BMA
BERMUDA MONETARY AUTHORITY

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Bermuda Monetary Authority

Catastrophe Risk Modelling

2024 Report

Foreword

Bermuda stands as a leading international financial centre, distinguished by its strong focus on insurance and reinsurance, particularly in catastrophe risk. It is home to one of the largest and most sophisticated reinsurance markets globally.

Given the significant concentration of catastrophe risk underwritten in Bermuda, a comprehensive understanding of catastrophe modelling practices is fundamental to the Bermuda Monetary Authority's (the Authority or BMA) supervisory framework. Insurers operating in Bermuda rely extensively on both proprietary models and external vendor solutions to assess catastrophe exposures. This information is therefore critical not only to Bermuda insurers but also to global stakeholders and insurance markets.

Recognising Bermuda's pivotal role in the catastrophe reinsurance sector and the BMA's responsibility in regulating this market, the Authority publishes this report annually. The report provides an overview of catastrophe modelling practices in Bermuda and underscores our commitment to maintaining robust supervisory standards and promoting transparency across the industry.

Ricardo Garcia
Managing Director, Supervision

Modelling Practices Report

This is the Authority's sixth stand-alone annual Catastrophe Risk Modelling Report. The content of this report is the result of analyses carried out by the BMA staff and includes data from both insurers and (re)insurers.

About the BMA

The BMA was established by statute in 1969. Its role has evolved over the years to meet the changing needs in Bermuda's financial services sector. Today, it supervises, regulates and inspects financial institutions operating in the jurisdiction. It also issues Bermuda's national currency, manages exchange control transactions, assists other authorities with detecting and preventing financial crime and advises the Government on banking and other financial and monetary matters.

The Authority develops risk-based financial regulations that apply to the supervision of Bermuda's banks, trust companies, investment businesses, investment funds, fund administrators, money service businesses, corporate service providers, insurance companies, digital asset issuances and digital asset businesses. It also regulates the Bermuda Stock Exchange and the Bermuda Credit Union.

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This publication is available on the BMA website: www.bma.bm

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ACRONYMS

AAL	Average Annual Loss
AIR	AIR Worldwide
AMO	Atlantic Multi-decadal Oscillation
Authority	Bermuda Monetary Authority
BMA	Bermuda Monetary Authority
BSCR	Bermuda Solvency Capital Requirement
Cat	Catastrophe
Cat Return	Catastrophe Risk Return and Schedule of Risk Management
CSR	Capital and Solvency Return
EQECAT	Catastrophe Risk Management (CoreLogic)
EP	Exceedance Probability
IFC	International Financial Centre
Mph	Miles per hour
PML	Probable Maximum Loss
RMS	Risk Management Solutions
RDS	Realistic Disaster Scenarios
SPI	Special Purpose Insurer
SST	Sea Surface Temperatures
TVaR	Tail Value at Risk

I. EXECUTIVE SUMMARY

This report highlights the Catastrophe (Cat) modelling practices of Bermuda (re)insurers. (Re)insurers rely substantially on models to project losses and assist them in risk and solvency calculations. In its prudential supervisory work, the Authority tracks trends in the usage of models to form views and supervisory responses in managing Cat risk.

Key report highlights:

- In 2024, the average loading factor for Bermuda legal entities in the accumulation process decreased slightly to 11.92% compared to 12.30% in 2023
- The loading factor has shown a consistent upward trend since 2020, driven by:
    i. Rising claims costs; and
    ii. Secondary perils and climate change.
- The average loading factor for groups stood at 9.22% in 2024 compared to 10.68% in 2023
- More than 70% of Bermuda legal entities and groups utilise the Atlantic Multi-decadal Oscillation[1] (AMO) near-term view of exposure
- AIR Worldwide (AIR) and Risk Management Solutions (RMS) are the most frequently used modelling software tools. AIR remains the leading model for legal entities and groups in 2024
- In-house modelling was used by 41.3% of legal entities and 35.3% of groups in 2024
- More than one model was used by 13.3% of legal entities and 7.7% of groups in their accumulations
- Quarterly model accumulations are the most common practice, with 54.2% of legal entities and 47.1% of groups performing accumulations on a quarterly basis

II. INTRODUCTION

Bermuda's insurance sector is regulated and supervised by the BMA. As part of its regulatory and supervisory measures, the Authority requires all Class 3B and Class 4 insurers to submit a Capital and Solvency Return (CSR). This includes a Catastrophe Risk Return and Schedule of Risk Management (together 'Cat Return') as part of their annual statutory filing, detailing the insurers' Cat risk management practices.

The global insurance market, particularly, the Bermuda market, relies significantly upon vendor models to assess Cat exposures. If vendor models underestimate potential losses from events, the industry as a whole may have its capital levels affected. The Authority expects insurers to have a thorough understanding of these

[1] AMO refers to the alteration of Sea Surface Temperatures (SST) in the Northern Atlantic Ocean from cool to warm phases that last several years

vendor models; therefore, the monitoring of modelling practices in Bermuda is a key aspect of the Authority's supervisory framework.

This report contributes to the understanding of Bermuda as an insurance-based International Financial Centre (IFC) and a leader in regulating the Cat (re)insurance market. Ultimately, this report demonstrates the contribution of Bermuda's natural Cat risk mitigation to the global capacity for risk-taking while also emphasising the Authority's commitment to high standards of transparency.

III. METHODOLOGY

This report was produced using aggregated and non-aggregated data from the Bermuda Capital and Solvency Return (CSR) filings of Class 3B and Class 4 legal entities and insurance groups for the period ending 31 December 2024[2]. Specifically, the following schedules from the CSR were used as data sources:

- Schedule X(e) – Cat Risk Return: Accumulations Overview
- Schedule X(f) – Cat Risk Return: Data Analysis

The exclusion of other insurer classes, such as Special Purpose Insurers (SPI)[3], limits the conclusions that can be drawn from the results of this survey; therefore, the results reflect one industry segment and not the entire exposure of the Bermuda insurance market.[4]. This report also does not consider mortality a catastrophic risk, as long-term (life) insurers are excluded from the analysis.

The analysis of the accumulation process is based on insurer responses from 2024 and on CSR filings from previous years. It provides insights into the relationship between insurers' modelling practices and the actual management of those risks from an operational perspective.

The analyses in this report were based only on original CSR data input. Although other documents are separately required for the CSR filing, no reference was made to them for the purposes of this report. The Authority's supervisory team reviews these additional documents at the micro level in the context of individual insurers. However, the analysis for this report did not capture the subtle nuances of an insurer's full return that might otherwise affect these results.

[2] Not all insurers have 31 December year ends; therefore, the data used in the report may not fully reconcile with other BMA publications.
[3] SPIs are significant contributors to Cat risks underwritten in Bermuda. Their details are included in the BMA's annually published Alternative Capital Report.
[4] The term 'Bermuda insurance market' includes the Bermuda (re)insurance market.

Information Box

Class 3B and Class 4 insurers are the largest property and casualty commercial insurers in Bermuda's market and are required to maintain a statutory capital and surplus of at least 99% Tail Value at Risk (TVaR) over a one-year time horizon.

Aggregate Statistics for Classes 3B and 4, 2024 (In US$ billions)

Net Written Premiums	72.6
Net Earned Premiums	70.7
Net Income	30.9
Total Claims	39.4
Total Assets	338.0

Source: **BMA**

IV. PROBABLE MAXIMUM LOSS AND ACCUMULATION PROCESS

The accumulation process, often referred to as portfolio management, is an important component of the modelling process and is integral to the insurer's risk management framework. In Bermuda, the accumulation of assumed insurance risk, and in particular assumed Cat risk, is a multifaceted risk management process. Insurers' modelling practices are a portion of this accumulation process. As part of the CSR filing, the Authority annually collects information about the accumulation process from companies' prudential filings.

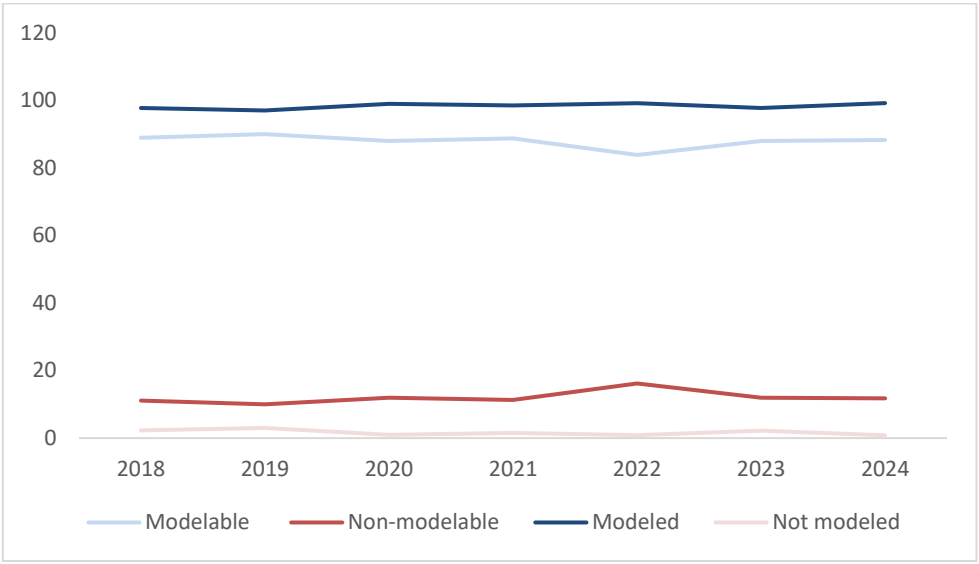
The 2024 CSR filing showed that 88.21% of the Cat risk exposure underwritten in Bermuda is modellable[5] using vendor Cat models, and that 99.18% of Cat risks were modelled[6]. While the percentage of modellable exposure has increased slightly compared to 2023, the percentage of modelled exposure remained steady[7].

[5] Modellable exposure refers to the exposure that can be simulated through a vendor Cat model. Non-modellable exposure refers to exposure that cannot be simulated using a vendor Cat model, or to exposure for which no Cat model assesses the risk of the region peril under consideration. Modelled exposure refers to risks that the insurer modelled. When exposures are not modellable using vendor Cat models (i.e., non-modellable exposures), insurers often use in-house models to evaluate risk. As such, very few exposures are 'not modelled'.

[6] Reasons for non-modelled risk may include data limitations that prevent the exposure from being run through a vendor or in-house Cat model. This may be due to: 1) lack of resolution of the data or lack of completeness of the data, which renders the data insufficient to produce credible modelled results; 2) model deficiency, where the model is deemed to be inadequate to produce credible results; and/or 3) not having an accessible model to assess the peril under consideration.

[7] The 2024 CSR filing showed that 88.21% of the Cat risk exposure underwritten in Bermuda is modellable using vendor Cat models and that 99.18% of Cat risks were modelled.

Figure 1. Modellable and Modelled Exposure (In per cent)

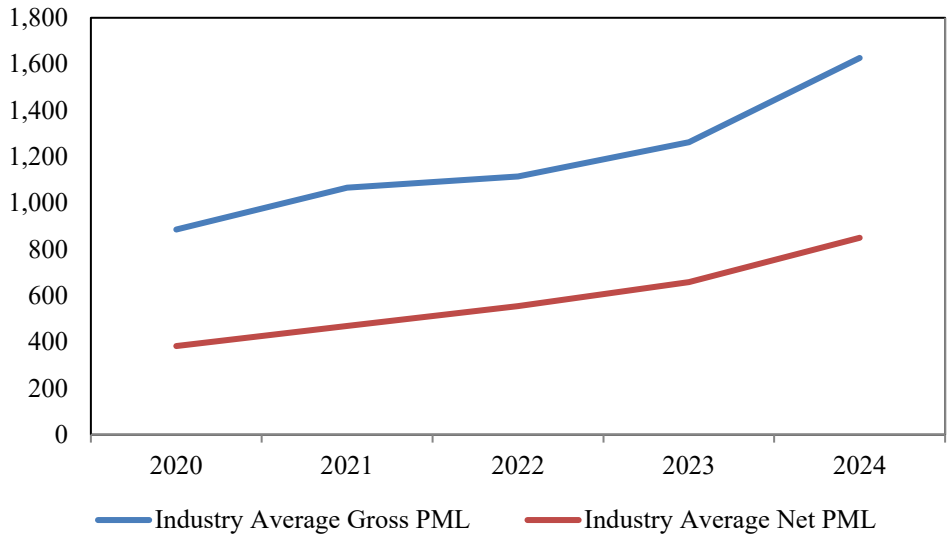


Source: BMA staff calculations.

A. PROBABLE MAXIMUM LOSSES AND ACCUMULATION PROCESS - LEGAL ENTITIES

This section presents aggregated results from insurers' 2024 statutory filings. Bermuda Class 3B and Class 4 insurers are required to file the Catastrophe Risk Schedule, a questionnaire addressing modelling practices. The Catastrophe Risk Schedule also includes quantitative information about catastrophe exposures. With respect to quantitative metrics, Bermuda insurers report Average Annual Loss (AAL), Probable Maximum Loss (PML) and factor-loading metrics. The latest data is displayed in the following figures and tables. The PML is defined as the 99% Tail Value at Risk (TVaR) on an aggregate basis.

Figure 2. Gross and Net Average Industry PML (in US$ millions)



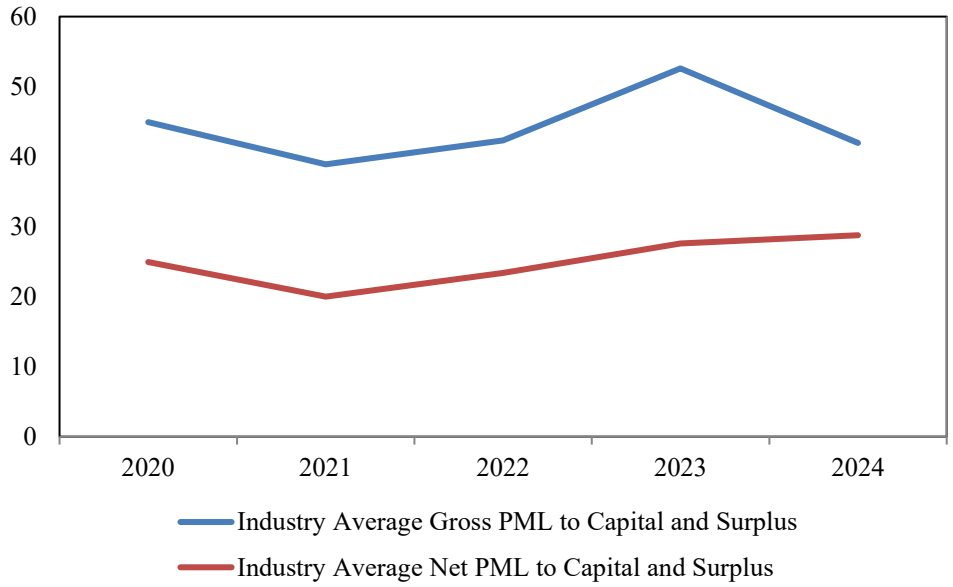
Source: BMA staff calculations

Table 1: PML (in US$ millions)

	2024	2023	2022	2021	2020
Industry Average Gross PML	1,626.6	1,262.7	1,115.1	1,066.4	885.8
Industry Average Net PML	850.0	659.3	555.2	469.6	382.7

Source: BMA staff calculations.

Figure 3. Gross and Net Industry PML to Capital and Surplus (in per cent)



Source: BMA staff calculations.

Table 2: PML Ratios (in per cent)

	2024	2023	2022	2021	2020
Industry Average Gross PML to Capital and Surplus	43.4	52.6	42.3	38.9	44.9
Industry Average Net PML to Capital and Surplus	29.5	27.6	23.4	20.0	24.9

Source: BMA staff calculations. The sample removes certain outliers that distort the ratios.

Table 1 represents the average PML for legal entities in US$ amounts. The average PML for 2024 increased 28.8% on a gross and 28.9% on a net basis compared to 2023.

Table 2 presents gross and net PML ratios to capital and surplus. This ratio indicates whether the available capital and surplus can withstand a loss equal to 99% TVaR. On a gross basis, in 2024, a 99% TVaR aggregate loss was expected to consume 43.4% of available capital and surplus. On a net basis, a 99% TVaR aggregate loss was expected to consume 29.5% of available capital and surplus. Both ratios decreased Year over Year (YoY), reflecting the lower level of insurance exposure, both gross and net, relative to increasing available capital and surplus.

Table 3 presents the average loading factors used as add-ons to the output of catastrophe modelling. These factors allow insurers to incorporate their view of risk, adjust for model error and reflect conservatism into the modelling and/or aggregation process, and they are applied to the PML. For example, if the Cat model

yields a PML of US$100, a 5% factor would raise the PML to US$105. Note that insurers provide to the BMA an average loading factor; however, in practice, loading factors are applied by region, peril, frequency and/or severity.[8]

Table 3: Loading Factors (In per cent)

	2024	2023	2022	2021	2020
Average Loading Factor	11.9	12.3	10.6	9.3	6.6

Source: BMA staff calculations.

In 2024, the average loading factor was 11.9%, broadly consistent with the 12.3% observed in 2023. Vendor models continue to incorporate additional event and loss data with each release, aiming to improve the accuracy of loss forecasts and, over time, reduce the need for elevated safety margins. However, the persistent upward trend in loading factors underscores ongoing pricing challenges driven by claims inflation and the increasing severity and frequency of catastrophe events, including secondary perils that may not yet be fully captured within existing models.

The loading factor is estimated using variations of an analytical portfolio approach, the total loss experience, or a per-risk view that blends the experience of single lines of business into the total portfolio PML. The responses are found in Table 4.

Table 4: Loading Factor Estimation Methods (in per cent of respondents)

	2024	2023	2022	2021	2020
Determined Analytically	42.1	40.5	40.5	41.0	35.7
Estimated	57.9	59.5	59.5	59.0	64.3

Source: BMA staff calculations.

In 2024, 57.9% of insurers estimated the loading factor, while 42.1% determined it analytically through modelling.

Another interesting modelling practice is the usage of AMO. Since the mid-1990s, a warm phase has existed. A correlation has been observed between warm SSTs and increased frequency of severe hurricanes and other destructive weather phenomena. Based on both near-term and long-term views, Bermuda insurers were asked whether they consider loading for this risk factor.

[8] The loadings reflect the cumulative loading regardless of the level applied (i.e., within the accumulation process or post the accumulation process/applied to the PML). The same applies for legal entities and groups.

Table 5. AMO Factor Consideration (In per cent of respondents)

	2024	2023	2022	2021	2020
Near-term Frequency	73.9	72.9	73.5	68.9	64.6
Long-term Frequency	26.1	27.1	26.5	31.1	35.4

Source: BMA staff calculations.

In 2024, 73.9% of insurers utilised the near-term AMO factor to model Atlantic hurricane exposures, while 26.1% utilised the long-term factor. The AMO factor relates to trends in hurricane frequencies considered in modelling Atlantic hurricane exposures and the financial losses that stem from hurricane activity.

The questionnaire asked insurers to indicate the vendor used and if they based their modelling opinions on one or multiple models. This question helps identify the more prevalent Cat model vendors in the market. In addition, the questionnaire also asks how frequently insurers perform portfolio modelling (or, as the BMA refers to it, 'accumulations') and whether insurers develop their models separately from vendor models. The following table summarises the responses.

Table 6: Vendor Model Usage and Licensing (in per cent of respondents)

Model Usage	**2024**	**2023**	**2022**	**2021**	**2020**
AIR Only	50.0	42.4	46.7	37.5	37.1
EQECAT Only	0.0	0.0	0.0	0.0	0.0
RMS Only	36.7	27.3	36.7	28.1	34.3
AIR and RMS	13.3	30.3	16.7	34.4	28.6
AIR and EQECAT	0.0	0.0	0.0	0.0	0.0
EQECAT and RMS	0.0	0.0	0.0	0.0	0.0
AIR, EQECAT and RMS	0.0	0.0	0.0	0.0	0.0
Model Licensing	**2024**	**2023**	**2022**	**2021**	**2020**
AIR Only	41.3	33.3	37.5	29.5	21.7
EQECAT Only	0.0	0.0	0.0	0.0	0.0
RMS Only	23.9	25.0	25.0	20.5	21.7
AIR and RMS	34.8	35.4	50.0	54.3	61.7
AIR and EQECAT	0.0	0.0	0.0	0.0	0.0
EQECAT and RMS	0.0	2.1	0.0	2.2	2.1
AIR, EQECAT and RMS	0.0	0.0	0.0	0.0	0.0

Source: BMA staff calculations.

AIR is the most used stand-alone model. Moreover, using three models in tandem is the exception, with EQECAT receiving no share of use within the last five years for the insurer category in this report. However, dual licensing of AIR and RMS is common in the market.

Table 7: Model Frequency Usage (in per cent of respondents)

	2024	2023	2022	2021	2020
Ad-hoc	0.0	0.0	0.0	0.0	0.0
Annual	0.0	2.1	4.2	2.3	4.3
Semi-annual	0.0	2.1	2.1	0.0	4.3
Quarterly	58.7	54.2	54.2	56.8	41.3
Monthly	26.1	25.0	22.9	20.5	23.9
Weekly	0.0	0.0	0.0	0.0	0.0
Daily	8.7	8.3	10.4	13.6	17.4
Real-time	6.5	8.3	6.3	6.8	8.7

Source: BMA staff calculations.

Insurers use and update Cat modelling in fixed periods, usually quarterly and monthly. Each quarter, renewals or supervisory reporting are the most common reasons to run the Cat models, with 58.7% of insurers reporting quarterly use in 2024. In addition, real-time use was 6.5% of insurers in 2024.

Table 8: Do Business Units utilise different Accumulation Frequencies (in per cent of respondents)?

	2024	2023	2022	2021	2020
Yes	31.8	37.5	32.6	39.5	36.6
No	68.2	62.5	67.4	60.5	63.4

Source: BMA staff calculations.

Insurers were asked whether different business units use Cat models at different frequencies. In 2024, 68.2% of respondents said they do not perform accumulations at different frequencies.

Table 9: Internal Model Usage (in per cent of respondents)

	2024	2023	2022	2021	2020
Yes	41.3	41.7	37.5	36.4	41.3
No	58.7	58.3	62.5	63.6	58.7

Source: BMA staff calculations.

In 2024, 41.3% of insurers developed their stochastic model. Insurers with specialised lines of business outside the cover of traditional vendors are more likely to develop such in-house models to capture their unique risks.

The BMA also asked insurers how their Cat risk modelling reflects their reinsurance and retrocession purchases. The responses are shown in Table 10.

Table 10: External Reinsurance Model Usage (in per cent of respondents)

	2024	2023	2022	2021	2020
The company has minimal Cat exposure protection; therefore, gross is effectively net	0.0	0.0	4.2	2.3	6.8
The accumulations are calculated on a gross basis with reinsurance protections calculated approximately outside of the system	4.3	4.3	2.1	0.0	2.3
The accumulations are calculated on a gross basis, with reinsurance protections calculated explicitly outside of the system	2.2	0.0	4.2	4.7	0.0
The accumulations are calculated on a gross basis with the effect of reinsurance protections calculated explicitly for some types of protection within the system	43.5	48.9	50.0	48.8	45.5
The accumulations are calculated on a gross basis with the effect of reinsurance protections calculated explicitly for each type of protection within the system	50.0	46.8	39.6	44.2	45.5

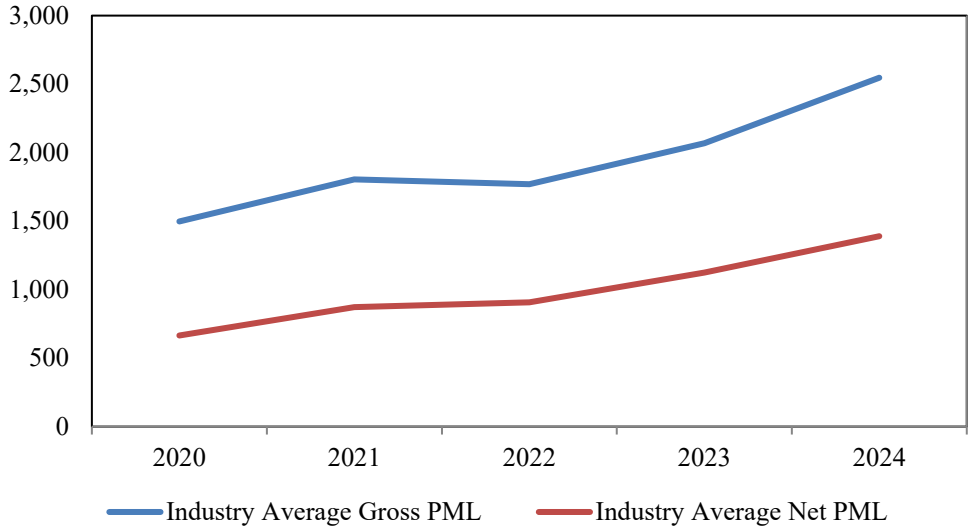
Source: BMA staff calculations.

The number of insurers purchasing little or no external Cat reinsurance remained at 0.0% of respondents in 2024. The vast majority of insurers model Cat risk by explicitly considering external reinsurance, either for some treaties or separately. In 2024, 95.7% of respondents explicitly calculated some or all external reinsurance treaties in their Cat modelling.

A. Probable Maximum Losses and Accumulation Process - Insurance Groups

The same data collected from legal entities is also collected from insurance groups.

Figure 4. Gross and Net Average Industry PML (in US$ millions)



Source: BMA staff calculations.

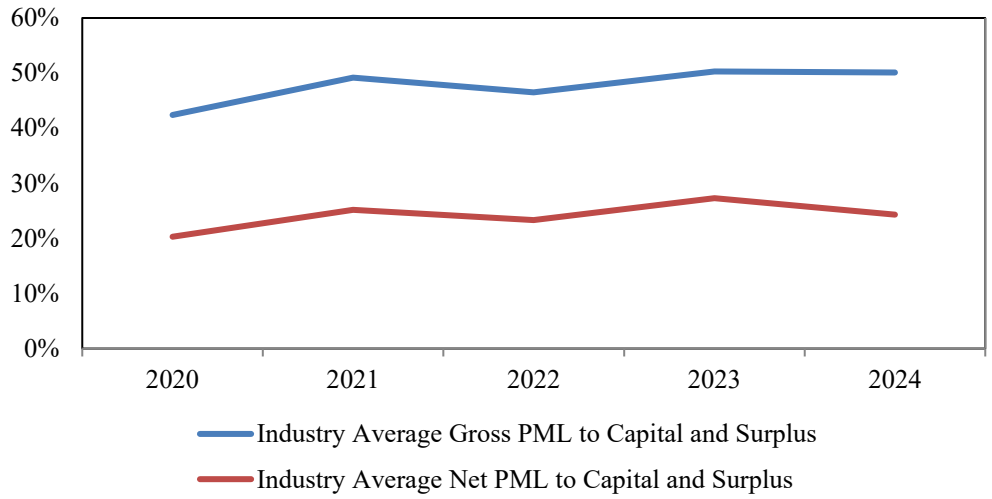
Table 11: PML (in US$ millions)

	2024	2023	2022	2021	2020
Industry Average Gross PML	2,546.5	2,068.5	1,769.9	1,805.1	1,497.6
Industry Average Net PML	1,389.6	1,123.7	906.8	871.9	665.1

Source: BMA staff calculations.

In 2024, the industry average gross exposure increased by 23.1% from 2023 levels, with net exposure increasing by 23.7%. This shows that insurance groups continue to retain growth in their gross exposures.

Figure 5. Gross and Net Industry PML to Capital and Surplus (in per cent)



Source: BMA staff calculations.

Table 12: PML Ratios (in per cent)

	2024	2023	2022	2021	2020
Industry Average Gross PML to Capital and Surplus	50.3	50.3	46.5	49.2	42.4
Industry Average Net PML to Capital and Surplus	24.3	27.3	23.3	25.2	20.3

Source: BMA staff calculations.

As in the case of legal entities, the BMA surveys the average loading factors for groups, using the last five years of data displayed in Table 13.

Table 13: Loading Factors (in per cent)

	2024	2023	2022	2021	2020
Average Loading Factor	9.22	10.7	9.1	8.8	4.6

Source: BMA staff calculations.

The loading factor for groups has remained relatively stable since 2021, with 2024 showing a slight decrease compared to 2023. This modest decrease aligns with the trend observed for legal entities. Over the past several years, the average loading factor has continued to edge higher, driven by persistent model uncertainty relative to actual loss experience, ongoing claims inflation, and the effects of climate change – factors that may not yet be fully incorporated into existing models.

Table 14 shows how groups establish loading factors through either estimation or analytical determination. In 2024, 64.7% of groups determined their factors non-analytically by relying on expert judgment.

Table 14: Loading Factor Estimation Methods (in per cent of respondents)

	2024	2023	2022	2021	2020
Determined Analytically	35.3	42.1	42.1	41.2	35.3
Estimated	64.7	57.9	57.9	58.8	64.7

Source: BMA staff calculations.

In 2024, 70.6% of groups used near-term frequency of the AMO, indicating a continued reliance on more recent hurricane activity to inform modelling outputs.

Table 15: AMO Factor Consideration (in per cent of respondents)

	2024	2023	2022	2021	2020
Near-term Frequency	70.6	68.4	71.4	68.4	55.6
Long-term Frequency	29.4	31.6	28.6	31.6	44.4

Source: BMA staff calculations.

Table 16 displays the model vendor licensing and usage statistics for groups.

Table 16: Vendor Model Usage (in per cent of respondents)

Model Usage	**2024**	**2023**	**2022**	**2021**	**2020**
AIR Only	61.5	52.9	47.4	38.9	31.3
EQECAT Only	0.0	0.0	0.0	0.0	0.0
RMS Only	30.8	17.6	26.3	38.9	43.8
AIR and RMS	7.7	23.5	21.1	22.2	18.8
AIR and EQECAT	0.0	0.0	0.0	0.0	0.0
EQECAT and RMS	5.9	5.9	5.3	0.0	6.3
AIR, EQECAT and RMS	0.0	0.0	0.0	0.0	0.0
Model Licensing	**2024**	**2023**	**2022**	**2021**	**2020**
AIR Only	52.9	42.1	42.9	26.3	21.1
EQECAT Only	0.0	0.0	0.0	0.0	0.0
RMS Only	23.5	21.1	23.8	31.6	31.6
AIR and RMS	23.5	31.6	28.6	42.1	42.1
AIR and EQECAT	0.0	0.0	0.0	0.0	0.0
EQECAT and RMS	0.0	5.3	4.8	0.0	5.3
AIR, EQECAT and RMS	0.0	0.0	0.0	0.0	0.0

Source: BMA staff calculations.

AIR usage continued to make up the largest share in groups, either stand-alone or in combination with other models. Nevertheless, the market remains concentrated on two vendors.

Table 17: Model Frequency Usage (in per cent of respondents)

	2024	2023	2022	2021	2020
Ad-hoc	0.0	0.0	0.0	0.0	0.0
Annual	5.9	10.5	14.3	10.5	10.5
Semi-annual	5.9	5.3	4.8	5.3	5.3
Quarterly	47.1	42.1	38.1	42.1	42.1
Monthly	29.4	31.6	28.6	26.3	26.3
Weekly	0.0	0.0	0.0	0.0	0.0
Daily	5.9	5.3	9.5	15.8	15.8
Real-time	5.9	5.3	4.8	0.0	0.0

Source: BMA staff calculations.

Accumulation frequency follows a similar pattern for groups and legal entities. Most groups perform accumulations quarterly, as 47.1% of respondents did in 2024 compared to 42.1% in 2023.

Table 18: Do Business Units utilise different Accumulation Frequencies (in per cent of respondents)

	2024	2023	2022	2021	2020
Yes	25.0	33.3	42.9	31.6	31.6
No	75.0	57.1	57.1	68.4	68.4

Source: BMA staff calculations.

With regard to the utilisation of different accumulated frequencies, a quarter of the groups represented have frequency differences compared with 31.8% of legal entities.

Table 19: Internal Model Usage (in per cent of respondents)

	2024	2023	2022	2021	2020
Yes	35.3	31.6	28.6	31.6	31.6
No	64.7	68.4	71.4	68.4	68.4

Source: BMA staff calculations.

The BMA also surveyed groups on the use of internal models. As of 2024, two-thirds of groups do not use internally developed models, compared with a third that do.

Table 20: External Reinsurance Model Usage (in per cent of respondents)

	2024	2023	2022	2021	2020
The company has minimal Cat exposure protection, and as such, gross is effectively net	0.0	0.0	0.0	0.0	5.6
The accumulations are calculated on a gross basis with reinsurance protections calculated approximately outside of the system	0.0	0.0	0.0	0.0	0.0
The accumulations are calculated on a gross basis, with reinsurance protections calculated explicitly outside of the system	5.9	0.0	0.0	0.0	0.0
The accumulations are calculated on a gross basis with the effect of reinsurance protections calculated explicitly for some types of protection within the system	41.2	57.9	52.4	63.2	50.0
The accumulations are calculated on a gross basis with the effect of reinsurance protections calculated explicitly for each type of protection within the system	52.9	42.1	47.6	36.8	44.4

Source: BMA staff calculations.

On the group level, models can be used to apply the effect of outward reinsurance treaties. In 2024, all groups had external reinsurance treaties to mitigate catastrophe exposure. The percentage of groups that explicitly modelled reinsurance protections for all treaties within the Cat model was 52.9%.