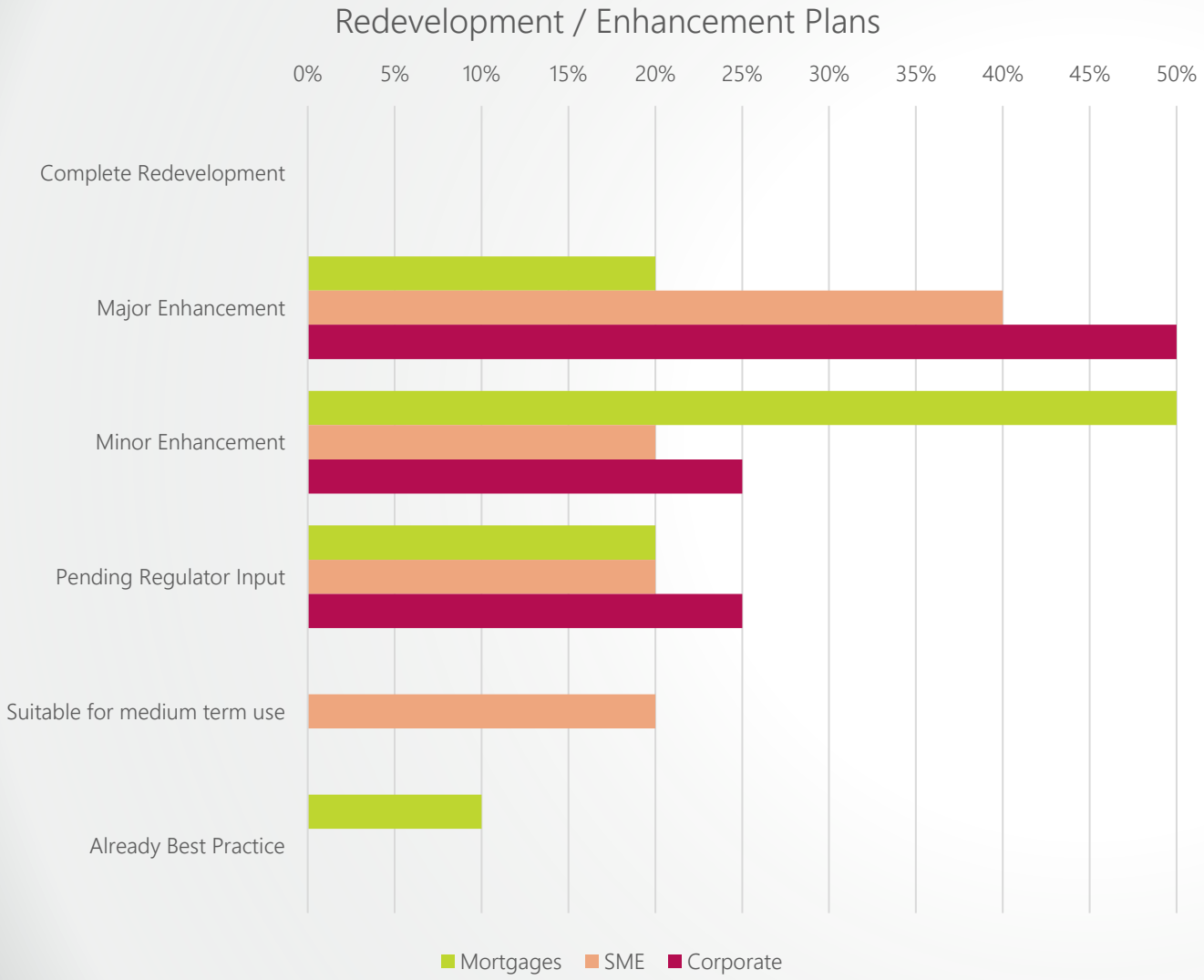
The survey was shared with larger UK retail lenders, focussing on those with material Residential Mortgage lending books. 10 responses were received, from 5 IRB firms, and 5 IRB-aspirational firms. These firms shared results under the agreement of receiving anonymised feedback *(and with knowledge the results would be presented here!)*

Note – if you are part of a UK mortgage lender who did not participate and want to get involved feel free to contact me after the presentation

Survey Q1 – Integration across different measures

Integration of Climate Risk Credit model outputs	0	1	2	3	4	5	Avg.	Comments
By Business Area								
Underwriting and Acquisition								Firms are relatively comfortable with their stress testing solutions, and impairment is beginning to be impacted. Firms have less confidence they are accounting for Climate Risk in First Line areas like Pricing, Collections, Conduct, and Funding.
Pricing Impacts								
Pillar 1 Capital (SA / IRB)								
Stress Testing								
Impairment								
Conduct Risks								
Customer Behaviour / Funding								
Collections Strategy								
By Lending Type								
Individuals								Firms are largely comfortable with models of Individual risk, but have concerns about their SME approaches
SME								
Corporate								
By Risk Driver								
Flooding / Rainfall								Firms believe they have captured much of the risk related to flooding risk and EPC transition, with a high degree of confidence in other physical risks (mostly Subsidance). Aligning with the above, company factors like Carbon Emissions are less well understood.
Other Physical								
Carbon Emissions								
Fuel Costs								
Energy Ratings								
Other Transition								

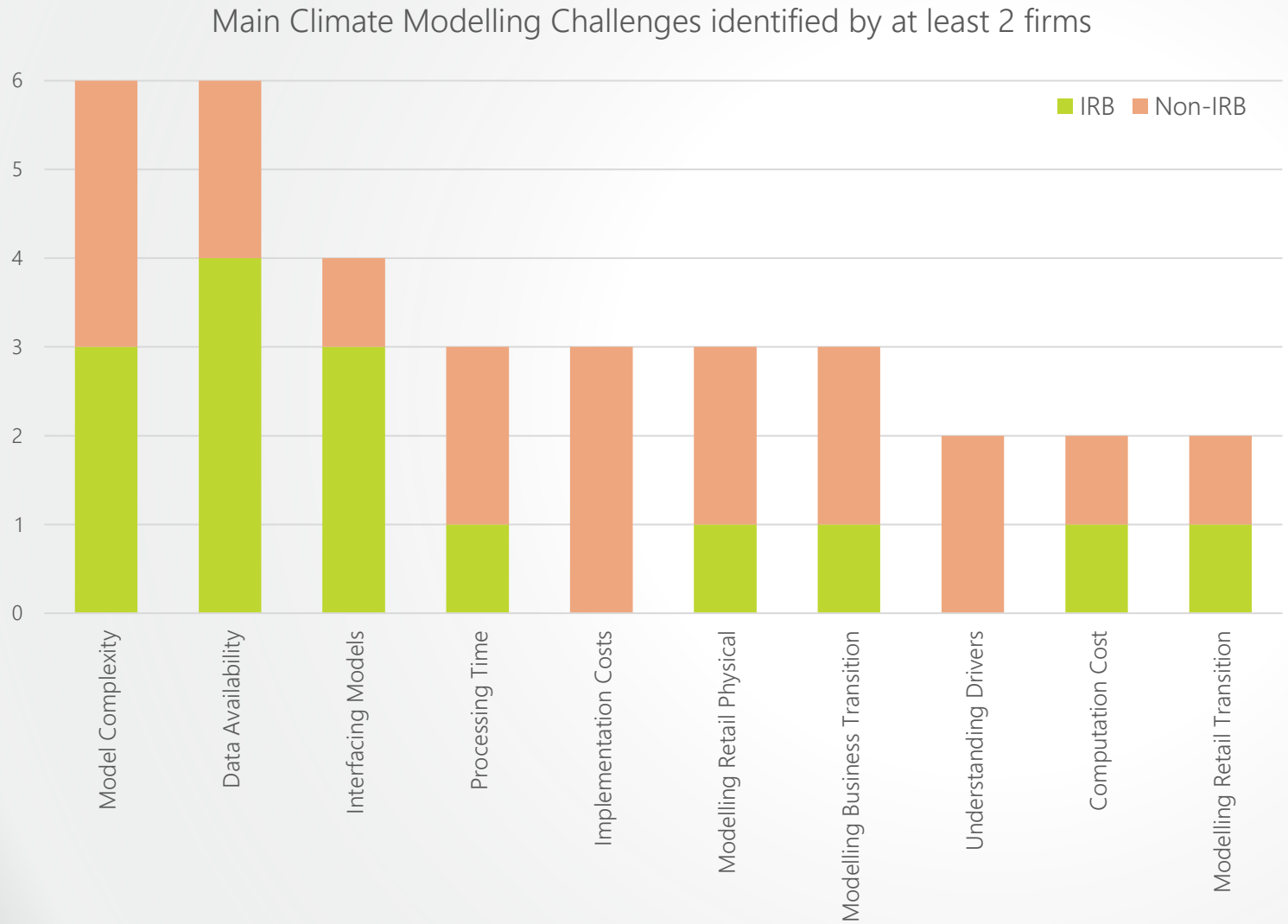
Survey Q2 – Climate Model Development Plans



Observations

- Most firms are committed to some level of model redevelopment in the short-medium term
- Some level of reluctance to undertake major enhancements was noted due to the uncertainty of the regulatory landscape, but there is enough clarity and expectation that most firms are already acting on minor enhancements
- UK retail firms have more work to do on their SME and Corporate exposures *(note - fewer responses were given here and this trend may be driven by materiality due to the sample bias towards tier-2s which have smaller SME/Corporate exposure)*

Survey Q3 – Main Climate Modelling Challenges



Observations

- Most firms called out issues related to model development, citing difficulties driven by the complexity of the models, data availability.
- In addition, most IRB firms noted difficulty interfacing models with existing infrastructure
- Conversely, most non-IRB firms primarily identified ongoing costs / resource issues.

Design requirements for Next-Generation climate risk models, and how they are differentiated from First-Generation models (1/2)

Lending to Individuals

Generation-1 of Climate Models was largely exploratory.

For Physical Risk on Mortgage portfolios, the Next-Generation of models is likely be a move towards a more aligned range of approaches, to ensure comparability across firms, and improve the model effectiveness.

Flood and **Subsidence** Risks on Mortgaged properties has emerged as the primary physical risk for UK firms. The standard based on property-level modelling using geographic flooding data – with a particular focus on tail-events. Addressing any data or process deficiencies in this element is the first-priority for any UK retail lender. Second order effects are also not very well understood and will need further analysis (e.g. flooding of nearby amenities).

For Transition Risk, the primary focus of CBES and firms being **EPC Energy Ratings** of properties. While this is an important factor, there are also cost-of-living pressures which may drive economic stress with disproportionate effect on struggling customers – as demonstrated by the current high fuel / carbon costs and ULEZ discussions. The effects of other transition first and second effects on the retail space are generally less well understood at this point. Firms should consider these in the Next Generation of models.

Design requirements for Next-Generation climate risk models, and how they are differentiated from First-Generation models (2/2)

Lending to Companies

Non-retail is expected to be a significant area of focus in the short-medium term – with firms generally indicating in SME and Corporate risk. This is a challenging and rapidly evolving area, due to the increasing availability of Scope emissions data, and the need to tie-up idiosyncratic, sector, and macroeconomic effects.

Firms will need to be able to explain how the emissions data for a firm, it's sector, and the growth forecast projected in the stress-test combine to form a plausible climate risk profile. This can be taken a step further for corporates, where financial disclosures will include Climate Risk plans. Many Generation-1 models primarily used simple macroeconomic stresses – often borrowed from IFRS 9, which is unlikely to be considered sufficient in the long-run. Incorporating sector level information like GVA will be a major enhancement to a generic non-sector model

Other

A key question remains the primary basis for forecasting – should Climate Risk be estimated based on back-book, forecast portfolios, or a static balance-sheet? Different regulatory regimes have different rules and views on the suitability of different approaches here.

Discussion of potential technical solutions to the challenges which limited the efficiency of First-Generation Climate Risk models

Technical Challenges

Three Key Challenges were noted in the survey: model complexity, interfacing models, and data availability.

The first two points primarily stem from using Capital and IFRS 9 models for modelling future synthetic portfolios over 50 years and 3+ scenarios, which is far from their designed use-case as these models are designed to project a single current balance sheet and run once on a monthly basis. Because of this these models tend to manually set-up for each run to at least some extent. Three types of solution may allow a simplified or more efficient implementation:

(1) designing climate models that 'shift' IFRS 9 / IRB results which can be run off an output file,

(2) using simplified versions of the IRB/IFRS 9 models,

(3) re-building existing model implementations to be much more efficient.

Discussion of potential technical solutions to the challenges which limited the efficiency of First-Generation Climate Risk models

Scope Limitations in First Generation Models

Capital Models

- Most firms are only capturing climate impacts on capital through expert add-ons, rather than implementing climate impacts in capital models.
- Per the CEO letter, capital figures are likely to need to include Climate effects robustly
- It is unlikely that they effects will be included in IRB Pillar-1 due to the 12m outlook – but it is understood that firms may need to be able to adjust their ICAAP view to include climate stresses
- As climate effects will generally not be included directly in the score, the probability weighted view of impact on LGD and In-Default volumes is one potential solution.

Impairment

- Climate effects are not currently included in most IFRS 9 models.
- Both LECL and SICR should consider the impact of lifetime climate effects.
- Climate effects will likely need to be embedded within scenarios, so the impact of these scenarios on the exposure should be considered. This would often require Economic forecasting teams to develop a greater understanding of how the NGFS scenarios interact with their economic forecasts (and vice versa)
- Differences in pre- and post- climate effect lifetime losses should be considered in SICR assessment – especially if it wasn't considered at the point of underwriting.

Credit Strategy / Policy

- Climate effects should be considered in the decisioning and pricing of applications *(and ongoing case review for revolving facilities).* For this to occur, firms will need to develop data pipelines that ensures the key information needed to identify risky cases prior to onboarding customers.
- The impact of Climate effects on customer willingness and ability to pay needs to be considered and understood from a collections point of view, to manage cases effectively and manage conduct risk
- Definition of Default may need to consider additional Unlikeliness to Pay triggers

The business advantages which can be gained from Climate Risk models, and how Next-Generation models could be designed to support these processes.

While Climate Risk has been primarily viewed as a Stress Testing activity, there are a few distinct business advantages that can be drawn from effective Climate Risk modelling, and firms should consider how they can design their models and processes to maximise these opportunities. Alongside some of the more obvious avenues like pricing here are a couple of more niche ideas which may be worth exploring.

1. ESG Outputs – Consumers tend to show a preference for Green firms, and the Markets have been coming to realise that ESG investments tend to outperform non-ESG alternatives (especially in terms of downside risk). Firms that are better able to demonstrate their ESG credentials will tend to have an easier time interesting both retail and institutional investors. Analytics and business decisions stemming from Climate Risk models can be used to bolster firm's ESG credentials, and the outputs needed to support marketing/investor relationship teams should be considered in the model design phase.
2. Underwriting Climate Impacts – Adjusting Underwriting Rules for customers who are highly exposed to climate risk will help firms to minimise credit and operational costs related to customers being impacted by Climate events. Mortgage customers who lose their home to climate events pose a particular risk in terms of monetary cost, high operational cost managing the collections process, as well as a potential conduct and reputational risk relating to Consumer Duty (e.g. *"Bank X gave me a £200k mortgage when their data said my house would be underwater in 10 years"*)

Conclusion

Climate Change is happening, and the regulator is keen that banks take it seriously

Firms are comfortable with their ability to model risks for Mortgages in a stress testing environment, but their understanding of other areas is generally underdeveloped

The Next Generations of Climate Risk Models will likely focus on three areas:

1. Upgrading First Generation models to be more efficient and bring methodologies in lines with other firms
2. Improving the modelling approaches for SME and Corporate exposures, in line with improving data availability and techniques
3. Integrating Climate modelling results into other areas of the business to allow full understanding across the credit lifecycle and balance sheet

Thank you for listening!
Any questions?

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