

Parametric Risk Transfer

A solution to narrow Asia's protection gap

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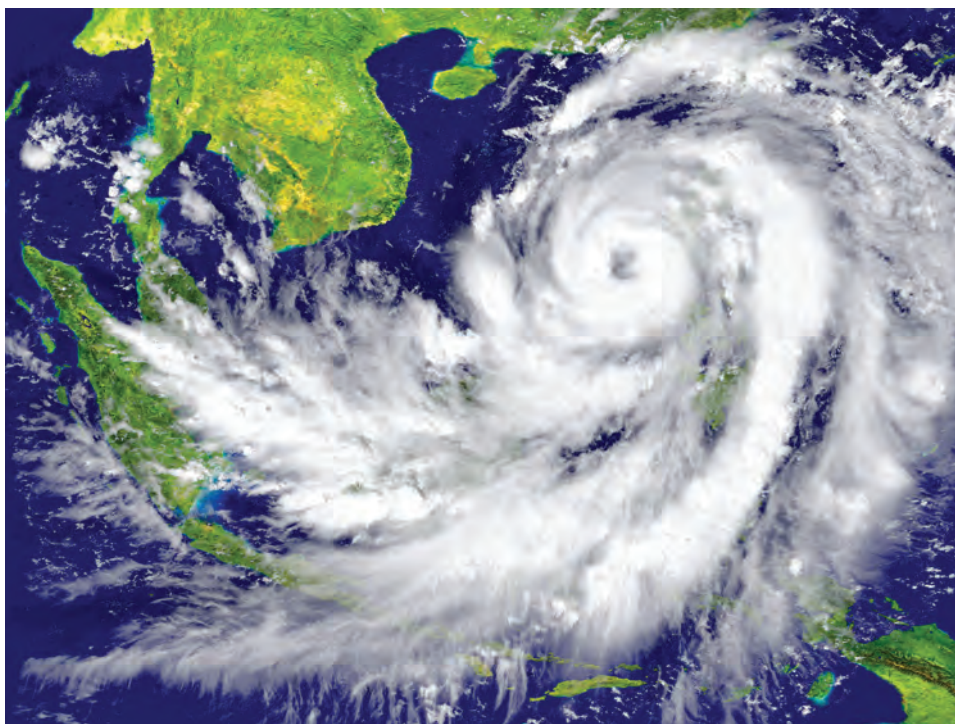
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Foreword

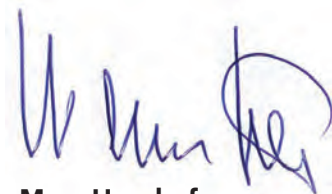
There are circumstances when individuals, corporates and governments find traditional re/insurance coverages falling short, for example, when extremely speedy claims recovery is required to finance post-loss recovery.

Parametric risk transfer is a potential solution.

However, the Asian parametric risk transfer marketplace has barely got off the ground so far. For this reason, the Singapore Reinsurers' Association has initiated this project to develop a paper with inputs from subject matter specialists that would identify factors inhibiting the growth of this product class and propose recommendations that would help spur its development.

Only superior collaboration between our industry, its regulators and governments will lead the way to enhance parametric concepts in this region and beyond. This paper is intended to raise awareness of its readers of the enormous potential for parametric risk transfers and to consequently encourage further dialogue in the non-traditional reinsurance turf.

I would like to thank the members of the Technical Sub-Committee and the many subject matter specialists who have contributed their knowledge and insights towards this publication.



Marc Haushofer
Chairman
Singapore Reinsurers' Association



Introduction

Parametric risk transfer has proven to be a valuable concept to complement traditional insurance products or cover the gaps where such cover is not available. Parametric risk transfer products have proven to be very beneficial to re/insureds in responding quickly especially in emergencies, helping people and businesses to get back on their feet. Even though parametric risk transfer solutions have been tested and used in some jurisdictions in Asia and beyond for many years, we continue to observe some lack of understanding of their features and benefits.

The Singapore Reinsurers' Association (SRA) takes the view that markets for parametric risk transfer are still quite underdeveloped across Asia and that there is further potential to develop business in a manner that will benefit market participants and the society more broadly.

As a result, the Technical Subcommittee of the SRA decided to develop this article in order to demystify parametric risk transfer solutions and share some recommendations on how such risk transfer activities could be further promoted in Singapore and the rest of Asia. The paper has been structured as outlined below, providing the following information:

- Key features of parametric risk transfer solutions;
- Applications in the re/insurance market;
- Regulatory considerations; and
- Recommendations on further steps required to develop a broader use and acceptance of parametric solutions.



Key features of parametric risk transfer activities and their benefits

◦ Principle of indemnity

In order to explain parametric risk transfer, it is useful to start by briefly recapping features of conventional re/insurance, which is based largely on the principle of indemnity. This principle states that the re/insured is to be placed back in the same financial position prior to the damage or loss, not better or worse, subject to policy conditions. As a consequence, claims investigation and claims adjustment activities are features of indemnity-based re/insurance, as the exact extent of loss suffered by the re/insured has to be determined before a claim can be paid, subject to the applicable policy wording.

In contrast to this and by design, parametric risk transfer ensures the coverage of a loss by way of pre-agreed valuation. The re/insured will receive a monetary amount (the payout) that depends on the underlying index alone. A payout will be triggered if a pre-agreed parameter threshold is breached. This payout is commonly designed to vary with the intensity of the triggering event, e.g. the magnitude of an earthquake, to correlate with the extent of potential losses. The formula is based on the profile of the re/insured risk, and leverages historical data allowing intensity to be correlated to loss, potentially more precisely than traditional loss adjustment would allow.

While parametric risk transfer is often considered a recent innovation, products have existed for decades. Its earliest applications, in the late 80s, were to offer financial protection against the consequences of natural catastrophes such as earthquakes or tropical cyclones. The underlying indices were the magnitude of an earthquake event or maximum sustained windspeeds and central pressure reported for tropical cyclones. Subsequent developments led to more general weather indices, where excess (or lack of) rain, as well as high or low temperatures could lead to a payout. In the agriculture space, parametric re/insurance on the basis of yield indices is also very popular. In the renewable energy space, data on solar radiation or windspeeds can be used to protect against production shortfalls. In recent years, advances in data analytics and recording as well as new modelling techniques have allowed the use of new indices and boosted the development of new solutions in many other areas. Among others, these include covers for delayed flights (duration of delay), flooding (water height), drought (normalized difference vegetation index/NDVI) and lack of snowfall (snow height).

The index is the key component of a parametric risk transfer structure. In line with the examples mentioned above, variables are used that reflect the intensity of the underlying peril and can be structured to correlate with expected losses. Further, the data used for the construction of the index should be provided by an impartial third-party, in a consistent and transparent fashion. The importance of these data requirements cannot be overstated. For a payout under a parametric risk transfer, the underlying index must breach pre-agreed thresholds. This breach, and possibly its extent, are the only determinant of the size of a potential payout. By design, no loss investigation or loss adjustment is needed to arrive

at a payout. Depending on the jurisdiction and regulatory requirement, a more formal statement on the sustained losses may be required (see Regulatory Considerations below). The following example serves to better illustrate how parametric risk transfer works.

As the example demonstrates, determining the payout of a parametric risk transfer can be very transparent and straightforward. Most importantly, the insurance proceeds can be paid out much quicker than under a traditional re/insurance policy. Because the payout depends only on the reported intensity of the index, it is important that its construction is transparent and based on data provided by an independent third-party. This and subsequent structuring according to the risk profile of the re/insured are the cornerstones of any parametric risk transfer solution.

Cat-in-a-circle

A parametric risk transfer structure to protect a policyholder from the losses of a tropical cyclone could have the following conditions for a payout:

- The tropical cyclone is an eligible event only if its track passes within 100km of the location specified by the policyholder; and
- The payouts further depend on the highest windspeeds reported for the cyclone when its track is inside the 100km circle.

Reported windspeeds (in km/h)	Parametric payout (in USD)
Below 100	0
Between 100 and 150	500,000
Above 150	1,000,000



Any cyclone whose track misses the location by more than 100km will not result in a payout, regardless of its reported windspeed.

For cyclones within the 100km radius, the reported windspeed is the only determinant of the payout. The assumption here is that the insured location suffers no actual loss below windspeeds of 100km/h (or feels reasonably comfortable to retain potentially smaller losses), 50% of the sum insured for windspeeds between 100 and 150km/h and a full loss above. The described structure is a stepped payout – various levels of payouts are made to reduce the basis risk.

The payout structure and conditions of this example have been chosen purely for illustrative reasons. They are not meant to serve as basis for a meaningful risk transfer structure.

◦ Insurable interest

Both indemnity-based and parametric re/insurance contracts follow the principle of "insurable interest" – an economic stake in an event for which a person or entity purchases a re/insurance policy to mitigate the risk of loss. This is a key feature of re/insurance products and differentiates from other type of contracts that do not require insurable interest.

◦ Basis risk

Basis risk is defined as the risk of an unintentional deviation of any payout under the policy from the actually sustained losses resulting from an eligible event suffered by the policyholder. Such deviation can occur in both directions, i.e. with calculated parametric payouts below or above the sustained losses. In traditional indemnity-based insurance policies, such unintentional deviations normally occur on one direction only and are brought about by exclusions, (sub-)limits and deductibles. Such gaps in coverage by indemnity policies may be addressed and reduced by parametric risk transfer solutions.

In parametric covers, some residual basis risk remains because any index or parameter used in a parametric risk transfer solution is usually only an imperfect proxy for the actual financial loss sustained. The aim of structuring a parametric solution is to ensure that resulting payouts are correlated as closely as possible with the actual loss sustained, thereby minimising basis risk. This is best achieved by tailoring a risk transfer solution to the risk profile and needs of the prospective policyholder, through proper choice of underlying/index, payout schemes and possibly multiple trigger conditions. Recent advances in data analytics, more granular reporting and availability of parameters as well as improved modelling techniques are driving innovation and leading to new triggers allowing to reduce basis risk. However, some basis risk is bound to remain, because no index can perfectly foresee and match how actual losses unfold after an event.

Advantages of parametric over indemnity-based

	Indemnity-based	Parametric
Claims handling cost	Higher due to claims adjustment expenses	Lower as no claim adjustment is needed
Claim payment speed	Slower due to claims adjustment process	Faster as no claim adjustment is needed
Claim transparency	Claim amount depends on claim adjustment, applicability of average, exclusions, etc.	Claim amount is pre-defined

Applications of parametric risk transfer activities in the market

Parametric re/insurance is a broad protection class and many loss events can have appropriate triggers to provide adequate protection for the policyholder. Some of the examples of parametric risk transfer applications include:

- **Catastrophe event protection:** this is still the most prominent application of parametric covers and include protection against earthquakes, tropical cyclones, or floods. Most catastrophe event protection rely on a defined triggering event and payout index, provided by independent reporting agencies, such as a government weather service or vendor modelling agency.
- **Weather-based:** this type of cover might include protection for agricultural assets, (renewable) energy supply contracts, event cancellation or tourism. River levels, sunlight, rainfall and temperature triggers are all forms of weather-based parametric triggers.
- **Intangible asset and revenue protection:** parametric products have been developed to provide non-damage business interruption, denial of access and balance sheet protection, reputational risk protection and cyber protection.

◦ Types of re/insurance transactions

– Cat-in-a-Box

For catastrophe protection a "Cat-in-the-Box" still seems to be the most popular parametric insurance structure, where a payout occurs if a catastrophe such as a tropical cyclone (the 'Cat') passes through a pre-defined area (the 'Box' – which in practice can take any shape). In addition, this 'Cat' must also breach the pre-agreed severity threshold to trigger the payout. This threshold could be based on either maximum sustained windspeeds or the central pressure reported for the storm (see Cat-in-a-Circle example above).

The concept is analogue for earthquake risks, where a 'Box' is defined to capture epicentre locations that are expected to cause losses to the insured. Depending on risk profile and appetite, a threshold in terms of the earthquake's magnitude is set to quantify the payouts for 'Cats' that occur within this 'Box'.

These structures can be refined along multiple dimensions to accommodate for risk profile of each client: the location of the exposure will largely determine the size and shape of the 'Box', its resilience to a 'Cat' event the thresholds at which payouts are triggered. The value of the covered exposure influences the size of the payouts and the limit, but eventually, all dimensions are subject to the policyholder's risk appetite and budget.

– Industry Loss Warranties (ILWs)

ILWs are reinsurance contracts that are based on the total loss arising from an event to the entire insurance industry being above a certain trigger level. Parameters of ILWs can be actual market loss or modelled loss, which are often conducted by credible third-party catastrophe modelling companies. However, there have been questions regarding the accuracy of modelled losses by catastrophe modelling companies vs the actual losses incurred. For instance, some modelling companies underestimated the initial market loss of typhoon Jebi in Japan, which resulted in significant basis risk for a respective parametric cover.

To reduce basis risk, care should be taken to review changes in market condition (e.g. changes in insurance penetration) and underlying policy conditions (e.g. change in policy sub-limits for certain perils) compared to historical data. Such data and respective analyses are not always readily available for many developing markets in the region.

– Weather indices

As the name suggests, weather indices are based on measurable characteristics of weather, for example temperature, solar radiation, water levels, rainfall or snow. These 'underlyings' are typically reported by third-party agencies such as national weather services or meteorological agencies and are mostly used in covers for non-catastrophic weather events. Popular applications are in the energy sector, where temperatures can have a significant impact with and high correlation to demand of energy and gas for cooling and heating. Likewise, excess rainfall can delay construction projects, prolonged lack of rain lead to droughts and a shortage of sunshine reduce the output of a solar farm.

To ensure that the re/insured purchases a suitable cover, it is recommended that historical loss patterns are used to calibrate any structure to maximise correlation with the weather index used, thereby reducing basis risk.



– Intangible asset and revenue protection

Further examples of parametric applications include products which protect re/insureds against losses to non-physical assets and interruption to both revenue streams and key resource dependencies.

For individuals, products exist which provide defined benefits triggered by pre-set events. The most common application of this is seen in travel insurance, where delay to trips trigger automatic payouts not linked to the actual value of the time lost but rather the costs incurred for certain travel arrangements.

In respect of companies, the range of non-physical asset classes that can be re/insured is broad and includes intellectual property, supply chains, information, software, reputation and goodwill. Companies are highly concerned over disruption of their revenue streams, and parametric solutions can provide coverage for reduction, loss or delay of these incomes.

The re/insurance market has developed a range of products that provide defined payouts to such losses. For example, businesses can purchase parametric covers that provide pre-defined amounts for loss of access to business premises resulting from closure due to public authorities or threat of terrorism. Industry-specific products include policies that protect against “footfall” decrease in the hospitality sector. More complicated product sets can provide protection against reputation damage as measured by pre-defined indices. New products are now available in certain jurisdictions to protect against cyber disruption by reference to indices which track the outage times and disruption levels.

Catastrophe bonds

While Cat bonds are often mentioned alongside parametric risk transfer, there is no mandatory link between the two. A Cat bond is primarily a means of accessing capital markets more directly for purposes of risk transfer. The underlying payout modalities can be manifold: Modelled losses, industry loss estimates, market losses, indemnity losses as well as parametric mechanisms are being used to determine drawdown of the bond's notional.

That said, parametric payout structures can have an obvious appeal to both issuers of and investors in Cat bonds and may explain their regular use. The impartiality and transparency of the index underpin unambiguity about the size of the payout and can facilitate assessment of the underlying risk. The swift availability of the index can lead to more immediate finality and access to funds.

Regulatory considerations

When determining whether the parametric risk transfer is a re/insurance product, the following interconnected key factors are normally considered: Insurable interest, basis risk and proof of loss requirements.

◦ Insurable interest

For any re/insurance contract, this is a fundamental prerequisite; the re/insured must stand a reasonable chance to suffer from financial loss from the type of event that is being re/insured against.

◦ Basis risk

This encompasses the possibility that the payout as calculated under the agreement deviates from the actually sustained losses. The deviation can occur in both directions, i.e. payouts can fall short of or exceed losses. Reasons for basis risk can be multiple and it is impossible to eliminate basis risk completely. However, proper choice of parameter, index and payout structure can significantly reduce basis risk. It is of utmost importance that a potential re/insured has adequate information about the facets, impact and possible consequences of basis risk.

◦ Proof of loss

Generally, insurance regulators are intent to uphold the indemnity principle and ensure re/insureds make no windfall gains from a parametric policy by receiving a payout without suffering a commensurate loss. In some jurisdictions, regulators may require an indication of an actual loss from the policyholder for this purpose. The extent of this indication can vary from a mere notification of a loss event to more detailed loss quantification. To re/insureds, this may reduce some of the benefit of parametric products, as prompt payout is one of its features.





Another important regulatory consideration is the type of buyer of parametric products. Corporates are generally more knowledgeable as well as experienced re/insurance buyers who understand the implication of basis risk well. Therefore, they are motivated to seek parametric solutions tailored to their needs and exposures, and basis risk can be minimized in the structuring process, including consultation by broker firms.

However, retail buyers of parametric products usually have less sophisticated level of relevant knowledge. Therefore, requirements on efforts to minimize basis risk and make buyers aware of its possible impact can reasonably be set much higher for retail parametric solution products.

In Singapore, no specific approval by the Monetary Authority of Singapore (MAS) is required for parametric risk transfer activities if parametric solutions are provided within the purview of the licence given by MAS. However, to qualify for capital relief under the Risk-Based Capital (RBC) framework, any insurance contract needs to fulfil two conditions:

- **Risk Transfer**

There is the need to demonstrate that there is risk transfer to the re/insurer, and to establish that the basis risk is acceptably small.

- **Insurance contract**

The reinsurance contract must be for an uncertain event and that the contract is indeed a contract of insurance. Specifically, the insurer does not benefit from a reinsurance contract if they did not suffer any loss. A consultation paper in 2010 discusses whether a contract is a reinsurance contract, refer to the link below:

https://www.mas.gov.sg/-/media/MAS/resource/publications/consult_papers/2010/CP_ReinsMgt_29Jun10.pdf



For other jurisdictions, similar considerations such as those stated above need to be evaluated in order to render parametric solutions an effective tool. Regulators play an important role in supporting the further development of parametric covers both in their domestic markets and in the APAC region. Below are some examples of incentives and initiatives by regulators.

In Singapore, the existing tax incentive that applies to traditional reinsurance applies to parametric reinsurance as well; this currently stands at a relief of the 10% tax on underwriting income and insurance income. The MAS is generally open for suggestions how to adjust incentives to accommodate specific reinsurance products like parametric reinsurance.

Setting aside pure parametric covers, the MAS has also been supportive of Insurance Linked Securities (ILS) and aims to be a key ILS hub for Asia. An ILS grant scheme was launched in February 2018 and allows sponsors to receive a saving on the issuance of their ILS transactions; it funds 100% upfront issuance costs of catastrophe bonds in Singapore, up to 2 million Singapore dollars. This scheme has been extended until 31 Dec 2022.

The MAS is supporting the building of infrastructure that may support parametric re/insurance in the future. An example is NatCatDax (<https://www.natcatdax.org>), which is currently in phase 2 and is looking to expand territorial coverage. Eventually, the MAS does hope that NatCatDax may be able to provide independent market loss estimates that will help to encourage the development of parametric re/insurance covers.

The MAS contributed to the establishment of the ASEAN Cross Sectoral Coordinating Committee on Disaster Risk Financing and Insurance (ACSCC) to strengthen regional coordination of disaster risk management. ACSCC brings together three key stakeholder groups: Finance Ministers and Central Banks represented by the ASEAN Finance and Central Bank Deputies Meeting

(AFCDM); Insurance regulators represented by the ASEAN Insurance Regulators Meeting (AIRM), and the National Disaster Management Organisations which are represented by the ASEAN Committee of Disaster Management [2] (ACDM). Under ACSCC, the ASEAN Disaster Risk Financing and Insurance (or ADRFI) programme was established as the central platform to coordinate ASEAN-wide efforts in developing and implementing disaster risk financing strategies.

The ASEAN+3 countries have recently come together to establish the Southeast Asia Disaster Risk Insurance Facility, known as SEADRIF (<https://www.seadrif.org>), in partnership with the World Bank. As the first regional catastrophe risk facility to be established in Asia, SEADRIF will provide participating ASEAN countries with climate and disaster risk solutions.



Conclusions and recommendations

Parametric risk transfer is a useful tool to complement the traditional reinsurance product suite. The ease and speed of payment collection, broad coverage (addressing intangible assets), unambiguous loss triggers and defined benefits are attractive features for re/insureds looking to protect themselves against specific events in an affordable manner. For re/insurers, parametric risk transfer activities could also lead to substantial benefits. This includes lower claims administration costs, reduced industry reputation risk as coverage is clearer due to re/insured perils being named specifically, and improvements in aggregate and overall portfolio management as coverage terms are less ambiguous.

Parametric re/insurance can play an important role in addressing the financial needs of governments, companies and individuals. Over the past years, we have observed increased awareness and uptake of parametric re/insurance covers and we believe that further investment in the development of this protection class would help to reduce the massive protection gap – difference between economic and insured losses – that currently exists globally.

The Singapore re/insurance industry has a broad skill set and experience in designing and providing capacity for parametric risk transfer activities. The Singapore market practitioners include many of the largest buyers and sellers of parametric re/insurance in the world. The marketplace also includes intermediaries with dedicated teams specializing in constructing and advising clients on alternative risk transfer techniques, including parametric re/insurance. The MAS has also been actively supporting academic, industry and academic-industry joint initiatives to produce accurate and fair assessment of risk, industry exposures and weather reporting.

◦ Key success factors for parametric re/insurance

Below is a summary of key factors for parametric re/insurance to fulfil its potential as a financial risk management tool to narrow the protection gap:

- Clear understanding of parametric re/insurance by both re/insured and re/insurer, including its advantages and limitations;
- Ability to demonstrate insurable interest;
- Unambiguous and transparent trigger mechanism that is reported by an independent third-party;
- Ensure high correlation of trigger mechanism with potential financial impact to minimize basis risk;
- Re/insurance regulatory framework that defines sufficiently clear rules for parametric re/insurance without ambiguity; and
- Ability for parametric contracts to qualify for capital relief under the respective regulatory frameworks.

◦ Recommendations

To further develop and enable the growth of this market segment, the SRA recommends regulators and governments to focus on the following:

- Encourage the regulatory community to consider incorporating specific definitions of parametric re/insurance in re/insurance legislation. Regulations should clarify what conditions should be met for parameter-based products to be treated as re/insurance;
- Encourage the creation of credible reporting and modelling agencies within Singapore and the wider Asian community. Parametric re/insurance relies on professional, neutral bodies to provide accurate assessment of loss triggers and unbiased modelling to allow transparent assessment of pricing and loss;
- Promote education and marketing to potential buyers of parametric re/insurance as well as other stakeholders, especially governmental and international non-governmental agencies; and
- Broad based promotion and marketing of the technical and execution capabilities and capacity available within the Singapore market place.



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About **Singapore Reinsurers' Association**

Established in 1979, the key objectives of the Singapore Reinsurers' Association (SRA) are to represent members in matters affecting their business interests; to facilitate dialogue and encourage healthy market competition; to promote professional excellence through education and training; to foster strong social bonds within the industry and beyond; and to advance the reinsurance industry in Singapore and its diverse career opportunities.

At 30 September 2020, the SRA has a total membership of 55, comprising 30 Ordinary, 20 Associate, 3 Affiliate and 2 Honorary members. All major non-life reinsurance companies with a presence in Singapore, as well as some direct insurance companies that write a substantial reinsurance portfolio are Ordinary members of the SRA. In addition, several major reinsurance broking firms as well as some regional reinsurers are Associate members.

The SRA is managed by an elected Executive Committee, which comprises senior reinsurance practitioners who dedicate their time on a strictly voluntary basis, supported by a full-time Executive Director and Secretariat team. To achieve its aims, seven sub-committees – Accounts, Education, Human Resource, Reinsurance Legal & Compliance, Social, Technical and Women-in-Reinsurance (WiRE) – are mobilised to organise a diverse range of activities for members, including educational talks, technical seminars, dialogue sessions, community service projects, social gatherings and golf events, as well as to study and formulate responses to regulatory and market developments.

More information can be found on the SRA website: www.sg-reinsurers.org.sg

