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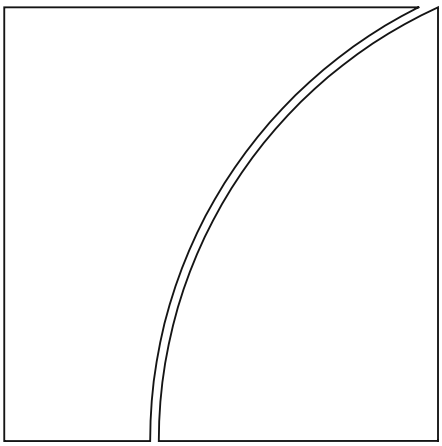

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Uncertain waters: can parametric insurance help bridge NatCat protection gaps?

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Uncertain waters: can parametric insurance help bridge NatCat protection gaps?[1]

Executive summary

Economic losses from natural catastrophes (NatCat) are increasing, with a significant portion remaining uninsured. NatCat protection gaps, often defined as the difference between insured and total economic losses from natural disasters, can be substantial. A widening protection gap may increase strain on governments, threaten financial stability and have a significant impact on households and businesses. Addressing these gaps requires coordinated efforts from governments, international organisations, the insurance industry, insurance supervisors and consumers.

The International Association of Insurance Supervisors (IAIS) has issued a call to action for supervisors to address NatCat protection gaps. It outlines a series of actions whereby insurance supervisors could help improve the affordability, availability and uptake of catastrophe insurance. Key actions include creating a supportive regulatory environment that enables offering innovative products such as parametric insurance.

Parametric insurance offers a promising solution to reduce NatCat protection gaps. It provides rapid payouts triggered by predefined, measurable parameters, offering alternative or supplementary coverage to traditional indemnity insurance, including for losses that are often excluded by the latter. Despite its potential, the adoption of parametric insurance remains limited due to challenges such as basis risk, product complexity and regulatory barriers.

This paper analyses the key design elements of parametric insurance products and provides insights to supervisors in jurisdictions where it can be an effective risk management tool. It synthesises insights from responses from 12 insurance supervisory authorities and seven market participants to a survey focused on the design of non-agricultural NatCat parametric insurance for households and small and medium-sized enterprises (SMEs), as these events directly impact them and often cause severe financial harm. Rapid recovery is crucial for economic and societal resilience, particularly in emerging market and developing economies (EMDEs) where SMEs drive economic activity and employment.

Survey responses indicate that regulatory requirements for parametric insurance products vary widely. Some jurisdictions have specific laws, while others use broader insurance regulations or pilot projects to govern these products.

On the topic of index selection, respondents highlighted the importance of using indices that are objective, reliable and closely correlated with potential losses. Authorities in some jurisdictions have established clear guidelines and requirements for index selection, while others allow more flexibility. Industry participants emphasised the need for high-quality data and transparency in index selection, using diverse sources such as government agencies and third-party data providers.

[1] Denise Garcia Ocampo (Denise.GarciaOcampo@bis.org), Bank for International Settlements, and Carlos Lopez Moreira (Carlos.LopezMoreira@bis.org), International Association of Insurance Supervisors. We thank Alison Arnot, Christopher Au, Samuel Brown, Emma Claggett, Juan Carlos Crisanto, Jonathan Dixon, Conor Donaldson, Alistair Gough, Alex Hardy, Neil Kempston, Alex Korb, Dario Luna, Miroslav Petkov, Arwen Ross, Leigh Wolfrom, Jeffery Yong and Manuela Zweimueller for helpful comments and suggestions. We also thank Rebecca Guerra for helpful research support and Theodora Mapfumo for valuable administrative support.

When it comes to triggers, the determination of payout triggers involves various approaches, including direct triggers, intensity-at-location triggers and multiple triggers. Ensuring that triggers are closely aligned with actual losses is crucial to minimise basis risk. Authorities have implemented measures such as educational workshops and transparency requirements to enhance the understanding and acceptance of triggers.

Payout structures in parametric insurance can include fixed, proportional and incremental payouts. Industry participants use strategies like leveraging sensor data and streamlined claims processes to ensure timely and fair payouts. Regulatory measures to promote transparency and fairness in payout structures include clear criteria for payout eligibility and general transparency principles.

Despite advancements, challenges remain in integrating indices and triggers into parametric insurance products. Issues such as client acceptance, data quality and the high cost of data collection and risk modelling were identified by industry participants. Authorities emphasised the need for better data availability, enhanced modelling techniques, and stakeholder collaboration to address these challenges and improve the effectiveness of parametric insurance.

Survey respondents provided several key recommendations to address the challenges associated with the adoption and effectiveness of parametric insurance products. These recommendations focus on improving data quality and availability, enhancing analytical and modelling capabilities, increasing education and awareness among potential users, and fostering regulatory clarity and support.

To improve data quality and availability, respondents emphasised the need for high-quality, granular data sourced from reliable providers such as satellite imagery, sensors and meteorological stations. Authorities are encouraged to establish clear guidelines for index selection and ensure transparency and reliability through data source verification and compliance checks.

Enhancing analytical and modelling capabilities involves leveraging advanced tools like artificial intelligence and machine learning for risk modelling and backtesting. Respondents also highlighted the importance of refining trigger mechanisms to ensure they closely align with actual losses, thereby minimising basis risk. Collaboration with other agencies and stakeholders is crucial for developing standardised transparency requirements and joint risk and exposure studies.

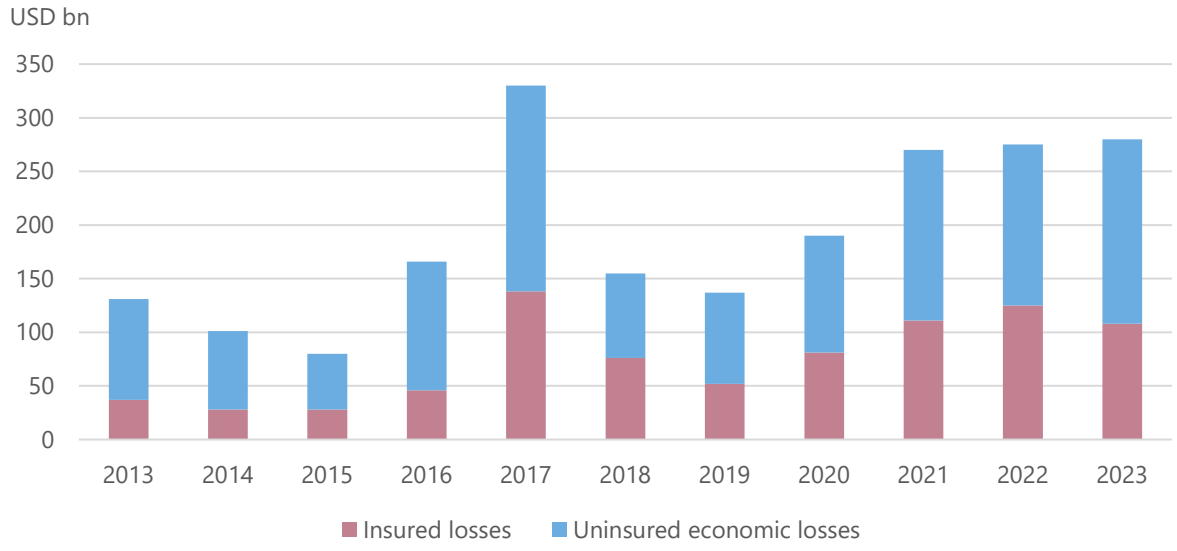
Increasing education and awareness among potential users is essential for promoting the adoption of parametric insurance. Respondents recommended conducting educational workshops, improving consumer financial literacy, and providing clear policy documentation to help users understand the benefits and limitations of parametric insurance products.

Regulatory clarity and support are key for the successful implementation of parametric insurance. Authorities are encouraged to establish clear regulations for indices, triggers and payout structures, and provide an enabling supervisory framework that sets out clear expectations and guidance. Engaging in stakeholder consultations and enhancing cooperation among insurers, authorities and data providers will help build trust and ensure the reliability of parametric insurance products.

Section 1 – Introduction

1. **The damage and economic losses from natural catastrophe (NatCat)[2] events are rising.** This is due to a number of factors, including increased exposure in high-risk areas, urban expansion, escalating climate change impacts and other shifts within the insurance market.[3] These factors are expected to lead to wider protection gaps, especially in emerging market and developing economies (EMDEs). NatCat protection gaps, often defined as the difference between insured and total economic losses caused by natural disasters, can be substantial. For instance, the Swiss Re Institute's *sigma* report reveals that 62% of the global economic losses in 2023, totalling USD 280 billion, were not insured (see Graph 1).[4] This share varies significantly across regions: 85% in Asia, 80% in Latin America, 70% in Europe, the Middle East and Africa (EMEA), 43% in North America and 42% in Oceania.

Global economic losses from NatCat events — Graph 1



Source: FSI and IAIS staff based on Swiss Re Institute *sigma* reports from 2014 to 2024.

2. **Insurance plays a crucial role for individuals, households and small and medium-sized enterprises (SMEs) affected by NatCat events.** It offers financial protection, aids in recovery and can incentivise risk prevention and reduction. Besides such microeconomic benefits, insurance also contributes to macroeconomic resilience by encouraging disaster preparedness and helping to absorb the negative financial impacts on the economy after a NatCat event.

[2] The term "natural catastrophe" (NatCat) is generally used to describe significant natural events, such as floods, earthquakes and storms, that lead to widespread damage and losses. In insurance contexts, NatCat refers specifically to the financial risks and damages these events cause. For this paper, the term NatCat is aligned with the definition found in IAIS (2023a).

[3] Factors driving NatCat protection gaps include, but are not limited to: (i) the penetration of NatCat risk insurance, which is primarily influenced by the level and speed of economic and financial sector development; (ii) other demand-side factors such as insurance literacy, cultural and social norms, and purchasing capacity; (iii) increasing exposure in high-risk areas and growing claims, leading to rising premiums; and (iv) tightening reinsurance conditions. See Holzheu and Turner (2018), IAIS (2023a), ECB and EIOPA (2023), Khoo and Yong (2023) and EIOPA (2024).

[4] See Banerjee et al (2024).

3. **Increasing losses from NatCat events are challenging insurers' ability to provide affordable coverage in high-risk areas, prompting them to reevaluate their risk management strategies.**[5] This may involve steps to increase premiums, implement more stringent underwriting criteria and, in some cases, withdraw from high-risk areas. These measures could lead to reduced availability and affordability of insurance, widening protection gaps and potentially hampering economic recovery in the aftermath of NatCat events. Additionally, the hardening of the reinsurance market, driven by accumulated losses from these catastrophes, further underscores the challenges facing insurers in managing such risks and pricing them affordably.

4. **A widening protection gap could impose greater burdens on governments, pose financial stability risks and ultimately impact households and businesses.** In some jurisdictions, fiscal capacity to absorb losses and support recovery might be limited, forcing households and businesses to deplete their assets, rely on informal networks or resort to international aid, thus putting people into a more tenuous situation. Widening protection gaps could pose financial stability risks and limit credit provision in countries where the financial sector has significant exposure to NatCat events, such as through real estate exposures, further limiting the tools available for immediate relief and post-event recovery.[6] Addressing these gaps requires a coordinated effort from a range of parties including governments, international organisations, the insurance industry, consumers and insurance supervisors.

5. **With economic losses from NatCat events on the rise, policymakers and the insurance sector are focusing on strategies to strengthen resilience and address insurability and affordability challenges.** Recent catastrophes, like the floods in Spain and Switzerland, have put to test the levels of preparedness and resilience across many jurisdictions, including in areas historically less affected by such catastrophes,[7] drawning the attention of policymakers. For example, a recent speech by the Deputy Prime Minister of Singapore called for innovation and collaboration within the insurance sector,[8] highlighting parametric insurance as a tool with the potential to address gaps where traditional insurance may fall short.

6. **The International Association of Insurance Supervisors (IAIS) has issued a call to action for supervisors to address NatCat protection gaps.** It outlines a series of actions[9] whereby insurance supervisors could help improve affordability, availability and uptake of insurance coverage against catastrophes. One of these actions refers to the establishment of an enabling regulatory and supervisory environment that supports the availability of insurance and encourages the uptake of coverage. Part of creating such an enabling environment can involve putting in place a regulatory and supervisory framework that helps foster responsible digital innovation. In some markets, a variety of innovative products and services have helped close NatCat protection gaps by making insurance more affordable, accessible and tailored to the changing needs of consumers and businesses. Examples of such innovations include product design developments, such as parametric insurance and disaster microinsurance, as well as initiatives to encourage innovation, such as regulatory sandboxes.

7. **Parametric insurance presents a promising tool in narrowing NatCat protection gaps.** It provides rapid payouts triggered by predefined, measurable parameters of NatCat events, offering alternative or supplementary coverage for losses that are often excluded from traditional indemnity insurance due to excluded risks, limited (re)insurance capacity or situations of widespread damage. Unlike

5 See Swiss Re Institute (2024).

6 See ECB and EIOPA (2023).

7 See Skujins (2024) and Thind (2024).

8 See MAS (2024).

9 Suggested actions include: (i) assessing insurance protection gaps; (ii) improving consumer financial literacy and risk awareness; (iii) incentivising risk prevention and reduction of insured losses; (iv) creating an enabling regulatory and supervisory environment to support availability of insurance and uptake of coverage; and (v) advising government and industry, including on the design and implementation of public-private partnerships (PPPs) or insurance schemes. See IAIS (2023a).

traditional indemnity insurance, which relies on post-event loss adjustments to calculate payouts, parametric insurance provides fixed payments as soon as predefined criteria, like earthquake magnitude or storm wind speed, are met. This approach facilitates quicker financial recovery, lessening the economic impact on affected individuals, households and businesses.

8. **Moreover, parametric insurance can be particularly useful for households and businesses facing a hardening risk landscape, especially during extreme loss events where traditional insurance might be insufficient.** For example, in hurricane-prone regions, households and businesses often struggle to obtain traditional insurance due to rising premiums, tightening of coverage conditions or insurer withdrawals, as a result of increasing and often unexpected losses.[10] Parametric insurance offers a viable alternative by using data, such as wind speed and rainfall, to assess and price these risks more accurately, thus helping to ensure continued protection.

9. **The origins of parametric insurance date back to the late 1990s.** It was initially developed as an index-based solution for farmers in developing Asian countries to mitigate the financial impact of severe weather. It experienced increased adoption in 2007 with the launch of the Caribbean Catastrophe Risk Insurance Facility (CCRIF), a multi-country risk pool for natural disasters that provides rapid, short-term liquidity when a parametric policy is triggered. Throughout the 2010s, increased data availability and digital advancements allowed insurers to launch the first mass-market parametric insurance products. In 2017, innovation surged, with Swiss Re launching Insur8, the first ever typhoon warning insurance product for businesses in Hong Kong SAR, while AXA introduced a Global Parametrics division to address emerging climate risks. By 2022, parametric insurance had expanded globally, offering coverage for a wide range of risks, from natural disasters to operational disruptions.[11]

10. **Despite its potential, the adoption of parametric insurance remains limited.** In 2023, the global market for parametric insurance was estimated to be valued between USD 14.8 billion and 18 billion in premium volumes, according to Global Market Insights[12] and Allied Market Research,[13] respectively. This represents around 0.8% of the global property and casualty (P&C) premiums and 13.7% of the global insured losses from NatCat events for 2023, indicating significant potential for growth.[14]

11. **Widespread adoption of parametric insurance faces some challenges.** One key challenge is basis risk, where the payout may not accurately reflect the policyholder's actual losses, potentially resulting in either overpayment or underpayment. Additionally, the complexity and relative novelty of these products also create educational challenges for both consumers[15] and insurers, who may find it difficult to understand how they work or how to determine appropriate coverage parameters. Regulatory challenges also exist in certain jurisdictions, where existing insurance regulations, designed for traditional products, have yet to allow for the unique characteristics of parametric policies that rely on predefined triggers and payouts. Furthermore, the effectiveness of parametric insurance is highly dependent on the availability of accurate and reliable data, such as weather or seismic measurements. Inaccurate or unavailable data can undermine the policy's effectiveness.

12. **International organisations are undertaking efforts to address the regulatory challenges of parametric insurance.** Notably, the IAIS and its implementation partner the Access to Insurance Initiative

[10] Khoo and Yong (2023) identify challenges in integrating climate risks into insurance pricing and underwriting, which may affect the availability of coverage.

[11] See Clere (2022).

[12] See Global Market Insights (2024).

[13] See Allied Market Research (2024).

[14] According to Global Market Insights (2024), global P&C premiums in 2023 were around USD 1.8 trillion. For the purpose of this report, global insured losses resulting from NatCat events have been used as a proxy for the size of the global NatCat insurance market. For the value of global insured losses resulting from NatCat events in 2023, refer to Casanova et al (2024).

[15] "Consumers" refers to the universe of actual and potential customers for insurance products, as defined by the IAIS (2019).

(A2ii), as well as the United Nations Capital Development Fund (UNCDF), the United Nations Development Programme (UNDP) and the Insurance Development Forum (IDF) have contributed to these efforts. Their work has resulted in valuable resources, including the IAIS Issues Paper on index-based insurances[16] and the A2ii and UNCDF's reports on the status and regulatory challenges of index insurance with specific guidance for Pacific Island countries.[17] These efforts provide a solid foundation for shaping the regulatory and supervisory landscape for parametric insurance.

13. **Building upon the literature previously mentioned, this paper examines the key design elements of parametric insurance products and their role in enhancing its adoption, with a focus on narrowing NatCat protection gaps.** It explores key design elements such as index selection, trigger mechanisms and payout structures. By analysing these key elements, the paper aims to complement the existing literature and offer new insights to regulators and supervisors in jurisdictions where parametric insurance can provide a viable risk management alternative, considering local market conditions and specific NatCat risks. The insights are based on responses from 12 insurance supervisory authorities[18] and seven market participants involved in data and risk modelling provision, product structuring and design, distribution and underwriting of parametric insurance[19] across the world, gathered from a survey conducted in July and August 2024.

14. **Given the extensive applications of parametric insurance, this paper focuses on the design elements of non-agricultural NatCat parametric insurance for households and SMEs.** These groups face distinct risks and needs compared to the agricultural sector, which requires specialised models and triggers and often involves participation of government funding through subsidies to ensure product viability. NatCat events have a direct and immediate impact on households and SMEs, often resulting in severe financial consequences. Rapid recovery is crucial for economic and societal resilience, especially in EMDEs where SMEs drive economic activity and employment.[20] Fine-tuning the design elements of non-agricultural parametric insurance can help unpack its key benefits – quicker payouts and reduced costs – by avoiding the lengthy claims process associated with traditional insurance coverages.

15. **The remainder of this paper is structured into four sections.** Section 2 provides an overview of parametric insurance, outlining its key features, benefits and limitations, and current regulatory approaches. Section 3 presents insights from authorities and market participants on supervisory requirements, market developments and challenges in refining each key design element. Section 4 presents the key recommendations for overcoming those challenges. Section 5 concludes.

16 See IAIS (2018).

17 The A2ii and UNCDF collaboration has encouraged initiatives in the Pacific Islands to support index-based products, eg introduction of weather-index microinsurance in Fiji; establishment of a regulatory sandbox in Vanuatu; and development of regulatory guidelines for the adoption of index-based products in Tonga. See Simoes (2021), and A2ii and UNCDF (2022).

18 Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin), Bermuda Monetary Authority (BMA), Insurance Regulatory Authority of Kenya (IRA), Office of the Supervisor of Insurance and Private Pensions of Belize (OSIPP), Prudential Authority of South Africa (PA), Comisión para el Mercado Financiero of Chile (CMF), Instituto de Supervisão de Seguros de Moçambique (ISSM), Autorité de Contrôle des Assurances et de la Prévoyance Sociale of Morocco (ACAPS), Superintendência de Seguros Privados of Brazil (SUSEP), Superintendencia Financiera de Colombia (SFC), Autorité de Contrôle Prudentiel et de Résolution of France (ACPR) and Hong Kong Insurance Authority (IA).

19 Beazley (UK), CelsiusPro (CH), Global Parametrics (UK), FloodFlash (US), ICEYE (FI) and WTW (SP). Additionally, Dario Luna, former Chairman and Co-founder of Súper Seguros (MX). It is important to note that Global Parametrics (UK) has no relationship with AXA's Global Parametrics division mentioned in paragraph 9 of this document.

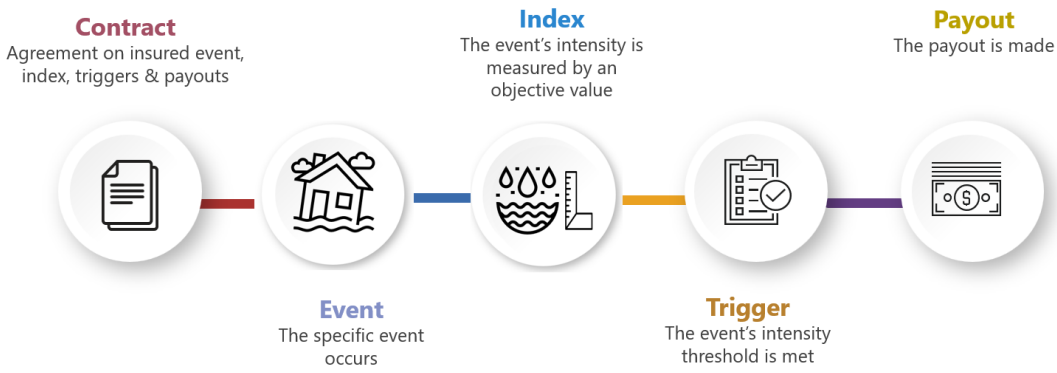
20 See IAIS (2023a).

Section 2 – Parametric insurance overview

Key features

16. **Parametric insurance is a type of contract that pays the insured a set amount upon the occurrence of a specific event meeting a predefined intensity threshold, as measured by an objective value instead of based on the amount of damage sustained.**[21] The intensity threshold is designed to mimic or reflect the potential loss from the insured event, allowing for quick payouts without the need for the usual lengthy loss adjustment process. NatCat events covered in these products could be earthquakes, tropical cyclones or floods where the objective value, referred to as the parameter or index, is the magnitude, wind speed or water depth, respectively (see Graph 2).

Parametric insurance — Graph 2



Source: FSI and IAIS staff.

17. **This definition highlights the three key design elements of parametric products.** These are: (i) the objective measure that is used to quantify the occurrence, severity or intensity of the event, referred to as the "parameter" or "index"; (ii) the condition or threshold which a parameter or index must meet or exceed for a payout to be made, referred to as the "trigger"; and (iii) the mechanism by which the payout is calculated, referred to as the "payout structure" (See Table 1).

[21] Based on definitions by Sengupta and Kousky (2020) and Swiss Re Corporate Solutions (2024).

Key design elements of parametric insurance Table 1

Element	Definition
Parameter or index	▪ Objective measure that is both reported by an independent third party (neither the insured nor insurer) and correlated to the insured financial loss. ▪ The key criteria for an index are that: it is fortuitous; it can be readily available from an independent reporting agency; and it can be modelled.[22] Some examples of agencies and respective parameters or indices are the Japan Meteorological Agency (JMA) seismic intensity scale and the Australian Bureau of Meteorology (BoM) tropical cyclone category. ▪ Although parameters related to NatCat or weather events are the most commonly used, there are other parameters available depending on the coverage provided by different parametric products. These can include crop yield, market indices, power outage, phone signal, flight delays and more.
Trigger	▪ Index threshold that determines the payout. If the parameter or index threshold is reached or exceeded, the insured is eligible to receive the pre-agreed payment. For example, the insured could receive payouts if a magnitude 7.0 earthquake or a category 5 tropical cyclone occurs in a defined geographical area. ▪ Triggers can take many forms. Many triggers for NatCat events are tied to the intensity of the event. For example, a parametric insurance policy for hurricanes might provide a set payout whenever wind speeds exceed a certain level in a particular location. Triggers may also be based on a percentage of total losses within an industry for a particular event, as reported by a third party, or on estimated losses generated by a catastrophe model. These broader triggers, based on industry-wide data or catastrophe models, are often used in policies designed to cover large-scale events or collective losses. Such policies include corporate, industry, or government level parametric solutions. In contrast, parametric insurance taken out directly by households or SMEs to protect against certain risks often focuses on triggers that directly align with the insured party's exposure, such as localised rainfall levels or earthquake intensity. ▪ Some parametric products may require multiple triggers to be met before a payout is made. ▪ The threshold is usually set in a way that aligns with the insured's risk tolerance and risk mitigation measures. For example, the insured may know that with the risk mitigation measures currently in place, they can sustain the effects of a magnitude 7.0 earthquake. Above that, however, they would require alternative protection.
Payout structure	▪ There are different mechanisms by which payouts are calculated, such as fixed payout (where the full payout is made once the trigger is met or exceeded regardless of the actual loss incurred); proportional payout (where the payout amount is proportional to the magnitude of the index value exceeding the trigger); incremental payout (where different payout amounts are defined for different levels or tiers of the index value); and layered payout (where multiple layers of coverage are provided, each with its own trigger and payout amount). ▪ There are hybrid products where payouts are based on parametric triggers, yet policyholders must still provide proof of financial loss. These hybrid models are primarily designed for corporate and government solutions, as these entities typically face larger-scale losses and require comprehensive coverage that combines rapid payouts with detailed loss verification. In some jurisdictions, a proof of loss is required for compliance with regulatory frameworks, ensuring payouts are aligned with actual damages and differentiating parametric insurance from financial derivatives.[23]

Source: FSI and IAIS staff.

18. **Parametric and index-based insurance are often used interchangeably due to their similarities; however, subtle differences distinguish them.** In index-based insurance, payouts are determined by an index, such as average rainfall or crop yields over a specified period or region, rather than by reaching specific thresholds. In contrast, parametric insurance triggers payments based on a

[22] See Swiss Re Corporate Solutions (2024) for a more detailed description.

[23] For example, the United States requires that insureds show proof of loss, though the value or magnitude of that loss is not relevant. US regulators have accepted minimal proof such as drone footage or text messages from customers describing the losses. See K Sullivan (2023).

measurable event parameter, such as temperature, wind speed, or earthquake magnitude.[24] For example, a parametric insurance policy might pay out after a magnitude 7.0 earthquake, while index-based insurance might compensate farmers if regional rainfalls drop below a certain level over a season.

19. **Parametric triggers are also used in other risk transfer instruments.** Notably, "parametric" refers to the trigger mechanism that activates a payout and is not limited to insurance products. Other instruments, such as insurance-linked securities and various derivatives, also incorporate parametric triggers (See Box 1).

Box 1

Risk transfer instruments using parametric triggers

Parametric triggers are used across many different types of risk transfer arrangements and financial products, such as insurance-linked securities and weather derivatives.

Insurance-linked securities (ILS) are financial instruments that enable (re)insurers to transfer the risk of large disasters to the capital market, allowing investors to assume some of the risks typically borne by insurers. These securities are linked to insurance-related events such as natural disasters or catastrophic events. The most common type is catastrophe bonds (CAT bonds), which provide coupon and principal payments to investors unless a predefined, usually low-frequency/high-severity catastrophic event occurs. In such cases, the issuer retains the bond's principal to cover losses and investors absorb the financial impact.

Various institutions, including governments, multinational corporations and insurers, issue CAT bonds to hedge their risks. CAT bonds help insurers secure large capital amounts for extreme natural catastrophe events, offering an alternative to traditional reinsurance by transferring risk to a broader set of investors.

ILS provide insurers access to broader financial markets and offer institutional investors, such as hedge funds, pension funds and mutual funds, the opportunity to earn attractive returns uncorrelated with other financial instruments in exchange for assuming catastrophe insurance risks. Unlike parametric insurance, ILS involve investors taking on insurance-related risks for potential returns. Investors receive regular interest payments and may get their principal back if specific insured events do not occur. However, if these events happen, investors may lose part or all of their investment.

Weather derivatives are a specific segment of the derivatives market, related to products that are strongly weather-influenced. Although the basic idea is a contract based on a meteorological index, these derivatives may take the form of futures, options and swaps and may be traded on financial markets. Due to their characteristics, they may also be used for financial speculation (ie an insurable interest is not a prerequisite), at the same time as they allow companies and farmers to deploy them as protection against weather variations that may adversely affect their profits or economic activities.

Sources: Polacek (2018); Swiss Re Institute (2011).

20. **For a parametric product be classified as insurance, it should satisfy two criteria.[25]** It must:

- **Demonstrate insurable interest:** The policyholder must have a legitimate financial interest in the subject matter being insured and stand to suffer a financial loss if the triggering event occurs.
- **Prove risk transfer:** The product must genuinely transfer risk from the policyholder to the insurer. The parametric trigger should be closely correlated with the policyholder's potential losses.

[24] See IAIS (2018), Sengupta and Kousky (2020) and Swiss Re Corporate Solutions (2024).

[25] For hybrid parametric products, a third criterion that must be met is the requirement to provide a proof of loss. Although the payout is based on the trigger event, policyholders of hybrid products may still need to demonstrate that they have incurred a financial loss due to the event.

21. **Parametric insurance offers a range of coverages, often including NatCat events.** These events are particularly well suited for parametric insurance due to the abundance of available data, such as seismic activity measurements or wind speed information. As data collection and analysis become more advanced, new methods for assessing risk continue to emerge. While data typically come from independent third parties, the insurance industry is becoming more confident in using customer-generated data. This shift enables innovative indexing approaches such as real-time monitoring via Internet of Things (IoT) devices and transparent data management through blockchain technology. These advancements allow for more precise parametric triggers in areas like climate change, cyber attacks, and health. Against this backdrop, new areas of coverage are emerging. Any exposure that can provide high-quality data to create a reliable and credible index can potentially be insured through parametric solutions. Examples of these new coverages include non-damage business interruption insurance (covering cyber attacks) and travel disruption insurance for events like flight delays.[26]

22. **Parametric insurance can be underwritten at various scales, with the scale influencing how a product is designed and structured.** These products are tailored to meet the needs of different sectors and coverage levels, ranging from individual policies to national-level solutions, as illustrated by the following examples:

- On a smaller scale, parametric insurance provides affordable, low-limit protection to low-income households or SMEs, particularly in developing economies. An example of this type of product is the UN World Food Programme's R4 Rural Resilience Initiative, developed in collaboration with Oxfam America, which offers weather-related protection to vulnerable farmers in 18 countries across Africa, Asia and Latin America and the Caribbean.
- In developed economies, parametric insurance is increasingly being introduced to residential customers to fill gaps in traditional property insurance and offer rapid financial relief after disasters, while waiting for more traditional recovery funds like indemnity policies, loans or government aid. Examples of such products include the one offered by StormPeace in Florida, US, which supplements homeowner's insurance for hurricanes and pays out within 72 hours based on hurricane strength and proximity to the insured property. Similarly, Bounce in New Zealand and Jumpstart in California, US, offer quick payouts for earthquakes triggered by predefined seismic intensity levels.
- At the national level, parametric insurance has been used as sovereign insurance, often through regional risk pools or as one of the available tools within disaster risk financing (DRF) programmes.[27] A key example is the CCRIF SPC (formerly the Caribbean Catastrophe Risk Insurance Facility), which provides parametric policies to Caribbean and Central American countries for tropical cyclones, earthquakes and excess rainfall. The parametric insurance offers short-term liquidity for disaster response, with payouts triggered by objective hydrometeorological data such as rainfall and wind speed, helping countries to quickly fund recovery efforts and maintain essential functions.

23. **The value chain of parametric insurance involves several key activities and entities. These can be divided into the underwriting and claims processes as follows:**

- In the underwriting value chain, activities include distribution, product design and structuring, risk modelling, underwriting and financial capacity provision. Distribution is typically handled by brokers, agents or digital platforms that connect with consumers. Product design and structuring

[26] See Swiss Re Corporate Solutions (2024).

[27] DRF is one element of a comprehensive approach to risk management that can help countries address the fiscal impacts and economic losses from natural hazards while supporting financial resilience. The World Bank's DRF framework comprises five key elements: (i) risk identification; (ii) risk reduction; (iii) preparedness; (iv) financial protection; and (v) resilient recovery. Parametric insurance can particularly contribute to the financial protection element of DRF programmes, by supporting rapid relief and recovery in the face of catastrophic events. See World Bank (2014, 2015).

defines the terms of the policy, determining the events that trigger payouts and how those events are measured. Risk modelling helps tailor the product to the consumer's needs, while underwriting is performed by insurers or managing general agents (MGAs). The primary financial support for the policy is provided by insurers, which is then backed up by reinsurers or alternative sources.

- On the claims side, data providers collect information on the event triggers and a calculation agent evaluates whether a payout should occur based on predefined parameters. If triggered, the payout is released from the insurer or reinsurer, and intermediaries such as brokers or MGAs may facilitate the payment to the insured.

24. **A variety of stakeholders are involved in parametric insurance.** These stakeholders include insurance customers, who are the ultimate beneficiaries, and insurance supervisors, whose primary focus is protecting the policyholders' interests and ensuring market stability. Government agencies, particularly those responsible for disaster risk management, often collaborate with insurance supervisors to ensure the success of these products. Additionally, external stakeholders such as non-governmental organisations and agencies contribute by producing indices or delivering the necessary data. Donors and sponsors, often crucial in the early stages of parametric insurance development, provide funding and technical expertise, especially during pilot projects. Public-private insurance programmes (PPIPs) can drive the growth of these insurance products, with governments working alongside private insurers.[28] Finally, intermediaries, including brokers, agents and digital platforms as well as other new distribution channels such as microfinance institutions (MFIs) or cooperatives, play a key role in distributing these products, offering channels for delivery and expanding access to insurance in diverse markets.

Benefits and limitations

25. **Parametric insurance presents a promising tool to narrow NatCat protection gaps for households and SMEs.** It can provide rapid payouts and extend coverage for specific losses that are often excluded from traditional indemnity insurance due to excluded perils, limited (re)insurance capacity or situations involving wide area damage.[29] These can include unforeseen expenses or losses from non-damage business interruption such as lost wages or revenue shortfalls.[30] Unlike traditional indemnity insurance, which requires detailed post-event loss adjustment, parametric insurance triggers payouts based on predefined parameters, ensuring rapid financial relief in the aftermath of NatCat events. Parametric coverage can reduce underwriting and loss adjustment expenses which often account for a significant share of insurance premiums - and thereby offering the potential for more affordable coverage.[31] Moreover, technological advancements such as mobile technology, artificial intelligence (AI) and machine learning (ML) further enhance its potential by improving accessibility, particularly for low-income segments in EMDEs,[32] offering an affordable and efficient way to manage NatCat risks and improve resilience.[33]

[28] In collaboration with the IAIS and the Organization for Economic Cooperation and Development (OECD), the G7 Finance Track's Climate Change Mitigation Working Group (CCMWG) has published a "High-level framework for public-private insurance programmes against natural hazards". This report offers a comprehensive step-by-step guide for developing PPIPs to mitigate the impact of natural hazards. It is designed to assist policymakers, insurance regulators and supervisors. See G7 Italia Presidency (2024).

[29] See Swiss Re Corporate Solutions (2024).

[30] See PWC (2024).

[31] See Descartes Underwriting Insights (2023).

[32] See Keller (2020).

[33] See Foxe Blader (2024).

26. **When used alongside traditional indemnity insurance, parametric products can enhance risk management strategies.** By integrating these solutions into their risk mitigation efforts, households and SMEs can adopt a more comprehensive and resilient approach to protecting against potential losses from NatCat events. Parametric products can fill gaps left by conventional policies by providing coverage for risks that may otherwise be challenging to underwrite. These include risks with increased complexity, wide-area impact or costly loss assessments. Any exposure that can be quantified with high-quality data to create a reliable index is potentially insurable through parametric products.[34]

27. **Despite the benefits, parametric insurance has some key limitations.** The most significant of these is the risk that the payout may not fully match the insured's actual losses, a concept known as basis risk (see Box 2). This misalignment can result in payouts when no significant loss has occurred or, conversely, insufficient or no payouts in the event of actual losses. Insufficient payouts can undermine trust in parametric insurance products. There have been cases where a major disaster occurred, but payouts were not triggered because thresholds were not met, or the payments were only a small fraction of the actual losses.[35] This situation left policyholders frustrated, as the funds were either non-existent or inadequate to cover both immediate needs and long-term recovery. As a result, confidence in the product was undermined.

Box 2

Factors contributing to basis risk

Basis risk occurs when the index does not perfectly correlate with the actual losses experienced by the insured. This can arise due to several factors, including the following:

* Data quality: inaccurate or insufficient historical data can cause a mismatch between the index and actual losses. Sparse data in less developed jurisdictions or evolving factors like climate change can further exacerbate this issue.

* Geographical granularity: the index may not capture localised losses if the geographical area it covers is too large or not well aligned with the actual area of loss. Disparities in infrastructure and building codes within the covered area can also lead to a mismatch between index readings and actual damage.

* Model accuracy: errors in models used to predict losses based on the index can lead to basis risk. The complexity of natural phenomena and the potential for models to become outdated over time contribute to this risk.

* Policy structure: deductibles, limits and the specific structure of the parametric product can affect how closely payouts match losses. Misalignment between policy terms and the actual risk profile or financial resilience of the insured can lead to significant basis risk.

* Temporal granularity: if the time frame used by the index does not align with the period of loss, it can contribute to basis risk. For example, seasonal variations can impact the relationship between the index and actual losses.

Source: PWC (2024).

[34] Although some residual risks may remain that the insurance industry is unwilling to cover. See Swiss Re Corporate Solutions (2024).

[35] In India's Nagaland State, a significant failure occurred in a pilot parametric insurance scheme where, despite heavy rainfall and floods, no payouts were triggered because the threshold was set too high. An investigation revealed that the satellite data used to establish these thresholds differed significantly from ground reality and data from the India Meteorological Department. This discrepancy led to the absence of benefits despite the state's substantial coverage (see Sirur (2024)). A parametric insurance policy was purchased to protect Bali's tourism industry from the financial impact of a volcanic eruption using metrics such as the distance of businesses from the volcano and the level of ashfall. When the 2018 Bali volcanic eruption occurred, the ash did not reach the predetermined levels required for the policy to pay out, even though the tourism industry sustained significant financial losses due to cancelled trips and closed businesses. See PWC (2024).

28. **In addition to basis risk, parametric insurance has several other limitations.** These include product complexity and lack of insurance and risk awareness, with many potential buyers and brokers unfamiliar with these products; fraud concerns, where payouts may not align with actual losses or could be triggered by manipulated data; legal disputes, which can arise from ambiguous policy terms or trigger definitions; and the cost of capacity and distribution, which can be higher due to the need for sophisticated data analytics and exposure to catastrophic risks.[36]

29. **These limitations underscore the importance of the key design elements when incorporating parametric insurance into broader risk management strategies.** The effectiveness of a parametric insurance policy depends largely on its precise design. Accurately defining the event, clearly determining the scope of coverage, setting well calibrated parameters, selecting reliable data sources and defining precise triggers are all essential to ensuring its effectiveness. Furthermore, it is crucial that policyholders trust the policy to deliver timely and transparent payouts, ensuring confidence in its reliability and value.

Regulatory frameworks

30. **The distinct characteristics of parametric insurance have raised questions about its classification as insurance.** In some jurisdictions, the definition of insurance is closely tied to the indemnification of losses through detailed loss assessments, rendering parametric products outside the traditional legal definition of insurance and thereby creating uncertainties in their regulatory treatment.[37] However, these uncertainties are being addressed as parametric products are increasingly gaining attention as a tool to increase accessibility and affordability of insurance.[38]

31. **Approaches to regulating parametric insurance vary widely, from applying broad principles under the general insurance law to granting exemptions.** In some jurisdictions, the insurance legislation is sufficiently broad and flexible to allow for non-indemnity products such as parametric insurance. In others, while legislation allows some flexibility, commercialising these products often relies on legal opinions interpreting the concept of "insurable interest". Meanwhile, other jurisdictions have taken a more proactive approach by establishing specific laws or regulations, or by implementing exceptions to the legislation through a pilot project or regulatory sandbox (see Table 2).[39]

[36] Issues such as low risk and insurance awareness, affordability, premium increases and low awareness of coverage conditions may pose conduct risks for consumers in the context of NatCat. See IAIS (2023a).

[37] See IAIS (2018).

[38] See Simoes (2021).

[39] See Simoes (2021).

Regulatory frameworks for parametric insurance

Table 2

Approach	Description	Example
Application of legal principles in existing regulation of insurance contracts	Legislation in force allows for or raises no barriers to parametric insurance.	Bolivia, Dominican Republic, Ecuador, Guatemala, Mexico, Panama, Paraguay, Peru, Venezuela
Specific laws and/or regulations that regulate parametric insurance	Laws and/or regulations specifically regulate parametric insurance, providing greater legal certainty for the use of parametric products.	Argentina, Colombia, Puerto Rico, Uganda, Uruguay
Legal opinion by which parametric insurance is governed by existing insurance regulation	Issuance of a legal opinion in favour of including these products under the oversight of the insurance law, based on the "insurable interest" at the date of contracting.	Brazil, Costa Rica
Exceptions to the governing law on insurance	Adoption of a pilot project, generally in the context of a regulatory sandbox, as an exception to the legislation. This approach lets insurers test parametric products within a supervised environment before regulatory changes.	Brazil, Fiji

Sources: Simoes (2021); UNDP (2022, 2023).

Section 3 – Key design elements

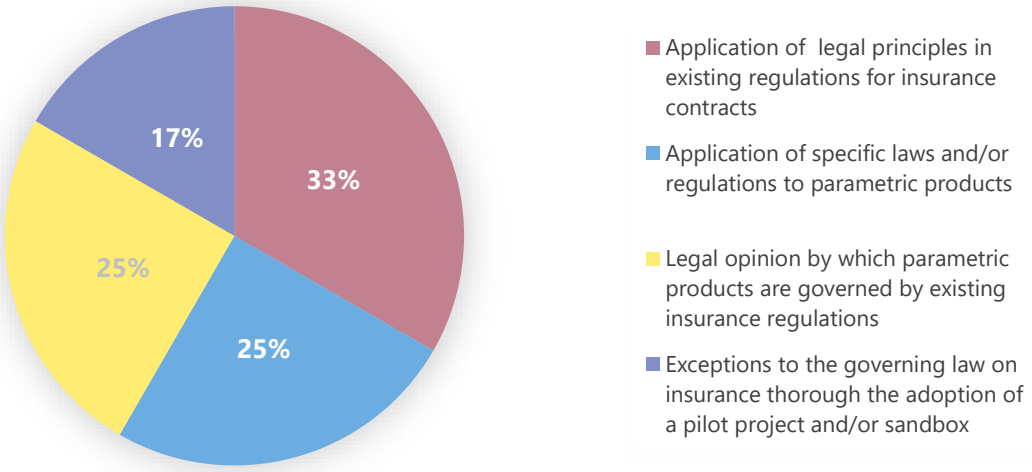
32. **This section summarises the views of survey respondents on the key design elements of parametric insurance.** It is organised into four subsections. The first offers an overview of NatCat parametric products within respondents' jurisdictions. The remaining subsections present the respondents' views on the specific design elements, namely index selection, triggers and payout structures. Each subsection begins by outlining the regulatory requirements applicable to parametric products in general and to each design element in particular. The section then presents respondents' views on current market developments in each area, along with the related supervisory approaches. Finally, the challenges identified by respondents are outlined.

NatCat parametric products

Regulatory requirements

33. **Regulatory approaches to parametric insurance products vary widely across the surveyed jurisdictions.** In one third of jurisdictions, parametric insurance is governed by applying general principles in existing insurance laws (eg Bermuda, France, Hong Kong SAR and Morocco). One quarter apply specific laws (eg Belize, Chile and Colombia) and another quarter govern these products through legal opinions (eg Brazil, Germany, Kenya). The remaining use exceptions to insurance laws, exploring innovative solutions though pilot projects or sandboxes (eg Mozambique and South Africa) (see Graph 3).

Survey responses on regulatory approaches to parametric insurance products Graph 3



Source: FSI and IAIS staff.

Market developments

34. **Authorities highlighted a range of NatCat events their jurisdictions are exposed to, with floods, windstorms and earthquakes being the most common.** Respondents reported having access to parametric insurance products specifically designed for most of these events.

35. **On the supply side, industry participants highlighted their active involvement in providing a diverse range of parametric products.** These products primarily focus on earthquakes, windstorms and floods, mirroring the most common risks identified by authorities. They are tailored to different market segments, ranging from flood insurance for commercial properties to earthquake coverage for households. Furthermore, some companies are innovating beyond traditional markets by exploring microinsurance options, such as products targeted at vulnerable segments like fishers in Southeast Asia. This highlights a move towards creating more accessible, inclusive and flexible insurance solutions to meet the unique needs of different segments.

36. **Industry participants underscored the importance of product innovation and leveraging advanced technologies.** Many are experimenting with new technologies like AI, telematics and blockchain to enhance product design and improve the efficiency of insurance processes. For example, telematics, combined with smart sensors and AI, is improving catastrophe risk modelling. Blockchain is being explored for mobile-based applications that enable quicker payouts.[40] ML processes real-time data, such as satellite imagery, to support parametric triggers. Additionally, real-time sensors are being used to automatically trigger claims, significantly reducing payout times.

Challenges

37. **Despite the wide availability of parametric products, authorities noted that market data are limited.** Most respondents noted the lack of market size estimates for parametric insurance, primarily

[40] An example of a blockchain-based parametric insurance is Vitana, a product developed by Swiss Re and MetLife's LumenLab. This product offers automated insurance coverage for pregnant women diagnosed with gestational diabetes. Using blockchain technology, Vitana deploys smart contracts that automatically trigger a payout upon diagnosis, eliminating the need for a traditional claims process.

due to the absence of mandatory reporting requirements. In the few jurisdictions where data are available, market penetration remains below 1% of the overall insurance market. This suggests that while parametric insurance is accessible, it has yet to gain significant market share.

38. **Industry participants recognise that, despite technological advancements, market adoption remains a challenge.** Some products, particularly those aimed at households and SMEs, have faced challenges in gaining widespread adoption, with a few offerings being discontinued due to customers perceiving them as lacking sufficient value.

Index selection

Regulatory requirements

39. **The majority of authorities who responded to the survey noted that insurers in their jurisdictions have flexibility in selecting indices for parametric insurance products, with no specific regulatory requirements governing this process.** In the remaining jurisdictions, where there are supervisory requirements or expectations on index selection, some authorities have requirements on the type of indices to be used for NatCat events and their key characteristics.[41] A notable example is Chile's Fintech Law, under which secondary legislation permits parametric insurance by defining specific risks, indices and payout triggers (see Box 3).

Box 3

Proposed regulatory framework for parametric insurance in Chile

Chile is highly vulnerable to natural disasters, such as earthquakes, and the introduction of a parametric insurance framework aims to provide the market with products that deliver immediate financial relief to those affected by these events.

The Fintech Law, effective as of 4 January 2023, amends the insurance law to allow parametric insurance, enabling payments based on specific index triggers without requiring an assessment of actual loss or damage. The Financial Market Commission (CMF) is mandated with developing the specific regulations to implement this law. The CMF has opted for a phased regulatory approach. Initially, only a limited range of parametric insurance products related to natural risks will be available in Chile. This phased approach is intended to provide time for the market, insurance companies, brokers and CMF supervisors to familiarise themselves with this insurance type and to reduce the risk of misunderstandings regarding coverage and operation. In the second phase, the CMF may expand the range of permitted products based on observed performance.

In September 2024, the CMF published a proposal for public consultation, which closed on 4 November 2024. The proposal aims to establish the criteria that will govern parametric insurance policies sold by companies, including:

a) Defining insurable risks under parametric insurance: The regulatory proposal identifies risks such as earthquakes, fires and other natural risks (including drought, frost, excess rain and hail) as potential risks covered by parametric insurance.

b) Specifying variables as indices: The proposal outlines indices such as the Mercalli or Richter scale for earthquakes; rainwater levels, snow levels, wind speed, temperature and relative humidity for other natural risks; and area burned for fires. An actuarial report must be signed by a mathematical actuary or technical manager and include a technical feasibility study specifying the type of index or parameter and its geographical area of influence. The report

[41] In the context of NatCat parametric insurance, the key characteristics of an index used as a trigger for insurance payouts include objectivity, correlation to the hazard, fortuitousness, modellability, and availability and timeliness. These characteristics ensure that the index accurately reflects the risk and can be relied upon to trigger payouts effectively in the event of a natural catastrophe. The index should be independently verified, closely linked to the hazard, unpredictable, capable of being modelled, and reported promptly to facilitate swift claims processing. See Swiss Re Corporate Solutions (2023).

should substantiate the relationship between the index or parameter and probable risks and damages, verifying causal correlation.

c) Establishing policy characteristics: The proposal outlines essential components of parametric policies, such as clear declarations, coverage definitions, index specifications and payment procedures.

d) Ensuring companies offer insurance tailored to the needs of the insured: The proposal requires insurers to send monthly information on parametric insurance marketing to the CMF. While the CMF may prohibit the marketing of any policy, policies do not require authorisation. Emphasis should also be placed on public awareness efforts to promote understanding of and confidence in parametric insurance, along with highlighting technological integration for efficient implementation and monitoring.

Following the consultation period, the CMF will consider the feedback received before issuing the final regulatins in 2025. Once these regulations are approved, the coverage of any new risk or the incorporation of a new index associated with a parametric insurance must be formally submitted by insurers to the CMF for its evaluation.

Source: CMF (2024).

Market developments

40. **On the supply side, industry participants who responded to the survey emphasised the use of a variety of indices.** For windstorms, wind speed is the most common measure, sourced from relevant agencies. Earthquake measurements are based on intensity, peak ground acceleration and magnitude. For floods, sensors measuring flood depth and proxies like extreme rainfall are common. Other events like tornadoes, wildfires, volcanic eruptions and tsunamis use specialised indices such as the Enhanced Fujita scale and Volcanic Explosivity Index (VEI).

41. **Data sources are diverse.** The most commonly used are government agencies, meteorological and geophysical monitoring stations and third-party data providers. Other data sources include satellite imagery and radars, weather prediction models and forecasting systems, sensors (either located in public areas or in a client's location) and research institutions and observation networks.

42. **Various methods are employed by industry participants to ensure the transparency and reliability of indices.** The most widely used method, reported by the majority of respondents, is data source verification, which entails assessing the track record and quality standards of data providers. Auditing and compliance checks, along with data quality assurance, are employed by most respondents. Some industry participants ensure transparency in data collection methods, such as through sampling procedures, while peer review by independent experts is the least used method.

43. **Industry participants use various methods to assess how well the indices in their products correlate with policyholders' losses.** The most common approaches are historical data analysis, including backtesting, and risk modelling, both of which are employed by the majority of respondents. Additionally, some participants gather client feedback to validate the effectiveness of the indices, while a smaller group relies on expert consultation.

44. **If evidence shows that the indices do not closely correlate with actual losses, industry participants typically take corrective action to mitigate and reduce basis risk.** In response, they may refine or recalibrate the indices by incorporating more granular data or using more advanced models. Many respondents provided examples of their efforts to address basis risk. For instance, in flood insurance, respondents often use sensors installed on insured properties to measure flood depth, directly linking the index to the actual damage incurred. In earthquake coverage, risk models tailored to specific building heights (especially in locations like Mexico City, with its unique soil conditions) have been effective in reducing basis risk. Additionally, some noted that well designed products, calibrated against historical losses, inherently minimise basis risk.

Supervisory approach

45. **Supervisory approaches to verifying the suitability of parametric insurance indices vary greatly across jurisdictions.** Some authorities do not have specific oversight for parametric insurance products, whereas others review technical notes and actuarial reports to validate the correlation between indices and insured losses. In jurisdictions with established oversight, authorities use technical analyses and data verification methods to prevent false triggers and ensure accurate reflection of covered risks.

Challenges

46. **Authorities identified four critical issues with index selection.** These refer to alignment of the index with actual losses, selection of an appropriate index, index data availability, and the quality and transparency of index data.

47. **Industry participants identified similar challenges in integrating indices into parametric insurance.** Despite technological advancements, significant challenges remain. The two most pressing issues (cited by one third of respondents) were client acceptance and lack of historical data. Other concerns include data quality issues and the high cost associated with collecting the necessary data and developing risk models.

48. **While advancements in big data, AI and ML, and satellite innovations offer potential solutions to these challenges, authorities emphasised the importance of "low-tech" solutions.** For instance, the availability and density of meteorological stations are often key in addressing basis risk, especially in jurisdictions where high-tech solutions may not be feasible.

Triggers

Regulatory requirements

49. **Authorities outlined various supervisory requirements and expectations regarding the mechanisms insurers use to determine payout triggers.** Nearly half of respondents noted that these requirements are set out in regulations, circulars, or guidelines. In other jurisdictions, insurers must demonstrate that trigger levels are correlated with actual damage. Conversely, the majority of authorities indicated that there are no specific expectations, allowing insurers flexibility in selecting triggers. In France, there is no specific regulation for parametric insurance, but such contracts must comply with both general contract and insurance law. These laws emphasise clarity, the avoidance of unfair terms and the compensatory nature of non-life insurance. Under French law, insurance is only valid if there is an actual asset or liability to insure, prohibiting contracts based on bets or speculation tied to an index. As in all other jurisdictions, the policyholder must demonstrate an insurable interest for a product to be classified as insurance.

50. **Authorities have implemented a range of initiatives to enhance the simplicity and transparency of triggers in parametric insurance.** Many respondents pointed to educational workshops for stakeholders and noted the introduction of transparency requirements, with insurers being asked to disclose their trigger calculations. Industry collaboration to standardise trigger methodologies was also mentioned, alongside the development of regulations or guidelines aimed at refining trigger design.

Market developments

51. **Industry participants noted that the determination of payout triggers involves multiple approaches depending partly on client needs and product specifics.** Some participants base triggers on specific client choices, like water depth during a flood, while others compare modelled and historical losses to reduce basis risk and keep premiums fair. Many also refer to historical losses, catastrophe

modelling and existing programmes to set triggers. In some cases, they consult with clients, discussing past losses and agreeing on appropriate trigger levels.

52. **Industry participants use various types of triggers in the products they offer.** The most used are the "direct trigger" (ie a NatCat event occurs at some point within an area and the payout is triggered when the index threshold is met) and the "intensity-at-location trigger" (ie a NatCat event occurs at one specific location and the payout is based on how the event affected a policyholder at their exact location), each cited by half of the respondents. Additionally, more than a third of respondents use "multiple triggers", whereby payouts are triggered when the index meets more than one threshold or when the index meets any one of multiple thresholds.

53. **Industry participants expressed confidence in their trigger definitions and have measures in place to evaluate the effectiveness of a trigger post-event.** These measures are focused primarily on consumer satisfaction and coverage adequacy. Claims analysis is the most used method employed by most respondents, followed by customer surveys and backtesting. A few respondents rely on expert reviews and customer feedback, while none use comparative studies. Additionally, industry participants are split on whether they have adapted triggers to address evolving NatCat risks and new market needs, with half saying yes and the rest saying no. Those who have adapted triggers cite adding more trigger options for policies, addressing extreme heat conditions, particularly in India, and creating a new tornado product to account for changing tornado behaviour. These methods highlight the importance of high-quality, granular data in evaluating trigger effectiveness.

Supervisory approaches

54. **Only a few authorities have specific supervisory tools to assess the accuracy and reliability of payout triggers.** In Chile, insurers are required to provide actuarial reports that include technical feasibility studies and clear correlations between index parameters, risks and triggers. These reports, signed by a qualified actuary or technical manager, must specify the type of index or parameter and its geographical coverage, and demonstrate a causal link between the index and potential risks or damages. Insurers must keep these reports available for regulatory review. Other authorities have implemented measures such as product approval, market conduct guidelines and data verification processes. Some also ensure that both insurers and reinsurers are aware of potential payout issues by requiring detailed models with defined calculations and parameters, access to data verified by independent agents and collaboration with local meteorological offices to accurately interpret weather data. However, most authorities lack specific supervisory processes and instead focus on supervisory requirements designed to ensure fair customer treatment.

Challenges

55. **The payout trigger is closely interconnected with the index, and similarly, alignment between the trigger and actual losses has been identified as a key challenge by some of the surveyed authorities.** Misalignment between the trigger and actual losses contributes to basis risk, undermining trust in parametric insurance, potentially increasing costs, and reducing its effectiveness as a risk management tool. This issue can be exacerbated by challenges related to trigger definition, as noted by some surveyed authorities, where the lack of an appropriate definition may mean that it fails to capture the characteristics of specific risks, furthering the misalignment.

56. **Some insurance authorities have underscored the need for insurers to demonstrate that payout triggers are directly linked to actual losses, which will require better data availability, enhanced modelling techniques, and stakeholder collaboration.** High-quality, granular data is crucial for defining payout triggers that accurately reflect losses. Additionally, enhancing modelling capabilities is key to refining triggers and making them more responsive to local conditions. Authorities also noted that addressing these issues will require cooperation and coordination with other stakeholders.

Payout structures

Regulatory requirements

57. **The majority of authorities who responded to the survey noted that insurers in their jurisdictions have flexibility in defining the payout structure for parametric insurance products, with no specific supervisory expectations or requirements governing this process.** In jurisdictions where determination of the payout structure is regulated, participants highlighted detailed requirements, such as clear coverage definitions, parameters and payout calculation formulae, along with transparent communication about the suppliers of the index information and geographical risk locations.

58. **A range of regulatory measures are in place to promote transparency and fairness in the payout structures.** In general, authorities require parametric insurance payouts to follow principles on fair treatment of consumers. Overall, the majority cited the establishment of clear criteria for payout eligibility as the most used measure to ensure transparency and fairness of payouts. Many respondents also mentioned other measures, such as general transparency and disclosure principles or industry-specific regulations. Only a few noted using stakeholder consultations, and none reported the use of regular third-party audits. The absence of regular audits by independent third parties suggests a potential area for improvement in ensuring the integrity of the payout process.

Market developments

59. **Industry participants use a mix of payout structures in their parametric insurance products, with some using more than one type.** The most commonly used is the incremental payout structure, chosen by nearly half of respondents, where different payout amounts are set for various levels or tiers of the index value. Fixed payouts, which offer the full payout once the trigger is met, regardless of the actual loss, are used by some respondents. Similarly, some participants use proportional payouts, where the payout amount increases based on how much the index value exceeds the trigger. Additionally, a few participants offer layered payouts, where multiple layers of coverage are provided, each with its own trigger and payout amount.

60. **Various strategies are used by industry participants to ensure payouts are both timely and aligned with the actual losses experienced by policyholders.** One strategy involves leveraging sensor data and implementing a streamlined claims process. This includes using a loss fund for claims that fall under a certain threshold, enabling insurers to resolve minor claims quickly without the need for extensive investigation. Other strategies involve effective communication between calculation agents, reinsurers and claims administrators to ensure timely payments as well as discussions with policyholders about the assets they wish to insure and coverage needs. Additionally, partnerships with payment service providers are a strategy to expedite the payment process through direct transfers.

61. **The survey results show that the majority of industry participants have mechanisms in place to assess and improve the effectiveness of their payout structures.** Internal reviews are the most common, used by the majority of respondents. Additionally, some respondents mentioned other methods, such as focus groups designed to explore the digital journey to sell insurance, which includes explaining basis risk and simulating payouts of historical and simulated events. No respondents reported using customer surveys, external audits or policyholder forums as part of their assessment mechanisms.

Supervisory approaches

62. **The supervisory approaches used by authorities to assess the timeliness and transparency of parametric insurance payouts vary across jurisdictions.** Many jurisdictions reported no specific supervisory process. For example, South Africa has not developed any specific supervisory process as parametric insurance is still in its early stages. Similarly, Hong Kong SAR relies on general principles embedded in broader conduct regulations to ensure timely payment of claims, without specific rules

tailored to parametric insurance. A few authorities perform prudential and conduct of business reviews, which include on-site inspections and analysis of claims management. In some pilot projects and sandbox initiatives, supervisory oversight is mainly limited to follow-up actions rather than a fully developed review process.

Challenges

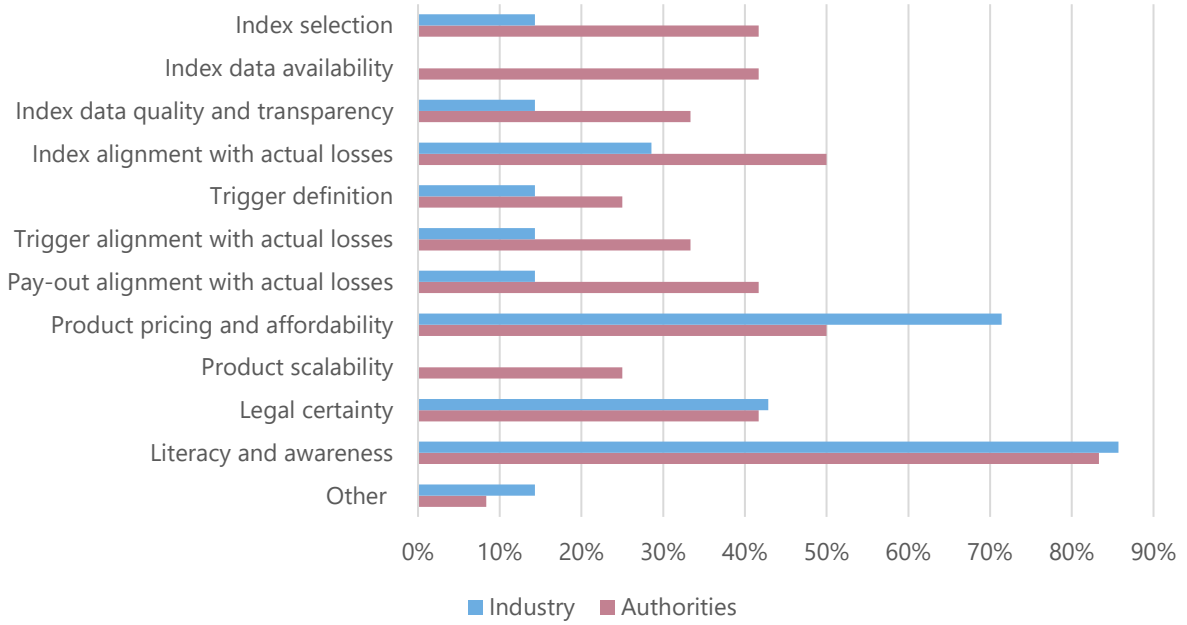
63. **Payout structures, being closer to the consumer end of the supply chain, face challenges related to the fair treatment of consumers.** The majority of authorities highlighted that the most critical issue is the lack of insurance awareness and literacy. Supervisors emphasised that promoting financial literacy is crucial to empowering consumers and fostering the adoption of parametric insurance as a complement to traditional coverage.

64. **Market participants highlighted various challenges with current payout mechanisms.** The most commonly cited issue is the complexity of understanding parametric products, especially from the policyholders' perspective. A significant number of respondents noted that policyholders often struggle to understand how and when payouts are triggered, indicating a gap in communication and product clarity. Delays in payment and disputes over trigger events were also frequently mentioned. Many respondents pointed out that disagreements on whether specific events meet the criteria for a payout create friction in the claims process. Additionally, some industry participants expressed concerns about the speed of payout disbursements, which can impact the perceived reliability of parametric insurance. Interestingly, no respondents raised concerns about inadequate compensation in relation to the losses covered by parametric insurance.

Section 4 – Recommendations

65. **Improving the feasibility and encouraging the wider adoption of parametric insurance products, particularly those aimed at mitigating household and SME losses from NatCat events, requires a focused approach to the challenges identified by survey respondents.** As shown in Graph 4, participants pointed out several key challenges and provided targeted recommendations to authorities for overcoming them. This section summarises these recommendations, offering clear suggestions to promote the wider adoption of these products as effective risk management tools.

Main challenges identified by survey respondents Graph 4



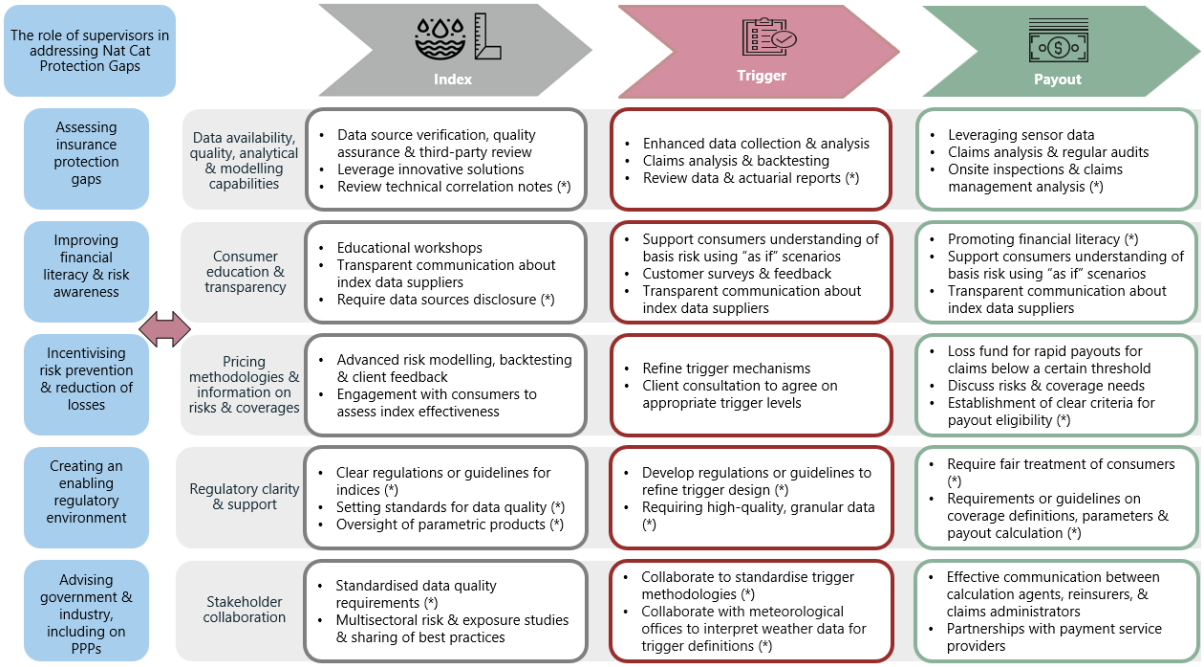
Source: FSI and IAIS staff.

66. **In response to the challenges identified earlier, survey respondents provided a variety of key recommendations to authorities for facilitating the adoption of parametric insurance products.** The recommendations underscore the importance of targeted actions aimed at improving data quality and availability; enhancing analytical and modelling capabilities; increasing education and awareness among consumers; improving risk-based pricing methodologies and enhancing information on risk and coverages; increasing regulatory clarity and support; and enhancing stakeholder collaboration.[42] These recommendations generally align with the supervisory actions identified by the IAIS to help address NatCat protection gaps (See Graph 5).

[42] In addition to addressing the technical aspects of designing and distributing parametric insurance, special attention should be given to the potential risks to consumers. The IAIS has provided further guidance on addressing consumer risks emerging from NatCat events through its Application paper on climate risk market conduct issues in the insurance sector. This includes: (i) ensuring that coverages use plain language and are easy to understand; (ii) testing consumers' understanding of exclusions and promoting transparent advice; (iii) considering the affordability and accessibility of coverage; and (iv) ensuring that claims are managed in a timely and fair manner. See IAIS (2023b).

Key recommendations by survey respondents

Graph 5



(*) indicates recommended actions for supervisors.

Source: FSI and IAIS staff.

67. **Survey respondents emphasised the importance of establishing clear guidelines for index selection to enhance the effectiveness of parametric insurance products.** They recommended that insurance authorities collaborate with industry stakeholders to define key characteristics of indices tailored for NatCat events. Other suggested actions include improving data quality and availability through high-quality, granular data sourced from satellite imagery, sensors and meteorological stations, and building open data sources alongside auditing and compliance checks. Additionally, enhanced analytical and modelling capabilities need to be encouraged through advanced analytical tools, historical data analyses and backtesting, leveraging AI and ML risk models. To promote consumer education and transparency, respondents advocated for enhancing risk awareness and informing consumers about tools to assess risks, alongside conducting peer reviews and gathering client feedback on indices. Furthermore, establishing clear regulations for indices is vital and this should include standards for data quality and transparency, as well as oversight of parametric products. Finally, enhancing stakeholder collaboration through data quality standards and joint initiatives for best practices will contribute to overcoming the challenges related to index selection in parametric insurance.

68. **Recommendations from survey respondents emphasise the importance of implementing effective management strategies to ensure that payment triggers in parametric insurance products align closely with actual losses.** In this regard, they recommend that insurance authorities require accurate and timely data through enhanced data collection practices. Clear regulations for triggers need to be established to ensure that the defined triggers effectively reflect actual loss scenarios. Furthermore, it is important to continuously refine trigger mechanisms, including through catastrophe modelling and leveraging advanced analytical techniques such as AI and ML. Conducting thorough claims analysis and considering consumer feedback for trigger definitions are essential steps in this process. Additionally, collaboration with other agencies to establish standardised transparency requirements will enhance the overall efficacy of trigger mechanisms. Joint risk and exposure studies should also be undertaken to better understand the potential impacts of NatCat events. By prioritising these measures, authorities can significantly enhance the reliability and transparency of payment triggers in parametric insurance.

69. **Survey participants highlighted the critical need for high-quality data to ensure accurate and fair compensation within parametric insurance products.** They recommended implementing incremental and proportional payout mechanisms to better align payouts with actual losses. Furthermore, the importance of educating consumers on payout criteria was emphasised, alongside the need to provide clear policy documentation to foster transparency and understanding. Participants also suggested that establishing clear payout guidelines, including market conduct requirements and well defined parameters, could significantly streamline the payout process. Engaging expert third-party reviews was noted as a method to identify and implement best practices for payouts.

Section 5 – Concluding remarks

70. **The survey responses provide a comprehensive overview of the current landscape of parametric insurance, highlighting key regulatory requirements, market developments and challenges associated with NatCat parametric products.** The insights gathered from respondents underscore the diverse approaches to regulation, the recent progress and innovations introduced by market participants and the critical issues faced in the adoption and implementation of parametric insurance solutions for households and SMEs.

71. **The regulatory landscape for parametric insurance varies significantly across jurisdictions.** While some authorities have established specific laws and regulations, others regulate these products under broader insurance laws or through legal opinions and pilot projects. This diversity reflects the evolving nature of parametric insurance and the need for flexible regulatory frameworks that can accommodate innovation while ensuring consumer protection and market stability.

72. **Market participants are actively engaged in offering parametric insurance products tailored to various NatCat events such as earthquakes, windstorms and floods.** By adopting advanced technologies like AI, telematics, IoT and blockchain, the industry is improving product design and operational efficiency. The introduction of microinsurance products for vulnerable groups highlights efforts towards inclusivity and accessibility.

73. **Despite the advancements, significant challenges remain.** Limited market data and low market penetration highlight the need for better data collection and reporting mechanisms. The complexity of index selection and the alignment of payout triggers with actual losses are critical issues that require ongoing attention. Enhancing data quality, improving modelling techniques and fostering multi-sectoral cooperation are essential steps to address these challenges.

74. **Several measures may improve the adoption and efficacy of parametric insurance.** These are:

- Undertaking efforts to enhance data availability and quality, and enhancing analytical and modelling capabilities by leveraging digital innovation;
- Supporting the implementation of risk-based pricing, underpinned by enhanced information on risks and coverages for better consumer outcomes;
- Empowering consumers by raising risk awareness and coverage understanding through financial literacy initiatives;
- Reducing regulatory uncertainty by establishing an enabling regulatory and supervisory framework that sets out clear supervisory expectations and guidance for index selection, trigger definition and payouts; and,
- Fostering cooperation with relevant stakeholders to address data limitations, ensure reliability of triggers and facilitate timely payouts to support broader adoption of parametric products.

75. **These insights should hopefully contribute to advancing the adoption of parametric insurance solutions as complementary risk management tools for NatCat events.** The recommendations identified above could provide useful guidance to supervisory authorities in addressing the existing challenges related to parametric insurance so that it can serve as a risk management tool that can better serve households and SMEs, ultimately strengthening resilience against NatCat events. Through the introduction of innovative parametric solutions, the protection gap can be narrowed, transitioning the insurance landscape from reactive disaster recovery to proactive financial resilience and safeguarding communities against the uncertainties of nature.

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