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Supervisory and Industry Approaches to Insurer Climate Scenario Analysis and Stress Testing

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Executive Summary

The challenges posed by climate-related risks are becoming increasingly evident in the global economy, of which the global insurance market is a key component. With many insurers voluntarily conducting climate scenario analysis as part of their internal risk management, and supervisors initiating and conducting their own climate scenario analyses, greater attention must be paid to the design and implementation of these exercises. This report, developed from a survey conducted among the Institute of International Finance's (IIF) insurance membership, reflects some of the lessons learned from supervisor- and industry-led climate-related scenario analysis exercises in the insurance sector. Some important lessons reflect data and modeling challenges and the long-term evolving nature of climate-related risks.

The aim of this report is to explore ways in which supervisors can support industry efforts to improve the analysis and mitigation of climate-related risks and address data challenges. In the report, we provide recommendations for how supervisory exercises could better complement insurers' internal climate scenario analysis and how collaborative exercises among supervisors and the industry could facilitate improved modeling capabilities and analysis. We hope these recommendations for supervisors will allow for an appropriate, proportionate, and flexible supervisory approach that can enhance the decision usefulness of any future supervisor-led scenario analysis exercises, as well as contribute to better industry and supervisory collaboration.

The paper proceeds as follows:

1. Introduction

It has become increasingly evident that, absent robust risk management, climate-related risks may result in significant market and economic risks to financial institutions with impacts that could reverberate around the global financial system. Financial sector prudential authorities, supervisors and standard setters are engaged in efforts to ascertain the size and scope of climate-related risks to their regulated entities, the potential impacts of those risks on the financial sector and the possibility for the transmission of risks and vulnerabilities from the financial sector to the real economy and vice versa.

In order to ascertain the size, scope, and potential impacts of climate-related risks, financial sector authorities have a growing interest in conducting exercises that analyze severe but plausible climate-related scenarios. A number of authorities have initiated supervisory climate-related scenario analysis or stress testing exercises for financial institutions, including both banks and insurers, with more exercises planned in the near future. The majority of these supervisory exercises to date have been scenario analysis exercises, which are the focus of this paper. The box below discusses the differences between scenario analysis and stress testing in the context of climate-related risks.

Although often used interchangeably, there are key differences between stress testing and scenario analysis. We refer to the definitions in the IAIS' Insurance Core Principle (ICP) 16[1] to clarify references to the two terms. ICP 16 considers stress tests to be a risk assessment tool that "measures the financial impact of stressing one or more factors which could severely affect the insurer," while scenario analysis "considers the impact of a combination of circumstances to reflect historical or other scenarios which are analyzed in the light of current conditions...[that] may be conducted deterministically using a range of specified scenarios or stochastically, using models to simulate many possible scenarios, to derive statistical distributions of the results."

In practice, there is a spectrum of approaches to the two risk quantification techniques and insurers generally use a combination of stress testing and scenario analysis to assess their climate risk exposures. Stress testing is a tool used by supervisors for both microprudential and macroprudential purposes. As a microprudential tool, stress testing is primarily a quantitative tool, where changes in the values of individual parameters (e.g. a sudden introduction of a carbon tax) are used to measure the effects on insurance assets and liabilities and the firm's financial position. Macroprudential stress testing is primarily a quantitative tool for assessing the resilience of a sector to particular stresses and determining whether the sector has sufficient resources to weather macro-financial risks that could crystallize as shocks over a period when firms have limited time and options to adjust. Macroprudential stress testing also involves an element of understanding the broader economic impacts of financial institutions' adjustments to shocks, such as the impact on insurance coverage and credit provision.

Stress tests generally are a useful tool in assessing climate risks over a shorter time horizon, such as for specific transition risks (e.g. financial market or liquidity stresses caused by sudden policy changes or technology shifts), but may be less suited to assessing impacts over longer time horizons. Increasingly, some insurers and supervisors use reverse stress testing of climate risks, using existing tolerances and applying a range of future-looking scenarios.

Climate scenario analysis exercises are designed to take a longer-term view of a range of potential pathways for climate-related risks. Scenario analysis can be qualitative and/or quantitative and typically includes a wider range of parameters being varied at the same time. Scenario analysis exercises are used to understand how potential climate change trajectories would affect financial institutions and to provide a framework for understanding how financial institutions would respond to them. When it comes to assessing forward-looking climate risks and the uncertainties around longer-term projections, scenario analysis is arguably a more valuable tool than stress testing.

In addition to insurers participating in supervisory climate scenario exercises, the industry has been proactively engaged in assessing climate-related risks and in developing its own models or utilizing third-party climate risk models that support internal climate scenario analysis exercises. Many of these modeling and scenario analysis efforts build on expertise developed in managing and mitigating natural catastrophe risks. The development of further climate risk management and mitigation expertise also presents insurers with opportunities in their roles as risk managers, risk carriers, and investors with a history of underwriting and pricing risks over long-time horizons.

The objective of this report is to reflect the current state of supervisor- and industry-led climate-related scenario analysis exercises in the insurance sector; identify challenges to

climate-related scenario analysis; explore ways in which supervisory exercises can better reflect and complement insurers' internal climate modeling; and provide some initial recommendations for an appropriate, proportionate and flexible supervisory approach that can enhance the decision usefulness of supervisory scenario analysis exercises, as well as contribute to better industry and supervisory collaboration in support of further developing and improving insurers' internal climate scenario analysis exercises. This IIF report is intended to be an input and complement to the work being undertaken by public sector authorities and global standard-setting bodies, such as the International Association of Insurance Supervisors (IAIS), on this important topic. As such, the report includes proposed recommendations for further public/private sector collaboration on climate risk scenario analysis.

This report draws on a survey conducted across a dozen of the IIF's largest insurance members, as measured by gross written premiums (GWP). The IIF surveyed 12 global insurers with experience in supervisory and internal climate scenario analysis exercises. The survey group represents life, health, property and casualty (P&C) insurers and reinsurers. The IIF Insurance Climate Scenario Analysis Survey (IIF Survey) aims to be representative of supervisory and industry approaches to climate scenario analysis across various jurisdictions, geographic distributions, and business lines. See Figure 1 for summary information about the geographic regions in which the participants have active operations (with at least 5% of GWP). Participating insurers provided input via the IIF Survey, as well as bilateral meetings with IIF staff. The IIF has also consulted its global insurance membership for feedback on the report and recommendations herein, which are intended to provide representative global industry views at the time of writing.

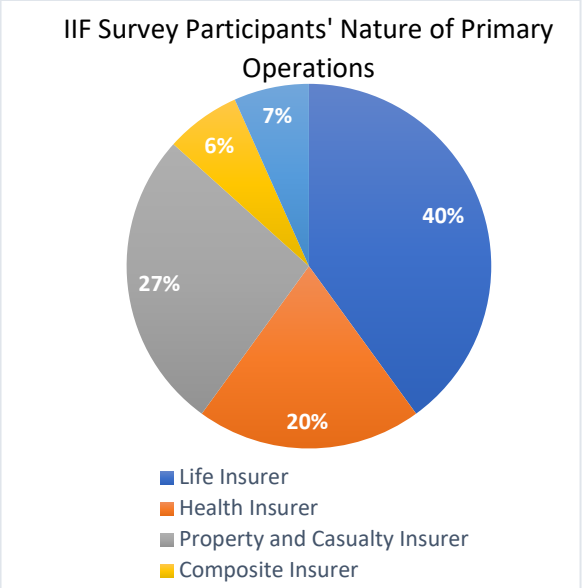

Figure 1: IIF Survey Participants' Nature of Primary Operations

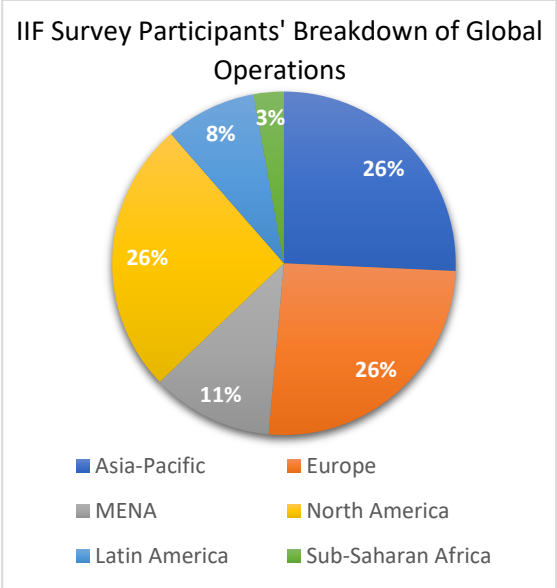

Figure 2: IIF Survey Participants' Breakdown of Global Operations

This report also draws on the IIF's considerable body of work on climate risk, including its position papers, *Climate and Capital: Views from the Institute of International Finance* (July 2022)[1] (hereafter referred to as the "2022 Climate and Capital Paper"), *Integrity through Alignment: A 2022 Roadmap for Global Standards and Market-led Approaches in Sustainable Finance* (February 2022)[2], and *Prudential Pathways: Industry Perspectives on Supervisory and Regulatory Approaches to Climate-Related and Environmental Risks* (January 2021)[3].

2. Industry Climate Scenario Analysis Exercises

Many insurers are voluntarily conducting climate scenario analysis for their own internal risk management; however, insurers need to adjust the design of these analyses to account for data limitations and modeling challenges. The majority of insurers surveyed noted that they are already voluntarily engaging in climate scenario analysis. Most surveyed insurers use the Network for Greening the Financial System (NGFS), scenarios. Other insurers use the four Intergovernmental Panel on Climate Change (IPCC) scenarios, which describe different Representative Concentration Pathways (RCPs)[4], in order to calculate a climate value at risk for the four scenarios and to determine an aggregate result by assigning relative likelihoods to the four scenarios.

Insurers found that the most helpful input physical variables for both supervisory and internal exercises included global and regional temperature pathways and the data on the frequency and severity of perils. Transition variables considered most relevant included carbon price pathways and emissions pathways, but surveyed firms noted a lack of data for both of these variables. Non-life insurers have considerable expertise in assessing the physical risks of climate change, given the extensive experience that many P&C insurers have in managing natural catastrophe risks. Life insurers are also well-positioned to manage long-dated risks, such as transition risks, given their significant investment portfolios which encompass a range of durations including longer time horizons. However, modeling for both physical and transition risk is dependent upon assumptions regarding climate pathways and trajectories, as well as assumptions regarding the frequency and severity of climate disasters, for which empirical evidence shows considerable variability.

Insurers' climate scenario analysis focuses on both physical and transition risks, with the impact of transition risks creating unforeseen and difficult to predict exposures compared to physical risks, especially for general insurance lines of business, which reprice annually and whose risks can be mitigated to some extent by reinsurance and through the alternative markets. Work is underway on better capturing liability risks, to which insurers may be exposed through

[1] https://www.iif.com/Publications/ID/5018/Climate-and-Capital--Views-from-the-Institute-of-International-Finance

[2] https://www.iif.com/Publications/ID/4784/Integrity-through-Alignment-A-2022-Roadmap-for-Global-Standards-and-Market-led-Approaches-in-Sustainable-Finance

[3] https://www.iif.com/Publications/ID/4224/Prudential-Pathways-Industry-Perspectives-on-Supervisory-and-Regulatory-Approaches-to-Climate-Related-and-Environmental-Risks

[4] RCP 2.6: 1.5 degrees C, aggressive mitigation; RCP 4.5: 2 degrees C, strong mitigation; RCP 6.0: 3 degrees C, some mitigation; RCP 8.5: 4 degrees C, no further mitigation.

directors' and officers' liability coverage. At present, liability risks are generally considered through qualitative analysis.

Insurers expressed different levels of confidence in their ability to model physical and transition risk over longer timeframes. Most insurers reported that they are able to model these risks only over relatively short (5 to 10 year) timeframes, but a minority of firms expressed confidence in modeling longer (20 to 30 year) timeframes. However, insurers noted the considerable challenges associated with modeling these risks even over shorter timeframes. Insurers report that the short- to medium-term impact on the asset side of the balance sheet is more pronounced than on the liability side, given short-term P&C contracts, annual repricing, the availability of reinsurance and other risk mitigants. However, P&C insurers acknowledge the potential for more significant impacts on their liabilities over the long term. Life and health insurers are considering longer-term climate-related risks in terms of their potential impacts on morbidity and mortality.

A key challenge for industry climate scenario analysis exercises, as well as supervisory exercises, is data availability. Respondents to the survey noted a number of difficulties in modeling climate risk (Figure 3), foremost being the difficulty of obtaining reliable data for use in climate risk models in appropriate formats that do not require extensive data cleaning and normalization. Survey respondents also noted the challenges of obtaining consistent data across the asset portfolio, including consistent emissions data from counterparties and investees. In some cases, considerable manual efforts were required in order to reconcile asset data from the insurer and from its asset managers and custodians. One insurer characterized the availability of data from a range of sources as poor due to limited reporting and the lack of consistent and comparable reporting both from counterparties and third-party data providers. Informational challenges were noted in the real estate sector in particular where assets may become uninsurable or prohibitively expensive to insure over the longer term.

Data availability issues are compounded by the lack of certainty as to the future path of governmental and regulatory climate policies and differences in policy across jurisdictions. Second-order effects of climate change, such as socio-economic impacts (e.g. changes in migration patterns) or the future direction of adaptation and mitigation efforts are also subject to substantial uncertainty.

Robust climate-related scenario analysis requires extensive resources from across an insurer's senior leadership team and often requires the involvement of outside experts, including climate scientists. Expertise is needed to design an exercise that captures material climate-related physical, transition and litigation risks and that quantifies the impact on the insurer's balance sheet in order to produce decision-useful results for the insurer's business and strategic planning. The risks of climate change that are expected to materialize over much longer time horizons than the business and strategic planning cycles need to be considered but are more dependent on estimates and assumptions and may prove less decision-useful for management.

Insurers may need to source technical skills and expertise beyond traditional quantitative, modelling or actuarial expertise. Organizationally, insurers reported that they

have enhanced interdepartmental cooperation, for example, among risk management and modeling, actuarial and finance teams, in order to translate natural catastrophe modelling into climate scenario analysis exercises. Insurers may also need to engage with experts in the climate sciences, such as meteorology, geology, and hydrology, as well as with engineers and city planners to better understand potential natural catastrophe risks and their effects on growing urban populations concentrated in certain geographic regions.

There are currently a number of proprietary vendor and open-source models that insurers can use to assess their climate risk exposures, but there are still significant limitations to the use of these models. Generally, the development of third-party and/or open-source models[5] is a positive development, as insurers do not necessarily need to develop their own internal models, particularly given the complexities and costs involved. Nevertheless, insurers note the need to be mindful of the aims and limitations of open-source and proprietary models, and to exercise caution when determining whether a particular model is designed to achieve the insurer's risk modelling objectives.

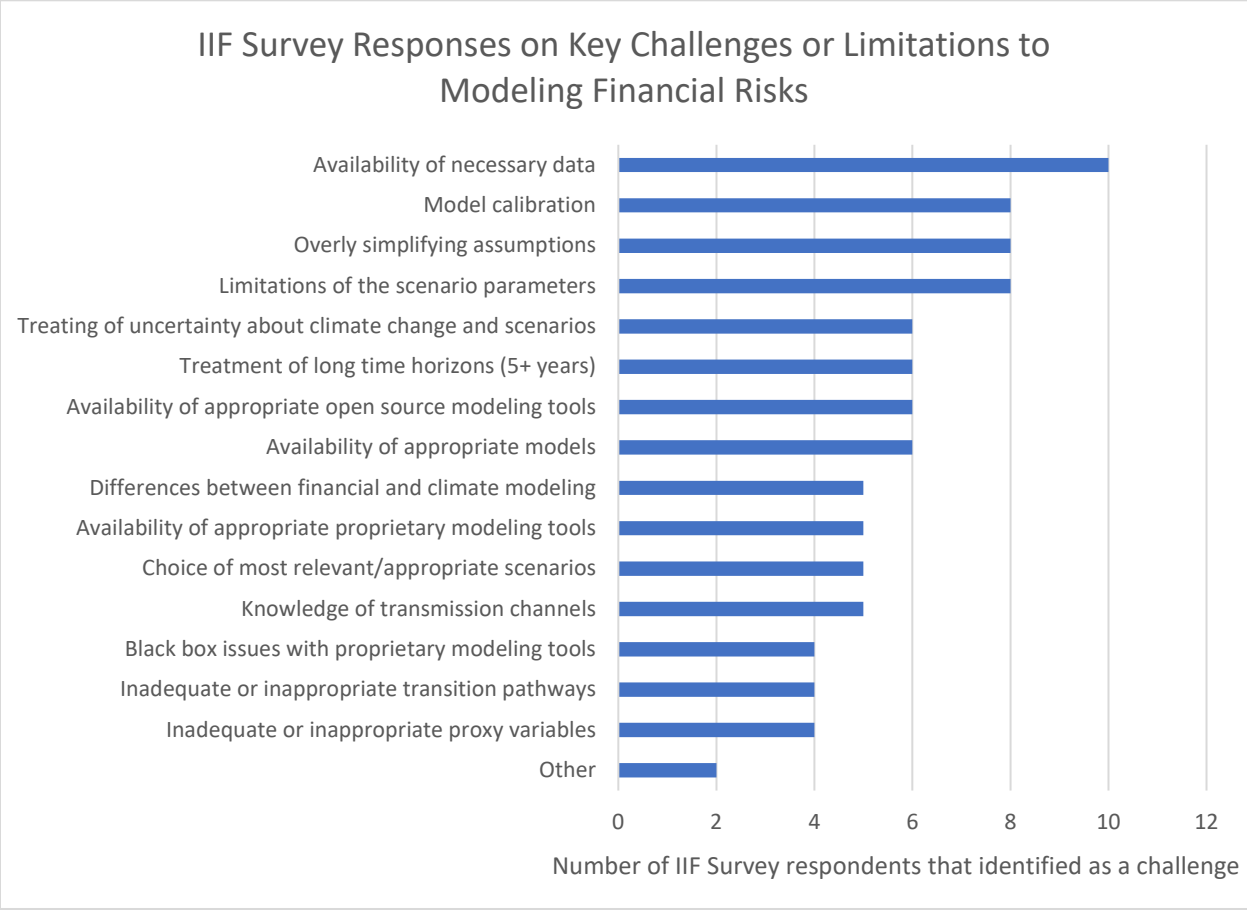

Figure 3: IIF Survey Responses on Key Challenges or Limitations to Modeling Financial Risks

[5] Insurers we surveyed generally use vendor models, as opposed to open-source models.

3. Reflecting Climate Scenario Analysis in Insurers' ORSAs and Strategic and Business Plans

Respondents reported that they use the results of internal climate scenario analysis as inputs to disclosures using the TCFD framework, to inform their Own Risk and Solvency Assessment (ORSA) and internal modeling, and, importantly, to inform strategic decision making - such as setting climate-related targets and commitments. Over time, internal climate scenario analysis exercises may help to inform current investment, pricing and underwriting practices; provide input into the risk appetite; make changes to certain lines of business; and/or update the risk management framework. An important aspect of climate scenario analysis is the integration of the findings of those analyses into overall business planning, particularly over longer time frames.

Most insurers surveyed believe that it is premature for supervisors to revise their ORSA rules and guidance in order to include prescriptive requirements for the inclusion of climate-related risks. Supervisory authorities could explore future opportunities to engage with industry stakeholders to ensure that firms have clarity regarding technical approaches for the reflection of climate-related risks in the context of supervisory guidance relevant to the ORSA. However, insurers should have the flexibility to incorporate material climate-related risks based on their internal climate scenario analyses to the extent that the company believes that the outputs of scenario analysis are material, sufficiently reliable, and decision-useful. The ORSA should be an assessment that is owned by the company, reflecting its individual risk profile and the materiality of certain risks.

Insurers generally believe that a longer-term view on climate-related risks that extends beyond the normal strategic and business planning time horizons of three to five years is sensible, given the long-term evolving nature of the risk. However, how climate-related risks are integrated into an insurer's strategic and business plan, and how and to what extent the quantitative and qualitative outputs from scenario analysis should be reflected in those plans, should remain under the control of the company. In general, insurers find that quantitative outputs are less reliable and require a greater degree of judgmental refinement before they can be reflected in business plans compared to qualitative findings.

Insurers typically rely on expert judgment to inform the calibration of their climate risk models and results need to be interpreted with caution. Qualitative safeguards and reassurances are important to ascertain the reliability of the assessment results, particularly if the results are to be used for decision-making. Just as for other types of risk, board and senior management oversight and critical challenge over the validation of insurers' risk models are important.

4. Supervisory Climate Scenario Analysis Exercises

Financial prudential authorities are increasingly concerned with the potential materiality of risks posed by climate change and their potential impacts on financial institutions. Since 2017, following the release of the Financial Stability Board's (FSB) Task Force on Climate Related Financial Disclosures (TCFD) recommendations, climate risk assessment and measurement and related calls for enhanced supervisory reporting and public disclosures of climate-related risks have been gaining momentum among regulators and supervisors, as well as in the investment community. At both the global and national levels, regulatory and supervisory authorities are implementing measures and offering guidance intended to raise awareness, and to mitigate the effects, of climate change on the financial services sector. Given the growing challenges caused by climate-related risks for the economy including the financial industry, authorities and investors are increasingly asking banks and insurers to quantify their exposures to climate risks. Regulators, supervisors and the investment community also are keenly interested in transition plans and efforts to improve resilience to climate-related risks, especially given the impacts of climate-related risks over the relatively long-time horizon over which these risks are expected to materialize.

The use of scenario analysis for climate risk assessment is an explicit recommendation of the market-led TCFD, which are designed to facilitate the disclosure of potential business, strategic, and financial implications of climate-related risks and opportunities over short-, medium- and long-term time horizons. Scenario analyses can be a particularly useful tool given the range of plausible climate scenarios and because they can be adjusted to capture various risk drivers related to climate change.

A majority of supervisory climate scenario analysis exercises are based on or influenced by the scenarios developed by the NGFS, but a significant number of jurisdictional authorities adjust the NGFS scenarios for jurisdictional specificities or use alternative scenarios that are deemed more appropriate to reflect local conditions and risks.

A recent report by the FSB and the NGFS, *Climate Scenario Analysis by Jurisdictions* (FSB/NGFS Jurisdictional CSA Report)[6] provides a synthesis of the findings from climate scenario analysis exercises undertaken by financial authorities to date.

An increasing number of insurance supervisors across a wide range of jurisdictions have taken steps to develop and pilot climate-related scenario analysis exercises to assess the impacts on the industry of physical and/or transition risks, with additional exercises planned for the near future. Since the 2017 release of the TCFD recommendations, a number of regulatory and standard-setting bodies across numerous jurisdictions (see Annex) have conducted or planned forward-looking supervisory climate risk scenario analysis exercises. These include efforts by the IAIS together with the Sustainable Insurance Forum (SIF), the NGFS, the European Insurance and Occupational Pension Authorities (EIOPA), the Prudential Regulation Authority (PRA) at the Bank of England (BoE), the French supervisory authority

[6] https://www.fsb.org/wp-content/uploads/P151122.pdf

(ACPR), the Monetary Authority of Singapore (MAS), the Japanese Financial Services Agency (JFSA), and the Australian Prudential Regulation Authority (APRA). In the U.S., the National Association of Insurance Commissioners (NAIC) and state insurance regulators, such as the New York Department of Financial Services (NY DFS), as well as federal authorities, including the Securities and Exchange Commission (SEC) and the Department of Treasury's Federal Insurance Office (FIO), have put forth climate-risk guidance including proposals for climate scenario analysis exercises.

There is no one-size-fits-all methodological approach to supervisory climate-related scenario analysis, nor should there be, particularly in the insurance sector, where the diversity and complexity of the industry add to the methodological challenges. Similarly, the same set of metrics may not be appropriate across the industry. Supervisors should consider the extent to which they can focus on certain key metrics and provide some level of flexibility for firms to develop the metrics that reflect best their most material risks. The insurance sector poses many unique challenges, as the diversity of business models across the industry and among and within the life, health and P&C sub-sectors does not lend itself to the development of a uniform scenario analysis methodology or uniform metrics. Rather, flexible approaches and methodologies are needed to reflect the potential impacts of physical and transition risk on these sub-sectors, and to capture risks and risk drivers on both the asset and liability sides of insurers' balance sheets. There may be a key set of metrics that are important to utilize in order to capture significant and material risks and to provide a baseline for comparison of results; however, insurers should have a certain degree of flexibility to use those metrics that reflect best the risks that are most material for their mix of business and markets.

Data is a key challenge in developing and implementing supervisory exercises, as assessing and measuring the impact of climate-related risks requires granular exposure data across multiple sectors and information from material counterparties. The results of the IIF Survey indicate that all respondents cited a lack of data, lack of consistent data, or both, to be a major impediment to their efforts to assess and quantify climate-related risks. Measuring the impact of climate-related risks requires granular exposure data that is often unavailable, unreliable or not easily comparable across sources. In particular, data used to estimate the impact of longer-term climate risks may be dependent on relatively rough estimates or assumptions about climate change trajectories and pathways that may change significantly over time or prove to be incorrect.

In a similar vein, the FSB/NGFS Jurisdictional CSA Report noted that respondents to the survey of financial authorities cited data gaps in counterparty greenhouse gas emissions, geographical location data and forward-looking information on counterparties' and customers' transition plans and noted challenges with respect to the use of existing industry classification codes.

Supervisory scenario analysis exercises vary considerably in terms of scope, objectives, underlying design parameters, time horizons, and input variables. The FSB/NGFS

Jurisdictional CSA Report noted wide variation in the scope and objectives of supervisory exercises, as well as a variety of exploratory design choices, which hinder a straightforward comparison of results. Underlying design parameters have significant implications for the feasibility, outputs and ultimately the decision-usefulness of scenario analysis exercises, for both supervisors and industry. Consistent with the findings of the IIF's 2021 *Navigating Climate Headwinds*[7] paper, the IIF Survey found there is no standard analytical method established for climate-related scenario analysis.

Most exercises have included both quantitative and qualitative components and most have relied on a subset of the 2020 or 2021 NGFS scenarios, which consider both physical and transition risks.[8] According to the IIF Survey results, the percentage of the insurance balance sheet captured by supervisory exercises varied from under 20 percent to over 80 percent depending on the exercise and the insurance firm.

A range of input variables are used in supervisory scenario analysis exercises. The IIF asked survey participants to indicate the variables that they found most relevant or significant in assessing the impact of various climate scenarios on the organization. Some of the most relevant and significant variables included carbon price and emissions pathways, global and regional temperature pathways, and certain macroeconomic variables such as GDP, corporate bond yields and equity indices.

There is a tradeoff between flexible input variables that better reflect a firm's business operations and risk management and more precisely specified variables that improve comparability. There is also a risk that precisely specified variables might lead to a false sense of comparability at the expense of meaningful results for a particular insurer. A one-size-fits-all approach to a diverse industry is likely to result in less meaningful and potentially misleading results and findings that could lead to unintended consequences.

One respondent noted that one limitation of an exercise in which they had participated was the consideration of solely downward movements in asset classes and sectors. This particular exercise did not reflect that some asset classes and sectors could appreciate in value as capital shifts into the asset class or sector from more carbon-intensive classes or sectors.

Respondents noted the need for greater scientific understanding among supervisors in the design and execution of climate scenario analysis exercises. For example, one respondent noted that the supervisory exercise did not take into account interdependencies among climate variables and used overly simplistic summation to assess impact. Others noted overly simplifying assumptions and restrictive variable sets. The materiality of risk to the insurance group was not always well reflected in supervisory exercises, nor was the impact of group-wide diversification as a risk mitigant. These limitations can divert attention from the riskier implications of climate change and can produce information that is not actionable.

[7] https://www.iif.com/portals/0/Files/content/Regulatory/07_15_2021_navigating_climate_headwinds.pdf
[8] Most recently, a third vintage of NGFS scenarios has been released. See NGFS (September 2022).

To date, most supervisory exercises have been based on a static balance sheet. A static balance sheet assumes a constant or invariant balance sheet over the period of time during which the exercise is being conducted. A static balance sheet does not take into account management actions or changes in the characteristics of assets and liabilities.

A dynamic balance sheet, in contrast, incorporates future business conditions and expectations and assumes that the size, composition and risk profile of the balance sheet will vary over the time horizon of the exercise. At this time, most insurers do not believe that climate risk models are sufficiently evolved to allow for the use of dynamic balance sheets in supervisory climate risk scenario analysis exercises. The FSB/NGFS Jurisdictional CSA Report noted that it is difficult to discern any systematic pattern in the outcomes of supervisory exercises that took into account dynamic responses (management actions) from those that did not.

The FSB/NGFS Jurisdictional CSA Report noted that approximately 80% of supervisory exercises utilized a static balance sheet approach, in light of methodological and data limitations associated with a dynamic approach. While survey participants believe that analyses based on both static and dynamic balance sheets can be of value, they note that the use of a static balance sheet can help to eliminate 'noise' due to differences in assumptions regarding how the balance sheet would change to reflect new information. A static balance sheet can better allow for the analysis of the impact of climate-related signals in isolation. The use of static balance sheets can also reduce the complexity of supervisory exercises, improve the comparability of results across insurers and provide a better understanding of aggregate and relative exposures. One insurer suggests the use of static balance sheets for quantitative supervisory exercises and dynamic balance sheets for qualitative supervisory analyses.

According to the FSB/NGFS Jurisdictional CSA Report, about half of the supervisory exercises utilized a top-down approach, with the other half employing a bottom-up or hybrid approach. While a top-down approach contributes to consistency and comparability and reduces burden on the industry, a bottom-up approach can provide useful insights into potential management actions and can facilitate counterparty engagement by participating firms.

The FSB/NGFS Jurisdictional CSA Report notes that most supervisory authorities were only able to account for first-order effects on climate-related risks given data and methodological limitations, as well as time constraints. However, one authority (the Bank of England) asked firms to consider the impact of peer companies taking similar management actions and the European Central Bank and the European Systemic Risk Board applied a network analysis approach to assess potential contagion channels across financial and real economy channels. The Polish Financial Supervision Authority considered how a reduction in reinsurance supply could affect insurance cover to carbon-intensive economic sectors. The findings of the Report indicate that considerable additional work needs to be done in order to capture second-order impacts on financial stability given the complexity and uncertainty associated with modeling feedback loops.

Relatedly, and consistent with the IIF *2022 Climate and Capital Paper*, IIF Survey participants agree that the use of the prudential capital framework to address climate-related risks is inappropriate, as long-term assessments are not well suited to determine solvency capital requirements over a one-year horizon. On a purely quantitative basis, the levels of potential exposure and stability risks posed by climate change do not currently appear to indicate levels of risk over the near to medium term which would justify the use of the regulatory capital framework. The assessment and quantification of climate-related risks require the consideration of much longer time horizons than the typical one-year time horizons used for calibrating regulatory capital requirements. This reflects the very long-term nature of many climate-related risk drivers. While insurers, especially life insurers, are used to considering risks over 50 years or more, data, methodological and modeling constraints make the consideration of climate risks over these long-term time horizons prohibitively difficult at present. Insurers generally note that the results of analyses based on shorter time horizons are more meaningful and actionable for insurers' risk management and business and strategic planning, as business underwriting and pricing decisions often consider a one-year time horizon and strategic planning horizons generally encompass a three to five year horizon. Given the higher levels of uncertainty inherent in longer time horizons, the rate at which climate risks are increasing, and the methodological and data gaps which remain, considerations of capital requirements may change. However, in the short-term, this uncertainty should call attention to the importance of further collaboration between supervisors and industry to assess the dynamics and implications of near-term climate risks.

5. Recommendations Related to Supervisory Climate Scenario Analysis Exercises

Supervisory exercises should be limited in scope, driven by an authority's supervisory mandate, and provide transparency around how the results will be used and communicated. As discussed in the IIF's *Prudential Pathways and Navigating Climate Headwinds* papers, there is value in greater clarity around why authorities are undertaking forward-looking climate risk exercises and how that purpose relates to the authority's mandate. It is also important for authorities to be transparent as to how they intend to use the outputs from those exercises and how the results will be communicated to participants, other regulators and supervisors and to stakeholders, including the public.

Some supervisory objectives may be better met through the use of other tools, including discussions with management, supervisory assessments of insurers' own forward-looking climate scenario analyses and review of insurers' disclosures of forward-looking metrics.

Supervisory demands for industry participation in supervisory scenario analysis exercises should be tied to the supervisory mandate, proportionate, flexible and focus on material climate-related risks. Insurers with global operations often are contending with multiple, varying exercises with overlapping and ambitious timeframes. Insurers should be expected to take a proportionate approach to managing climate risks that is reflective of the materiality of climate risk to their exposures, as well as the nature, scale, and complexity of their business and supervisors in turn should take a proportionate approach in the requirements they impose on insurers. Climate risk varies significantly depending on the insurers' size, complexity, geographic distribution, business lines, investment strategies, and other factors.

As well, the relevance of climate-related risks to different insurers or business models can vary widely.

Some firms find that supervisory exercises can detract from management time and attention to risk management and often fail to produce decision-useful information because the scenarios lack immediacy (i.e. the scenarios reflect future states many decades in the future) or actionability (i.e. the results are not translatable by risk managers into concrete action plans).

Supervisors should not underestimate the value of qualitative exercises. Qualitative exercises can produce decision-useful and actionable observations, particularly over longer time horizons and can be complemented by relevant quantitative analyses depending upon data availability and technical capacity. Overdependence on quantitative analyses risks creating a false sense of precision and misleading signals.

Insurers participating in the IIF Survey would prioritize alignment of exercise objectives, scope, scenarios and time horizons in their efforts to coordinate supervisory exercises. Insurers acknowledge the trade-offs inherent to the degree of specificity and detail of the input variables for supervisor-led exercises. Insurers acknowledge the need to balance calls for comparability with the need to allow insurers a degree of flexibility in how they respond to supervisory exercises (including the use of metrics) in order to better capture their business models and risk profiles. Dialogue between prudential authorities and the industry could be helpful in identifying areas where design flexibility could be accomplished with the least negative impacts on the reliability and comparability of results.

The results of supervisory exercises are an important input into the discussions of supervisory colleges for cross-border insurance groups. A lack of comparability among supervisory exercises can hinder the effectiveness of those discussions as supervisors may be speaking different 'languages.' At the extreme, the impact from different supervisory languages arising from a lack of comparability could be that the college recommends or requires the insurer to take actions that prove over time to be inconsistent with sound risk management. Most insurers surveyed believe that the group supervisor should determine the scope of supervisory exercises. The FSB/NGFS Jurisdictional CSA Report had also issued a clear call for greater cross-border cooperation.

It is critical that supervisory exercises are limited in scope in order to not "crowd out" insurers' internal analysis and risk management efforts. Some survey respondents call for less frequent and more narrowly tailored supervisory exercises, recognizing that the assumptions underlying forward-looking exercises do not change significantly year-on-year. While important for shaping a shared view across industry and supervisory communities on the potential implications of future climate risks, very frequent, highly granular or overlapping supervisory exercises may constrain the resource capacity of firms. Not all insurers have the same level of resources to devote to conducting forward-looking climate risk assessments, and some insurers will take longer than others to develop and implement appropriate practices. The demand for multiple, frequent supervisory exercises puts a strain on the scarce resources within insurers' risk management functions.

Ideally, supervisory exercises would complement insurers' own internal analyses. Industry and supervisory goals are ultimately aligned: to enhance risk management practices and to build capabilities to influence better strategic thinking on climate risk management. Many insurers are optimistic that supervisory exercises have the potential to provide decision-useful inputs to their internal scenario analyses, risk management and strategic planning, if supervisory exercises are designed and executed effectively.

There is a need and a clear opportunity for capacity building among supervisors in order to improve supervisory exercises. IIF Survey respondents noted a number of opportunities for greater collaboration and cooperation (Figure 4), notably the need for capacity building and greater scientific understanding among supervisors in order to improve the design and execution of supervisory exercises. Common design flaws include restrictive and inflexible variable sets that do not reflect the diversity of the industry and insurance business lines, the failure to consider interdependencies among climate variables, the materiality of climate-related risks to the insurer or the impacts of diversification. For example, one respondent noted that the supervisory exercise did not take into account interdependencies among climate variables and used overly simplistic summation to assess impact. Importantly, the materiality of risk to the insurance group was not always well reflected in supervisory exercises, nor was the impact of group-wide diversification as a risk mitigant. These limitations can divert attention from key climate-related risks and can produce misleading signals that could lead to suboptimal responsive actions. A focus on capacity building should be prioritized over the development of additional supervisory exercises.

Supervisory capacity building would be enhanced and accelerated through collaboration with private sector experts in risk management and modeling. Collaboration with the industry in the design of supervisory exercises could advance the state of climate risk scenario analysis and help to develop exercises that provide more decision-useful information, to the benefit of both the supervisory community and the industry. Supervisors should maximize opportunities for collaboration with industry experts and other key stakeholders in order to share learning and capabilities related to climate-related scenario analysis and climate risk management more broadly.

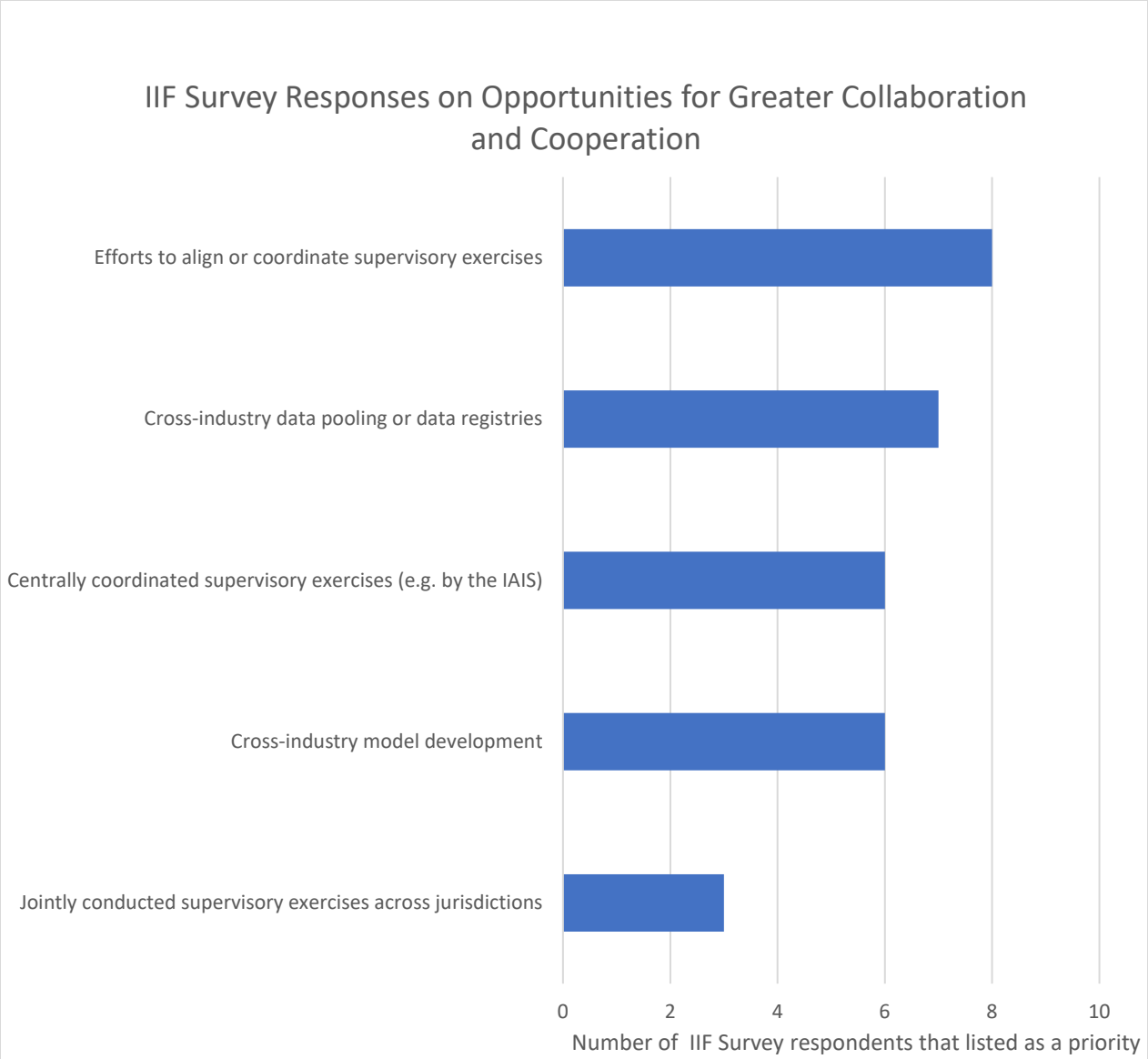

Figure 4: IIF Survey Responses on Opportunities for Greater Collaboration and Cooperation

6. Conclusions

As noted throughout this paper, climate scenario analysis exercises vary significantly between and among supervisor-led and insurer-led exercises in terms of the risks in scope, time horizons, and geographic coverage, and reflect an array of technical design choices and assumptions that shape how the analysis is conducted. These factors have significant implications for the feasibility of climate scenarios analyses, the comparability of outputs, and ultimately, the value of the exercise for supervisors and firms. The IIF's observations and recommendations are intended to enhance the alignment and usefulness of supervisory exercises:

- Supervisors should provide greater clarity as to the purposes and intended uses of scenario analysis exercises. In addition to providing needed transparency to the industry and other stakeholders, elaborating the purposes and intended uses of the exercise may help to sharpen supervisory focus on key risks to the industry.
- The value of qualitative supervisory exercises and findings should not be underestimated.
- Insurers believe that the trend of using a static balance sheet for supervisory exercises should be continued in the near term while techniques for utilizing a dynamic balance sheet are further developed.
- ORSA rules and guidance should not be amended to include prescriptive requirements for the inclusion of climate-related risks at the present time.
- The use of the prudential capital framework to address climate-related risks is inappropriate, as long-term assessments are not well suited to determine solvency capital requirements over a one-year horizon.
- Supervisory exercises should be limited in scope in order to not "crowd out" insurers' internal analysis and risk management efforts. While important for shaping a shared view across industry and supervisory communities on the potential implications of future climate risks, very frequent, highly granular or overlapping supervisory exercises may constrain the resource capacity of firms.
- Regulators and supervisors should maximize opportunities for collaboration within the regulatory/supervisory community and with industry and other stakeholders in order to share learning and expertise related to climate-related scenario analysis and climate risk management more broadly.
- Regulators and supervisors should carefully consider the outcomes of supervisory exercises in assessing the materiality of climate-related risks both to individual firms and sector-wide. This assessment should inform the need for any further supervisory action or guidance.

Annex: Summary of Supervisory-led Scenario Analyses Undertaken or Announced (2020-2024)

Authority	Year of Exercise	Recurrence	Financial Institutions in Scope	Executing Organization[9]	Objective(s)	Risk type(s)		Scenarios	Time Horizon Intervals / Balance sheets	Regulatory Use(s)
						Physical	*Transition*			
ACPR	2020	Pilot exercise	Banks, Insurers	FIs	Raise awareness / Assess vulnerabilities of institutions and costs induced by non-compliance with Paris Agreement	x	x	3 in total: Reference scenario of 2° warning under the Paris Accord/ Late reaction scenario / Scenario of a swift and abrupt transition	2020 to 2050 5-year intervals Dynamic balance sheet (starting in 2025)	Explicitly no use for capital treatment (for first exercise), but described as a prudential supervision tool to assess sufficiency of current regulatory framework
ACPR	2023/2024	Regular testing	Banks, Insurers	FIs	-	-	-	-	-	-
Australian Prudential Regulation Authority	2022	Climate risk self-assessment	Banking, insurance, and superannuation industries	FIs	Assess how medium-to-large FIs adhere to climate risk management guidance	x	x	-	-	Integrate climate-related risk into supervisory practices
Bank of Canada	2020	One-time	No application to individual organizations	CB	Assess economic impact to provide insights into potential financial system risks	x	x	4 in total: Business as usual / Nationally determined contributions (NDCs) / 2°C (consistent) / 2°C (delayed action)	2050	-
Bank of Canada / Office of the Superintendent of Financial Institutions	2021	Pilot exercise	Small group of institutions from the banking and insurance	FIs	Build climate scenario analysis capability / Increase	x	x	4 in total: Baseline (2019 policies)	2020 to 2050 Static current	Development of prudential guidance on risk management

[9] The exercise is either run by the central bank (CB) or the financial institutions themselves (FIs).

			sectors (voluntary)		understanding of potential climate risk exposure and FI's governance and risk-management practices			/ Below 2°C (immediate) / Below 2°C (delayed) / Net-zero 2050 (1.5°C)	balance sheet	expectations, scenario analysis, and disclosure
Bank of England / Prudential Regulation Authority	2019	One-time	Category 1 and 2 general Insurers	FIs	Inform view of sector risks / Assist in supervision of individual firms	x	x	3 in total: Sudden transition / Long-term orderly transition / No improvements + temperature increase > 4°C	Time horizon scenario dependent: 2022 / 2050 / 2100 Static current balance sheet	Inform and advance supervisory work / Explicitly no use for capital treatment
Bank of England / Prudential Regulation Authority	2021	One-time	Largest Banks and Insurers	FIs	Test resilience of institutions and financial system / Size risks / Identify data gaps	x	x	3 in total: Early policy action / Late policy action / No additional policy action/ Climate litigation scenarios	2020 to 2050 5-year intervals Static current balance sheet	Explicitly no use for capital treatment
Bank Negra Malaysia	2024	Pilot exercise	Financial Institutions	CB	Assess resilience of FIs / Strengthen current climate risk management and stress testing tools	x	x	3 in total: Current policies / Nationally Determined Contributions (NDCs) / Delayed transition	2023 to 2050	Inform and advance supervisory work / Explicitly no use for capital treatment
De Nederlandsche Bank	2018	Pilot exercise	Banks, Insurers, Pension Funds	CB (using data of slightly more than half of the total exposures of the FIs)	Gauge potential financial stability impact of a disruptive energy transition	-	x	4 in total: Policy shock / Technology shock / Double shock / Confidence shock	5-year horizon	

EIOPA	2020	Sensitivity analysis	Insurers	FIs (using Solvency II data)	Understand risks of climate change / Develop future stress testing	x	x	2DII Paris Agreement Capital Transition Assessment (PACTA) Bespoke Climate Scenario	-	-
European Central Bank	2019	One-time	Financial Institutions	CB (using sectoral and exposure-level data)	Raise awareness and understanding to help financial institutions build resilience	x	x	4 in total: Orderly / Disorderly / Hot house world / Too little, too late	-	Consideration of climate risk in banks' capital requirements framework would require evidence of the potential risk differential between green and brown assets.
Monetary Authority of Singapore	2018	One-time	Insurers	FIs (as part of stress test)	Explore institution's resilience / Raise awareness	x	-	Scenario featuring extreme flooding (average depth of 600 millimeters)	-	-
Monetary Authority of Singapore	2022	One-time	Banks, Insurers	FIs (as part of stress test)	Raise awareness / Facilitate learning	x	x	-	2030 to 2050 10-year intervals Static balance sheet	-
Swiss Federal Office for the Environment	2020	Periodic (last in 2017)	Banks, Asset Managers, Insurers, Pension Funds	External partners	Alignment of portfolios to climate change policy objectives	-	x	IEA scenarios (CPS, NPS, 2DS, B2DS)	5 years	None – transparency for participants on individual portfolios and on aggregate basis for

											public stakeholders
Japanese Financial Services Agency	2022	Pilot exercise	Three major banks and three major non-life insurers	CB		Understand impacts of climate change on FIs / Improve scenario analysis methodology / Understand data constraints	x	-	2DII PACTA Climate Scenario	Transition: 30-years Physical: 80-years	-

Table notes:

- The table was completed on a best-efforts basis from publicly available information. Any errors are the fault of the authors.
- " – " in a cell indicates that the information was not available from public sources.