

# MOODY'S

## INVESTORS SERVICE

### RATING METHODOLOGY

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## Reinsurers Methodology

This rating methodology replaces the *Reinsurers Methodology* published in August 2022. In this update, we have added "Consideration of Accounting Changes: IFRS-17 and US GAAP LDTI" in the "Scorecard Framework" sub-section of "Our General Framework for Rating Reinsurers," which describes that we may adjust factor scores as a result of these accounting changes.

### Introduction

In this rating methodology, we explain our general approach to assessing credit risk for issuers in the reinsurance industry globally, including the qualitative and quantitative factors that are likely to affect rating outcomes in this sector.

We discuss the scorecard used for this sector. The scorecard<sup>1</sup> is a relatively simple reference tool that can be used in most cases to approximate credit profiles in this sector and to explain, in summary form, many of the factors that are generally most important in assigning ratings to companies in this sector. The scorecard factors may be evaluated using historical or forward-looking data or both.

We also discuss other rating considerations, which are factors that may be important for ratings but are not included in the scorecard, usually because they can be meaningful for differentiating credit profiles, but only in some cases. In addition, some of the methodological considerations described in one or more cross-sector rating methodologies may be relevant to ratings in this sector.<sup>2</sup> Furthermore, since ratings are forward-looking, we often incorporate directional views of risks and mitigants in a qualitative way.

As a result, the scorecard-indicated outcome is not expected to match the actual rating for each company.

Our presentation of this rating methodology proceeds with (i) the scope of this methodology; (ii) our general framework for rating reinsurers; (iii) a discussion of the scorecard factors; (iv) other scorecard considerations; (v) assessing support; (vi) other rating considerations; (vii) assigning entity-level and instrument ratings; (viii) methodology assumptions; and (ix) limitations. In the appendices, we describe (i) how we use the scorecard; (ii) our approach to rating reinsurance sidecars; and (iii) how we incorporate stress testing in our analysis.

<sup>1</sup> In our methodologies and research, the terms "scorecard" and "grid" are used interchangeably.

<sup>2</sup> A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

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This publication does not announce a credit rating action. For any credit ratings referenced in this publication, please see the issuer/deal page on [ratings.moodys.com](https://ratings.moodys.com) for the most updated credit rating action information and rating history.

## Scope of This Methodology

Long-term Insurance Financial Strength Ratings (IFSRs<sup>3</sup>) for reinsurers are assigned at the legal entity level to insurance operating companies.

In addition to long-term IFSRs, we may assign short-term IFSRs<sup>4</sup> to provide institutional investors and financial intermediaries with opinions about an insurance company's ability to pay punctually its short-term senior policyholder claims and obligations. We use the same prime rating symbols for these ratings that we use for other short-term instruments and obligations.<sup>5</sup>

Reinsurance is a credit-sensitive industry. Reinsurers generally seek to position themselves as strong credits as a necessary condition to accessing attractive business opportunities.

The methodology also applies to the reinsurance business of primary insurers, companies that have a diversified business model writing significant amounts of both insurance and reinsurance business within the same analytic unit, as well as insurers whose direct insurance business shares many underwriting characteristics with traditional reinsurance. When compared to traditional primary property and casualty (P&C) insurance companies, these entities share the characteristic that their insurance exposure (whether generated on a primary or reinsurance basis) tends to be more severity-driven than frequency-driven, and, therefore, they are generally more akin to reinsurers. In addition, these companies tend to write a large percentage of their primary insurance in specialty lines; again, such exposures exhibit loss frequency and severity behaviors that typically have more in common with reinsurance than with traditional P&C insurance.

This methodology is also broadly applicable to niche insurance segments such as P&C or life insurance captives or other insurance-risk-specific special purpose entities.

Other ratings that may be assigned within the group (e.g., senior unsecured debt issued by the insurer or its parent company) are typically determined in relationship to the IFSRs of the group's main subsidiaries.<sup>6</sup>

## Our General Framework for Rating Reinsurers

Our general approach to assessing the credit risk of the various obligations of reinsurers is based on an assessment of the financial strength of the main operating units within that organization. This methodology is, therefore, intended primarily to explain our approach to assigning IFSRs to operating insurers. Specifically, the methodology describes our general approach to assigning a financial strength rating of a standalone entity before consideration of support. We also describe how we incorporate affiliate<sup>7</sup> support to move from the standalone credit profile to the assignment of the IFSR.<sup>8</sup>

<sup>3</sup> IFSRs are opinions of the ability of insurance companies to pay punctually senior policyholder obligations and claims and also reflect the expected financial loss suffered in the event of default. Please refer to *Rating Symbols and Definitions* for more details; a link can be found in the "Moody's Related Publications" section.

<sup>4</sup> Please refer to our methodology that discusses global short-term ratings. A link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Publications" section.

<sup>5</sup> Please refer to *Rating Symbols and Definitions* for more details; a link can be found in the "Moody's Related Publications" section.

<sup>6</sup> Please see our cross-sector methodology that discusses how we assign instrument ratings for insurers. A link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Publications" section.

<sup>7</sup> "Affiliate" includes parents, cooperative groups and significant investors.

<sup>8</sup> The standalone credit profile is an opinion of an insurer's standalone intrinsic strength, absent any extraordinary support from an affiliate or government. An analytic unit generally comprises all the operating companies with common analytic and credit characteristics operating in a single country or geographic region. An analytic unit could include a group of companies operating outside of a single geographic region if significant inter-company support arrangements exist, or if there is a high degree of integration in the management, systems, distribution and operations of the group of companies.

In rating reinsurers on a standalone basis, we focus on qualitative and quantitative characteristics in relation to the company's business and financial profile, as well as on the operating environment in which it conducts its business. Regulatory, accounting and product characteristics can vary widely from country to country, as can a country's insurance operating environment, and our rating approach considers these differences.

## EXHIBIT 1

Business Profile	Financial Profile	Operating Environment
Factor 1: Market Position, Brand and Distribution	Factor 3: Asset Quality	Insurance Systemic Risk Factor
Factor 2: Business and Geographic Diversification	Factor 4: Capital Adequacy	Insurance Market Development Factor
	Factor 5: Profitability	
	Factor 6: Reserve Adequacy	
	Factor 7: Financial Flexibility	

Source: Moody's Investors Service

In the following sections, we describe the key factors underlying a reinsurer's business and financial profiles, as well as factors that affect its operating environment. We explain our general approach for scoring each scorecard factor and show the weights used in the scorecard. We also provide a rationale for why these scorecard components are meaningful for an insurer's standalone credit profile, what the relevant financial metrics are in analyzing these factors, including regional/supplemental metrics, and how we interpret those metrics. Overall country risk and characteristics of the local (re)insurance operating environment also play an important role in our rating analysis, as do other factors such as management, governance and accounting policy and disclosures.

Given the inherent cyclicity of the reinsurance industry, a company's financial profile may be somewhat stronger than the scorecard-indicated outcome during cyclical peaks and somewhat weaker during cycle troughs.

We employ the same analytic approach to evaluating reinsurance companies worldwide, incorporating the business, financial profile and operating environment dimensions discussed in this methodology. However, each of the various regions has its own market nuances that reflect the local political, social and economic climates. These include the regulatory environment, governance and capital structures, taxation, accounting rules and public reporting requirements, and laws and the litigation environment. If these regional factors are not already captured in the Operating Environment component, we may incorporate them qualitatively into our analysis.

Reinsurance groups often consist of subsidiaries operating in more than one geographic region. Where this is the case, we typically consider the largest and most significant units of the group (in terms of revenues and earnings, capital, assets, or other key metrics), and, where relevant, apply the quantitative metrics in the methodology to this group of key subsidiaries to arrive at weighted average ratios. In some instances, this group of key subsidiaries may be less than 100% of the analytic unit. Also, in some instances, more than one group of subsidiaries, called analytic units, exist within a reinsurance group. Each analytic unit is typically analyzed separately.

Our ratings are forward-looking and reflect our expectations for future financial and operating performance. However, historical results are helpful in understanding patterns and trends of a company's performance as well as for peer comparisons. Many of the financial ratios are calculated based on multiyear averages or on a last-12-months basis. However, the factors in the scorecard can be assessed using various time periods. For example, rating committees may find it analytically useful to examine both historical and expected future performance for individual periods or periods of several years or more.

## Scorecard Framework

This methodology includes a scorecard, which is used in our analysis and reflects our opinion and judgment on each of the broad factors within the rating methodology. Information we use in the scorecard may include proprietary, non-public data. Business Profile factors represent 35% of the overall fixed scorecard weights, and the Financial Profile factors represent 65%; however, weights shown for each factor in the scorecard represent an approximation of their importance for rating decisions, and actual importance may vary substantially. The Operating Environment component, described in more detail later in this report, has a variable weight depending on the assigned score.

The scorecard calculates an unadjusted score for each factor, and analysts typically populate the scorecard with an adjusted score, which can range from Aaa to C. The score is derived from the raw metrics (see Appendix 1), and the adjusted score is based on analytical judgment. The scorecard also factors in the operating environment. We also consider a pre-defined severe stress case scenario.

### Consideration of Accounting Changes: IFRS 17 and US GAAP LDTI

Insurers reporting under IFRS or US GAAP may be subject to IFRS 17 or long duration targeted improvements (LDTI) under US Generally Accepted Accounting Principles (US GAAP),\* respectively, depending on the jurisdiction in which an insurance company reports.

The application of IFRS 17 or LDTI may significantly affect the overall presentation of financial statements as well as certain reported amounts, some of which are inputs to scorecard metrics. These inputs include shareholders' equity, insurance liabilities, revenue and net income.

Scorecard metrics whose inputs are affected by the application of IFRS 17 or LDTI may result in values and unadjusted scores that are significantly different from what would have otherwise resulted. The application of the new accounting standards are not expected to directly affect the underlying economic risk or expected cash flows of in-force business. In addition, for most regulatory jurisdictions, the standards do not directly affect regulatory financial reporting and regulatory capital.

Thus, qualitative adjustments to factor scores of affected metrics will, for a period of time, be particularly important for certain insurance companies, due to limited comparability with prior accounting periods\*\* or with insurers that follow different accounting standards. These adjustments fall within the scope of our overall approach to analyzing reinsurers where we may adjust factor scores to reflect our analytical perspective of credit risk.

As described in the "Discussion of the Scorecard Factors" section, we may consider supplemental metrics in our analysis, including metrics calculated or estimated from financial statements. For instance, we may place greater emphasis on leverage excluding accumulated other comprehensive income (AOCI) in assessing financial flexibility and on regulatory capital levels (e.g., Solvency II) in assessing capital adequacy.

\* Accounting Standards Update (ASU) 2018-12 is commonly referred to as Long Duration Targeted Improvements, or LDTI, and is effective January 1, 2023, for large US Securities and Exchange Commission (SEC) insurance filers. The LDTI update includes accounting changes for long-duration insurance contracts under US Generally Accepted Accounting Principles (US GAAP), particularly for certain life insurance products. IFRS-17 Insurance Contracts is commonly referred to as IFRS 17 and is effective as early as January 1, 2023, for entities reporting under the International Financial Reporting Standards (IFRS) framework; effective dates depend on the jurisdictions in which a firm reports. The IFRS 17 standard establishes the principles for the recognition, measurement, presentation and disclosure of insurance contracts.

\*\* Specifically, accounting periods for which metric calculations are based on financial reporting prior to the adoption of IFRS 17 and LDTI.

To arrive at the standalone credit profile for the analytic unit, we may assess the company's management, governance, risk management, accounting policy and disclosures, sovereign and regulatory environment as well as any special rating situations. To move from the standalone credit profile to the rating, we consider

any explicit or implicit support from affiliates, as well as other rating considerations. Scorecard factors and weights can be found below.

## EXHIBIT 2

Reinsurers Rating Methodology Scorecard Factors and Weights<sup>9</sup>

	Aaa	Aa	A	Baa	Ba	B	Caa and Lower	Score	Adjusted Score
<b>Business Profile</b>									
<b>Market Position, Brand, Distribution (20%)</b>									
Relative Market Share Ratio (NPW relative to the average NPW of the top 40 reinsurers)									
Direct Reinsurance Premiums % GPW									
<b>Business and Geographic Diversification (15%)</b>									
Business and Geographic Diversification									
<b>Financial Profile</b>									
<b>Asset Quality (10%)</b>									
High Risk Assets (HRA) % Shareholders' Equity									
Reinsurance Recoverables % Shareholders' Equity									
Goodwill + Intangibles % Shareholders' Equity									
<b>Capital Adequacy (20%)</b>									
Gross Underwriting Leverage									
Gross Natural Catastrophe Exposure									
Net Natural Catastrophe Exposure									
<b>Profitability (10%)</b>									
Return on Capital (ROC-5 yr. avg.)									
Sharpe Ratio of ROC (5 yr. avg.)									
<b>Reserve Adequacy (10%)</b>									
Adv./(Fav.) Loss Reserve Dev. % Beg. Reserves (7 yr. avg.)									
<b>Financial Flexibility (15%)</b>									
Adjusted Financial Leverage									
Total Leverage									
Earnings Coverage (5 yr. avg.)									
<b>Operating Environment</b>									
<b>Preliminary Standalone Outcome</b>									

Source: Moody's Investors Service

#### Notching Factors and Support Considerations:

- » Management, Governance and Risk Management
- » Accounting Policy and Disclosures
- » Sovereign and Regulatory Environment
- » Standalone Credit Profile

<sup>9</sup> See Appendix 1 for sub-factor weight details.

- » Nature and Terms of Explicit Support
- » Nature and Terms of Implicit Support
- » Scorecard-Indicated Outcome

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### Standard Adjustments in the Analysis of Financial Statements

The financial statements we use in our analysis generally have a consistent basis of accounting depending upon the region (e.g., Generally Accepted Accounting Principles (GAAP) or International Financial Reporting Standards (IFRS)). Different accounting conventions can affect – sometimes materially – comparisons among companies operating in different jurisdictions. Accordingly, we make standard and non-standard adjustments, as described below. The qualitative analysis that we employ may also consider accounting system differences, including when we do not have sufficient information to make specific adjustments. To the extent that other accounting conventions are used by a company, we may also use that data for a more direct comparison to global peers.

All of the quantitative credit metrics incorporate our standard adjustments to income statement, cash flow statement and balance sheet amounts for items such as underfunded pension obligations and operating leases. We may also make other analytical adjustments that are specific to a particular company.

For an explanation of our standard adjustments, please see the cross-sector methodology that describes our financial statement adjustments in the analysis of financial institutions. A link to an index of our sector and cross-sector credit rating methodologies can be found in the “Moody’s Related Publications” section.

In addition to the standard adjustments we may also make non-standard adjustments to financial statements for other matters to better reflect underlying economics and improve comparability among peers. For example, we may adjust financial statements in order to reflect estimates or assumptions that we believe better reflect an issuer’s sustainable forward-looking credit profile. We may also make non-standard adjustments where local GAAP or the interpretation of IFRS in a particular country or region differs from the norm in an area that would affect our analysis.<sup>10</sup> Our adjustments may incorporate non-public information.

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### Incorporating Scenario Analysis and Stress Testing for Reinsurers

Developing a forward-looking assessment of an insurer’s financial performance under an expected case and stress case is usually important to our assessment of financial strength. Our expectations of a reinsurer’s results over the medium term reflect our opinion of current and projected market conditions. The nature of a reinsurer’s operating and business profile, as well as its product offerings, mean that we may have differing levels of confidence in a particular expected case or stress case scenario.

In addition, our credit analysis includes an assessment of the downside risks faced by reinsurers and their creditors. Because challenging economic and financial events, as well as natural or man-made catastrophes, do occur – with potentially adverse effects on the financial and business profiles of reinsurers – we typically include an analysis of stress scenarios as part of our analysis.

Stress analysis can take different forms. To assess the impact of stress on a reinsurer, we may employ a number of different approaches as each situation dictates, including assessing reinsurers’ own capital models and performing pre-defined and ad hoc scenario analysis. Please refer to Appendix 3 for a discussion of the pre-defined stress scenarios we use in our stress test. Our ratings reflect an expected scenario, but also take into consideration the impact of the pre-defined stress scenarios on a company’s credit profile. We

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<sup>10</sup> See our cross-sector rating methodology on financial statement adjustments in the analysis of financial institutions for a discussion of our adjustments. A link to an index of our sector and cross-sector credit rating methodologies can be found in the “Moody’s Related Publications” section.

generally expect a reinsurer to be able to withstand moderate stress while maintaining a credit profile consistent with its assigned rating and that the application of the pre-defined stress scenarios (the stress test) would result in a credit profile deterioration of no more than a few notches below the assigned rating.

## Discussion of the Scorecard Factors - Business Profile

### Factor 1: Market Position, Brand and Distribution

#### Why It Matters - Market Position and Brand:

Market position, brand, and franchise strength are key credit considerations that drive a company's ability to develop and sustain competitive advantages in its chosen markets. Market position incorporates the firm's sustainable advantages in its key lines of business and considers market share; barriers to entry; scale advantages and their translation to expenses; control over pricing; and control of distribution. Additionally, a firm's brand encompasses a company's image and reputation in the market, brand recognition and perception by distributors and reinsurance purchasers, and customer loyalty as demonstrated by retention rates and distribution costs.

A company's sustainable competitive advantages -- the strength of its competitive position and its prospects for organic growth -- can have a direct bearing on its future profitability and ability to generate capital internally. In addition, a reinsurer with a strong market position, brand, and competitive advantage is better able to withstand prolonged difficult market conditions and to capitalize on new, potentially profitable opportunities that may develop in the future. We believe such companies are more likely to meet their obligations through varied economic periods. Conversely, a weak business franchise can indicate financial stress for a company if it generates low or erratic core profitability, and may lead management to enter unfamiliar businesses, take on new and unfamiliar risks, or leverage the company to a greater extent.

#### Relevant Metrics - Market Position and Brand:

Relative market share ratio (net premiums written (NPW) as a % of the average NPW of the top 40 reinsurers)

#### Interpreting the Metrics - Market Position and Brand:

We believe that a reinsurer's relative and absolute size is highly correlated with its market position and brand. The largest companies in terms of assets, premiums, and capital tend to have higher scores for this factor. Conversely, smaller companies tend to have lower scores for this factor.

Offsetting the size issue is a company's ability to exercise underwriting discipline and effectively navigate the underwriting cycle on an opportunistic basis. Growth during favorable market cycles can be a positive while growth during a soft market may be a negative. Further, significant market share within a smaller niche segment or within a certain geographic area may be a positive depending upon a company's approach to the business. There may be instances where a company's ability to sell high value-added, low risk products in a key market may be strong enough to offset a lower overall relative market share score.

#### Why It Matters - Distribution:

The methods and mechanisms by which a reinsurance company delivers its products are another fundamental aspect of the company's business and credit profile. A company's direct access to cedants, as well as the nature of its relationship with brokers relates directly to a company's creditworthiness and standing in the market, as well as its ability to grow revenues, retain business, enhance diversification of peak exposures and by geography, and to control its costs.



**Relevant Metrics - Distribution:**

Direct Reinsurance Premiums as a % of Gross Reinsurance Premiums Written

**Interpreting the Metrics - Distribution:**

In general, a substantial portion of business written directly, rather than through brokers, is indicative of the reinsurer's brand strength, pricing power, as well as the resilience of its franchise to a temporary decline in financial strength. It also enables the company to establish a better control over its cost base and to establish itself as lead reinsurer on the cedant's program which can be associated with more lucrative underwriting terms. An excessive reliance on brokers, by contrast, may lower stability of price and underwriting terms and conditions over time. However, consideration is given to how well established the broker account is, as well as to the strength of a reinsurer in the broker market-place via, for example, the amount of business led.

Beyond the above-noted metrics, we may also consider supplementary measures of market strength in the reinsurance industry such as the average premium volume per cedant in non-proportional reinsurance (also known as line size) as well as the number of lead positions held by the reinsurer. While these metrics may be considered by analysts and rating committees in evaluating the reinsurer's credit profile and its standing vis-à-vis its peer group, such metrics are not explicitly incorporated into the rating methodology as they are not always consistently available.

## EXHIBIT 3

**Summary of Relevant Metrics - Market Position, Brand and Distribution**

	Aaa	Aa	A	Baa	Ba	B	Caa
Relative Market Share Ratio (NPW relative to the average NPW of the top 40 reinsurers)	$x > 3x$	$3x \geq x > 1.5x$	$1.5x \geq x > 0.5x$	$0.5x \geq x > 0.25x$	$0.25x \geq x > 0.15x$	$0.15x \geq x > 0.05x$	$x \leq 0.05x$
Direct Reinsurance Premiums as % Global Reinsurance GPW	The entire book of business is written directly, reinsurer only has leading positions	Most of the business is written directly, preponderance of lead positions	Direct premiums account for approximately half of the company's total, and company serves as lead reinsurer on approximately half of contracts by premium	Most of the business is written through brokers, and the company is a follower on most reinsurance treaties	The business is exclusively generated through brokers, and the company occupies a follower position on all but a few treaties	n/a	n/a

Source: Moody's Investors Service

**Factor 2: Business and Geographic Diversification****Why It Matters**

A company's chosen lines of business are a major influence on its risk profile and creditworthiness because individual product segments and classes of business exhibit different volatility and competitive attributes.<sup>11</sup> The extent of a product's risk is often not fully known and understood at the time the product is first

<sup>11</sup> We recognize that the definition of a line of business varies by company and country. For our analysis of reinsurers, we have grouped various lines together, because we have determined that, in general, only a limited number of materially different lines of business exist. Those lines are distinct by region.

introduced and marketed. Under-pricing can be an unintended outcome. Product risk appears in many forms and can have significant adverse effects on a company's earnings and capital adequacy.

Diversification, both by product and region, generally leads to higher scores for this factor. Diversification in earnings, product and geography can reduce the volatility of a firm's earnings, capital, and cash flow, promoting more efficient use of capital resources. Diversification outside of (re)insurance, assuming appropriately managed and within reasonable limits, can further this benefit by countering the cyclical nature of reinsurance operating performance. That said, if a company enters a new line of business without the appropriate underwriting expertise, such diversification would typically be viewed as a credit negative. During a soft market, some companies diversify, only to subsequently shed those lines of business as poor results become apparent over time.

#### Relevant Metrics:

***Business and Geographic Diversification - absolute number of material distinct business lines and geographic regions***

#### Interpreting the Metric:

The evaluation of market diversity considers the breadth and depth of markets and products that the company targets. The evaluation of product/market diversity (within a geographic region<sup>12</sup> or across different geographic regions or industries) includes an assessment of the concentration and competition in the product/market; correlation of revenues and earnings of different markets and products; and whether the product is viewed as a commodity or a value-added offering. Analysts' judgment is particularly important in assessing diversification within product lines given that the types of product offerings can vary significantly across the globe.

Diversification of revenues in and of itself is not a positive factor if profits are also not diversified or if geographic diversification comes in regions which are overly restrictive in terms of pricing controls or capital measures. We separately consider the underwriting risk associated with geographic concentrations in the evaluation of risk management.

In addition to geographic diversification, we also assess the degree of business diversification (between life and P&C reinsurance) and product diversification within P&C and life reinsurance. Business diversification is important because life reinsurance, although not without risks of its own (which include the long-tail nature of liabilities, high sensitivity to mispricing and potential for large losses in certain low-probability scenarios, such as a severe pandemic and sustained and material improvement to longevity), does offer the advantages of low correlation of underwriting results with the P&C business and a steady stream of underwriting earnings which can be expected to reduce the volatility inherent in P&C earnings.

Product diversification within P&C bears recognition of the fact that earnings of a company that are active in only a limited number of business segments are more volatile, and peak exposures are more significant as a percentage of shareholders' equity.

For diversified reinsurers, we have identified three broad business segments: (1) property, (2) casualty, and (3) life reinsurance. For companies solely writing life reinsurance, we consider the split between mortality, morbidity and asset-based products.

Beyond the financial metrics, we may also consider a company's underwriting controls, pricing sophistication, staff, and technology in the context of the company's chosen lines of business. We also may consider whether the analytic unit has operations outside of reinsurance which may enhance diversification.

<sup>12</sup> For our analysis of reinsurers, a geographic region is considered to be one of the following: (1) North America, (2) Europe or (3) Rest of World.

We typically consider the quality of diversification; company's ability to manage diverse businesses unrelated to the core; synergies or lack thereof among diversified businesses; and degree to which diversified businesses detract from a focus on the core or add value to the enterprise as a whole.

We typically analyze the risk inherent in the company's particular business mix. We generally consider the type of business written and note that certain lines exhibit lower volatility than others. A concentration in more volatile lines of business would be viewed as a risk to policyholders/creditors, irrespective of the overall quality of the firm's underwriting and risk management function.

## EXHIBIT 4

**Summary of Relevant Metrics – Business and Geographic Diversification**

	Aaa	Aa	A	Baa	Ba	B & Lower
<b>Business and Geographic Diversification</b>	5	4	3	2	1	Not Applicable

A score of 1 is given to each product and geographic category where the company generates 20% or more of its net premiums written. There are three product categories (property, casualty, life) and three geographic categories (North America, Europe and Rest of World). Hence, the minimum raw score is 2 (every company has at least one product and one place to sell it) and a maximum is 6. We then subtract one to arrive at a diversification score, as follows:

Total raw score => diversification score

6 => 5

5 => 4

4 => 3

3 => 2

2 => 1

For pure life reinsurers, we typically assign product scores of 2 for the life business in recognition of the granularity of that business, but consider the split between mortality, morbidity and asset-based products.

Source: Moody's Investors Service

## Discussion of the Scorecard Factors - Financial Profile

### Factor 3: Asset Quality

#### Why It Matters - High Risk Assets:

Reinsurance companies' core assets are typically concentrated in high quality liquid assets in recognition of the uncertainty of their liability payout stream, both as to timing and amount. In many cases, however, companies will allocate a portion of their investment portfolios to higher-risk assets. Assessing the history and trends in risky asset exposures is important, because changes in the market environment, especially during periods of stress, can depress asset values, earnings, and ultimately, the company's capital base.

#### Relevant Metric - High Risk Assets:

#### *High risk assets as % of Shareholders' Equity*<sup>13</sup>

#### Interpreting the Metric – High Risk Assets:

High-risk assets include below-investment-grade and unrated bonds/loans, common and preferred stock equities, "alternative investments" such as private equity and hedge fund holdings, real estate assets, and other investments which are not classified on the balance sheet.

<sup>13</sup> Where applicable, we supplement shareholders' equity with other forms of capital, which, although not reported as equity, are nevertheless loss-absorbing. Examples of this would be equalization reserves.

Companies with higher scores for this sub-factor generally have lower exposure to high-risk assets. However, companies that have strong and stable operational performance are typically able to tolerate a higher proportion of these assets in their investment portfolios. For such companies to maintain high ratings, characteristics including solid capital positions and a stable earnings profile, as well as a strong track record and proven expertise in managing more risky asset classes, are important.

Beyond this single high-risk asset metric, we may also consider investment portfolio composition including the proportion of high risk assets in relation to total invested assets, and investment concentration risk. Excessive concentrations in a single name or sector can amplify market and credit risk and can affect liquidity and the sustainability of investment returns. We may also consider the liquidity and volatility of the investment portfolio and the strategy employed by the company, as well as assets that are higher-risk or less liquid due to features specific to a particular market (e.g., commercial mortgage loans in the US).

As part of our analysis, we typically consider a reinsurer's investment risk. Our investment risk stress tests, which vary by asset type, are typically conducted on holdings in equities, alternative investments, real estate, mortgage loans, sovereign/sub-sovereign bonds, corporate bonds and structured securities.

#### Why It Matters – Reinsurance Recoverables:

A potentially significant asset of uncertain value on the balance sheet of some reinsurers is recoverables/receivables from retrocessionaires (i.e. a reinsurer for reinsurers). The extent to which reinsurers use reinsurance and are dependent on it varies significantly. Some reinsurers are "gross line" underwriters, placing little reliance on reinsurance parties; while others manage their risk exposure through the extensive use of retrocession. The analysis of the amount of a company's retrocession recoverables, its concentrated reliance on a few retrocessionaires, and the credit quality of the individual retrocessionaires is important because write-offs of the recoverables as uncollectible could impact the reinsurer's income and capital, and because the loss of retrocession capacity could require the reinsurer to modify its market/product focus.

#### Relevant Metric – Reinsurance Recoverables:

##### *Reinsurance recoverables as % of shareholders' equity*

#### Interpreting the Metric - Reinsurance Recoverables:

Companies with higher scores for this sub-factor tend to have lower amounts due from retrocessionaires. In addition to evaluating a company's retrocession exposure ratio, we also review a company's retrocession program including coverage placed, terms and conditions, and the credit quality and collateral of its retrocession counterparties. Typically, our analysis focuses on the most significant retrocession collectibles, and we qualitatively assess the level of potential future collectibles based on the reinsurer's reliance on (and potential utilization of) retrocession protection, and the creditworthiness of its retrocessionaires. We typically evaluate the creditworthiness of retrocessionaires by: 1) considering their IFSRs or credit profiles; 2) evaluating the ceding company's retrocession surveillance practices, 3) considering prior payment experience, and 4) evaluating offsets, letters of credit, trust funds, and other features that improve the ceding insurer's position.

#### Why It Matters - Goodwill and intangibles:

Goodwill and intangible assets are derived from acquisitions and new business production. The economic value of these assets is often uncertain and may not be realizable to the extent expected at the time of acquisition. Within the property and casualty markets, acquisitions of commercial insurance and reinsurance firms have generally met with limited success. Write-downs of intangible assets are typically an indication that the potential profits of a book of business or a subsidiary are lower than what had originally been contemplated by management. Furthermore, although charges related to intangible assets are non-

cash in nature, they signal reduced future earnings and capital generation, potentially hurting investor confidence and reducing financial flexibility.

#### Relevant Metric - Goodwill and intangibles:

*(Goodwill + Deferred Acquisition Costs + Value Of Business Acquired / Present Value of Future Profits + Other Intangibles<sup>14</sup>) as % of shareholders' equity<sup>15</sup>*

#### Interpreting the Metric – Goodwill and intangibles:

This measure provides an indication of the strength and quality of a company's equity capital base. Companies with higher scores for this sub-factor tend to have lower amounts of goodwill and intangible assets relative to their equity base than companies with lower scores. Extensive growth through acquisitions usually elevates the credit risk of a group because of the integration challenges and the uncertainty about the ultimate costs and benefits, as well as incremental earnings, to be realized from the acquisition in the context of the purchase price and financing.

We consider the implications of acquisitions to the company's market position and overall diversification. However, in the reinsurance sector, acquisitions have often been problematic for issuers, particularly where the target company's reserve risk is high, given that a number of failures have been caused by acquisitions.

Although we believe that DAC (Deferred Acquisition Costs), PVFP (Present Value of Future Profits) and VOBA (Value of Business Acquired) have less measurement uncertainty and more economic value than goodwill, we believe that equity associated with any intangible asset is less leverageable than tangible equity. Non-Life reinsurers do report DAC, although the amounts are usually smaller than those reported by life insurers in light of the nature of the policies issued. PVFP and VOBA asset reporting is typically confined to life reinsurers.

We also typically analyze other assets such as fixed assets and deferred tax assets for reasonableness. Since these assets are less liquid than investments and other financial assets, we may discount these assets in our asset quality analysis if they are significant relative to total assets.

#### EXHIBIT 5

#### Summary of Relevant Metrics - Asset Quality

	Aaa	Aa	A	Baa	Ba	B	Caa
High Risk Assets % of Shareholders' Equity	$x \leq 25\%$	$25\% < x < 50\%$	$50\% \leq x < 100\%$	$100\% \leq x < 175\%$	$175\% \leq x < 250\%$	$250\% \leq x < 325\%$	$x \geq 325\%$
Reinsurance Recoverables % of Shareholders' Equity	$x < 35\%$	$35\% \leq x < 70\%$	$70\% \leq x < 100\%$	$100\% \leq x < 150\%$	$150\% \leq x < 200\%$	$200\% \leq x < 250\%$	$x \geq 250\%$
Goodwill & intangibles % of Shareholders' Equity	$x \leq 20\%$	$20\% < x < 30\%$	$30\% \leq x < 40\%$	$40\% \leq x < 55\%$	$55\% \leq x < 75\%$	$75\% \leq x < 95\%$	$x \geq 95\%$

Source: Moody's Investors Service

### Factor 4: Capital Adequacy

#### Why It Matters:

At the heart of our assessment of a reinsurer's creditworthiness is an opinion about the company's economic capital and capital adequacy or operational leverage. Economic capital is the cushion available to

<sup>14</sup> We use gross intangible assets, instead of net of applicable deferred taxes, to simplify this ratio.

<sup>15</sup> This metric is typically calculated on a consolidated basis if the analytic unit being considered is part of a larger group because goodwill due to acquisitions is not typically pushed down to the analytic unit for financial statement reporting purposes.

the reinsurer to absorb unfavorable deviations in its results. Capital adequacy measures a company's leverage in terms of business volume generated and its risks relative to the company's capital. Capital adequacy is critically important for a reinsurer because capital is required to actually be available to absorb losses as well as to demonstrate to cedants and brokers that the company has the ability to absorb loss, if required. Capital constraints can also negatively impact a company's ability to grow its business.

#### Relevant Metrics:

**Gross Underwriting Leverage:** *[gross written premiums (property & casualty) plus 0.25 x gross written premiums (non P&C) plus gross reserves (property & casualty) plus 0.25 x gross reserves (non P&C)] divided by [shareholders' equity minus 10% of High Risk Assets]*

Gross and Net Natural Catastrophe Exposure (measured at 99.6% confidence interval) Relative to Equity

#### Interpreting the Metrics:

In general, the higher a company's gross underwriting leverage (GUL), the more risk it is assuming and the greater the impact on its capital position from variations in actual performance. The concept of gross underwriting leverage is sufficiently broad to allow us to evaluate a reinsurer's use of reinsurance to assess the degree to which the company relies on it for leverage. Reinsurers with higher scores for this sub-factor tend to have lower gross underwriting leverage than companies with lower scores. We adjust this ratio by subtracting from the denominator a percentage (i.e., 10%) of high-risk assets which, in a stress scenario, are illiquid, and/or likely to be impaired or sold for a loss, and should no longer be included among a company's assets or capital resources.

GUL is a relatively simple measure that is typically combined with further analysis of a company's mix of business and rate-driven volume changes; as a result, it is most useful when comparing companies that have a similar business mix or in conjunction with other capital adequacy ratios. An important consideration is the reliance on outwards reinsurance protection and the quality of this protection. The GUL metric does not give credit for reinsurance and therefore is often considered in tandem with underwriting leverage on a net basis, which reflects full credit for reinsurance. Other meaningful influences on gross underwriting leverage include the duration of liabilities and an assessment of a company's claims payout patterns.

Although in the gross underwriting leverage ratio's denominator we make a basic adjustment to shareholders' equity for asset risk, our capital adequacy metric deals primarily with the underwriting risk run by a company.

For pure life reinsurers, instead of gross underwriting leverage, we focus on regional regulatory risk-based capital measures, or the metric of equity to total assets,<sup>16</sup> if no other measure is available.

In addition, we note that for most reinsurers, catastrophe risk – from both natural and man-made events – can be the most significant and volatile risk to capital over the short term; as a result, we typically spend time with management to understand and evaluate their exposure to and management of catastrophe risk in the context of the firm's capital resources. Our analysis assesses a company's risk appetite and its ability to monitor and manage its risk exposures and also considers its reliance on retrocession as a risk management tool. We evaluate catastrophe risk at a 1-in-250 year return period (for annual aggregate losses), both gross and net, relative to earnings and capitalization. We also typically incorporate the views of the company's third-party vendor models, internal surveys, relative market share analysis, and stress case scenarios.

<sup>16</sup> See our credit rating methodology that discusses life insurers. A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

For life reinsurers, instead of natural or man-made catastrophe exposure, we use a scenario of an additional 1.5 deaths per thousand as a proxy for mortality catastrophe exposure, which we believe is roughly a 1-in-250 year event.

In most regions, insurance regulators, to varying degrees, have developed more refined measures of capital adequacy/solvency by evaluating the available capital relative to the risk-adjusted exposures of the company. These additional metrics are particularly key to our analysis when they are determinants of a company's solvency.

The level of sophistication of the risk-based capital (RBC) regime, the scale on which it is measured, and its usefulness in the rating process varies considerably among regulatory jurisdictions.

Of particular importance are the ongoing solvency modernization efforts in both Europe (under Solvency II) and the US. Below, we provide an indicative mapping between Solvency II and our capitalization scores. While not our only consideration, this indicative mapping helps provide the analyst with further guidance when assessing capital adequacy. For example, for a given indicative capitalization score, we would typically expect a higher Solvency II ratio for a company with higher volatility of capital requirements or Solvency II ratio than shown in the table below.

Capitalization score	Aa	A	Baa and below
Solvency II ratio	> 200%	130% - 200%	< 130%

Source: Moody's Investors Service

We also incorporate management's internal capital models into our analysis of insurance and reinsurance groups. For reinsurers with more well-developed risk management capabilities, our assessment of capital adequacy typically places less reliance on the gross underwriting leverage and catastrophe risk metrics, and is instead based more on our review of the company's internal capital modeling process and results. We may also use a view of capital adequacy indicated by other tools, such as a stochastic risk-adjusted capital framework.

In assessing capital adequacy, we evaluate the potential impact under various stress environments. These include defined stress scenario testing incorporating potential losses from investment volatility, catastrophes, and deterioration in reserves for unpaid losses, and investments (see above section on Stress Testing). Also, emerging risk areas are considered in our assessment of prospective capital generation and adequacy.

The gross underwriting leverage metric score is calibrated to be more demanding for reinsurers relative to P&C insurers at the same rating level. The higher exposure to catastrophe losses or other low frequency/high severity risks among reinsurers typically necessitates more conservative operating leverage profiles.

## EXHIBIT 6

**Summary of Relevant Metric - Capital Adequacy**

	Aaa	Aa	A	Baa	Ba	B	Caa
Gross Underwriting Leverage	$x \leq 1.5x$	$1.5x < x < 2.5x$	$2.5x \leq x < 4x$	$4x \leq x < 6x$	$6x \leq x < 8x$	$8x \leq x < 10x$	$x \geq 10x$
Gross Natural Catastrophe Exposure at the 99.6% annual aggregate PML	$x \leq 12.5\%$	$12.5\% < x < 31.25\%$	$31.25\% \leq x < 62.5\%$	$62.5\% \leq x < 125\%$	$125\% \leq x < 187.5\%$	$187.5\% \leq x < 250\%$	$x \geq 250\%$
Net Natural Catastrophe Exposure at the 99.6% annual aggregate PML	$x \leq 10\%$	$10\% < x < 25\%$	$25\% \leq x < 50\%$	$50\% \leq x < 100\%$	$100\% \leq x < 150\%$	$150\% \leq x < 200\%$	$x \geq 200\%$

Source: Moody's Investors Service

**Factor 5: Profitability****Why It Matters:**

A reinsurer's earnings capacity – both quality and sustainability – is a critical component of its creditworthiness because earnings are a primary determinant of the insurer's ability to meet its policy and financial obligations, the primary source of internal capital generation to assure capital adequacy, and a key determinant of access to the capital markets on favorable terms. Diversification across multiple product lines and markets can result in more stable levels of earnings, increasing the predictability of internal capital growth and strengthening claims/debt paying ability.

**Relevant Metrics:**

**Return on Capital (ROC):** *Net income before non-controlling interest expense as a % of average financial debt + shareholders' equity<sup>17</sup> + non-controlling interest (5-year average)*

**Sharpe Ratio of Return on Capital -** *the mean of the company's annual return on capital (5-year average) divided by the standard deviation of return on capital (5-year period)*

**Interpreting the Metrics:**

In general, companies with higher scores for this factor tend to have higher profitability as measured by ROC and have lower earnings volatility.

The ROC ratio is a good measure of how well the reinsurer is utilizing its capital funds. ROC also equalizes any benefits to earnings from leverage, because the ratio considers both financial debt and equity in its denominator. For this reason, ROC is viewed in concert with a company's financial leverage, since this will indicate the level of borrowed funds (if any) required to generate the corresponding ROC, as well as the sustainability and volatility of its profits over time. A company's legal structure can also provide information about its likely use of debt and its ROC risk profile over time. For example, mutually-owned companies tend to be less focused on short-term profitability and are less reliant on debt than shareholder-owned companies.

In addition to the above scorecard metrics, we also typically consider other measures. For example, Return on Equity (ROE) is also a good measure of profitability and may provide insights into the impact of shareholder pressure on management to generate sufficient returns on capital. It is important to consider ROE in concert with both a company's financial leverage and organizational/legal structure. The relationship to financial leverage is important because companies utilizing higher amounts of leverage may exhibit more favorable ROE, since a smaller equity base tends to improve this measure, all else being equal. We also may

<sup>17</sup> Note that while many accounting regimes include non-controlling interest in shareholders' equity, Moody's does not.



consider an adjusted ROC metric including total debt (not just financial debt) in the denominator to assess the impact of operating debt deployed on profitability.

Return on Revenue (ROR) can be another useful comparative measure of profitability, as it is less influenced by a company's financial leverage policy or its capital adequacy. The ROR metric over time is generally a good indicator of a reinsurer's underwriting skill and pricing discipline relative to its peers while also capturing investment performance.

We also consider that net income can be meaningfully influenced by non-recurring favorable/unfavorable items, most notably realized gains/losses. For analytic units with meaningful investment-related gains/losses, we also may consider these metrics excluding such gains/losses. We also typically consider the impact on these ratios for entities that record all investments at fair value through the income statement when comparing against most insurers that recognize the change in value of investments directly to equity. The effects of hedging may also significantly impact the net income metric and, as such, may be considered in interpreting profitability metrics.

The Sharpe ratio calculated on return on capital gauges the inherent volatility in a company's returns in relation to average profitability and helps us to formulate an opinion about the predictability and sustainability of a company's earnings. The ratio considers net income since a company's capital generation is driven by its net income but we recognize that some capital gains/losses and taxes can at times be somewhat volatile and unpredictable or at other times be used to reduce underlying operational volatility. This ratio's analytic value has little meaning if the numerator is negative or zero, in which case the sub-factor weighting for the Sharpe ratio is allocated to the ROC metric and within the overall profitability factor, the ROC reverts to 100%. However, the volatility metric is most useful in comparing companies' earnings volatility to each other and in identifying trends relative to business mix.

We use five years of data in these ratios to attempt to capture the business cycles although recognize that cycles in the sectors can and do exceed five years.

#### EXHIBIT 7

#### Summary of Relevant Metrics - Profitability

	Aaa	Aa	A	Baa	Ba	B	Caa
Return on Capital (5 yr. avg)	$x \geq 15\%$	$15\% > x > 10\%$	$10\% \geq x > 5\%$	$5\% \geq x > 0\%$	$0\% \geq x > (5\%)$	$(5\%) \geq x > (10\%)$	$x \leq (10\%)$
Sharpe Ratio of Return on Capital	$x \geq 400\%$	$400\% > x > 300\%$	$300\% \geq x > 200\%$	$200\% \geq x > 100\%$	$100\% \geq x > 0\%$	n/a	n/a

Source: Moody's Investors Service

### Factor 6: Reserve Adequacy

#### Why It Matters:

Inadequate loss reserves have been a contributing, if not the primary, cause of most reinsurance company failures. Given the broad accounting latitude endemic to the insurance business, the importance of credible loss reserves cannot be over-emphasized. The evaluation of redundancy or deficiency in a reinsurer's loss and loss adjustment reserves impacts the analysis of its reported earnings as well as the assessment of capital adequacy. When reinsurers' loss reserves develop unfavorably, the impact on the company's financial profile and flexibility can be material as seen by the decrease in capital, the increased operating and financial leverage ratios, and reduced dividend-paying capacity to the holding company.

**Relevant Metric:**

**Loss Reserve Development - 1-year loss reserve development as % of beginning net reserves (7 year average)**

**Interpreting the Metric:**

Given that reinsurers do not know the cost of their product until after it has been sold, strong underwriting skills and a stable track record are significant credit strengths. Consequently, the premium rate monitoring, underwriting, and claims handling processes are critical areas of our assessment. We typically review past underwriting results (usually in connection with reserve adequacy analysis) and current underwriting practices that will impact future profitability levels.

Many of the reserve analysis techniques that we use are necessarily complex and at times involve our own actuarial analysis, a review of third-party reserve analysis, and consideration of disclosures regarding carried reserves within an actuarially determined range of reasonable estimates. However, we also find that a simple review of prior year reserve development - defined as the past year's loss reserve development as a percentage of prior year reserves, shareholders' equity or premiums - usually provides broad corroboration of the more detailed analysis. For trend purposes, the metric is based on an average of reserve development as a percentage of beginning net reserves over the last seven years. Companies with higher scores for this sub-factor tend to have less adverse reserve development than companies with lower scores. We also typically consider the cause of adverse development and attempt to consider past development in light of our current assessment of reserve adequacy.

Where applicable, we also may assess adequacy of core reserves separate from reserves associated with latent liabilities (primarily asbestos and environmental, or A&E, liabilities) which tend to represent a small proportion of overall reserves and do not lend themselves to traditional actuarial analysis. A variety of techniques may be used to assess reserve adequacy in this area, including a funding ratio which we consider is typically a good measure to gauge the relative sufficiency of A&E reserves, although we generally also consider the impact that a company's claims practices, historical market share and product mix, and single large payments may have had on this rather simple measure.

For pure life reinsurers, the reserve adequacy metric is not used in the scorecard, as reserve adequacy is generally not a relevant analytic issue (unless the life reinsurer has substantial disability or health business). If the reserve adequacy sub-factor is not used, its weight is proportionally distributed among the remaining scorecard sub-factors in the Business Profile and Financial Profile factors.

**EXHIBIT 8****Summary of Relevant Metric - Reserve Adequacy**

	Aaa	Aa	A	Baa	Ba	B	Caa
Adverse (favorable) development % of Beg. Reserves (7 yr. avg.)	$x \leq (10)\%$	$(10)\% < x < (5)\%$	$(5)\% \leq x < 1\%$	$1\% \leq x < 5\%$	$5\% \leq x < 9\%$	$9\% \leq x < 11\%$	$x \geq 11\%$

Source: Moody's Investors Service

**Factor 7: Financial Flexibility****Why It Matters**

It is important that a company is able to not only fund its business growth via internal capital generation, but also demonstrate the ability to service its obligations without stress. Reinsurers generally benefit from having the capacity to raise capital externally for additional growth or acquisitions, and to meet unexpected financial demands whether those come from an unusually negative credit/market environment, earnings volatility, or other planned or unplanned capital needs. Financial flexibility - as indicated by adjusted and

total leverage, double leverage, earnings coverage, dividend coverage, holding company liquidity and access to capital markets - is a key determinant of the reinsurer's credit profile. We also consider, as discussed at the end of this section, the depth of the capital markets of a company's domicile, which if thin, can lead to limited financial flexibility despite what may appear to be strong capital and income metrics.

#### Relevant Metrics:

Adjusted Financial Leverage: Adjusted debt divided by (adjusted debt + shareholders' equity)

Total Leverage: Total debt divided by [total debt + shareholders' equity]

Earnings Coverage: Adjusted Earnings before interest and taxes divided by interest expense and preferred dividends (5 year average)

#### Interpreting the Metrics:

Financial leverage measures the amount of a company's capital base that is financed through borrowed money, typically short and long-term debt and hybrid capital securities, which can be issued at an operating company or holding company. Our adjusted financial leverage calculation considers all forms of debt (including surplus notes and hybrid securities -- adjusted for Moody's Debt/Equity Continuum<sup>18</sup> -- plus unfunded and underfunded pension obligations and operating leases, and uncollateralized letters of credit for Lloyd's of London underwriting purposes) used to fund the company's operations as leverage. Shareholders' equity in the adjusted financial leverage calculation includes accumulated other comprehensive income (AOCI) because we believe reported equity and the impact of changes in AOCI, primarily from changes in value of investment securities, impact the markets' perception of reinsurers' ability to access capital markets at attractive funding costs. Consideration is also given to leverage metrics calculated using shareholders' equity without AOCI, especially during periods of volatile interest rate changes or where assets are reported at fair value but liabilities are reported at book value. In general, reinsurers with higher scores for this factor tend to have lower levels of financial leverage.

The typical starting point for assessing our leverage metrics is consolidated leverage of the entire organization, rather than the leverage ratio of individual entities or analytic units. Our general practice of attributing a reinsurance group's consolidated financial leverage ratio to all members or analytic units of the group is based on our assumption that each subsidiary/analytic unit benefits from, as well as contributes to, the group's debt service coverage (in some cases, capped at the domestic sovereign rating discussed below). Analysts may then make adjustments for subsidiaries or units that are not core to the group, and are unlikely to benefit from parent company debt or equity capital support.

In addition to our standard adjustments to financial leverage and earnings coverage, additional adjustments to these metrics are sometimes necessary for individual companies. For example, an adjustment may include adding back as debt an off-balance-sheet obligation because we believe the company will support the debt obligation, if necessary, because of reputation or economic incentives. In contrast, match-funded or self-liquidating debt appearing on a company's balance sheet is likely to be excluded from adjusted financial leverage and earnings/cash flow coverage metrics because the debt is analytically viewed as operating debt rather than financial debt.<sup>19</sup>

However, we also believe that it is important to consider, in tandem with our adjusted financial leverage metric, the total debt profile of a group, on an unadjusted basis (apart from pension obligations and

<sup>18</sup> We believe that it is appropriate for our credit analysis to limit the amount of total equity credit that is derived from the issuance of hybrid securities within a capital structure. Please refer to our cross-sector methodology for hybrid equity credit. A link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Research" section.

<sup>19</sup> Please refer to our cross-sector rating methodology that discusses how we assess operating debt used by insurance companies. A link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Publications" section.

operating leases) and including operating debt. Although potentially match-funded, operating debt nevertheless involves external debt raising and needs to meet certain criteria to avoid being classified as financial leverage. The scoring ranges for the adjusted financial leverage and total leverage metrics are the same in order to highlight those groups most reliant on the use of hybrids and operating debt.

Other considerations incorporated into our opinions about financial leverage may include, where applicable, a company's double leverage (i.e. investments in subsidiaries funded by parent company debt or a stacked ownership structure), historical trends, management's target level for leverage relative to current position, and maturity profile, as well as the complexity of the capital structure itself.

The debt capacity of a reinsurer is also implied by its earnings capacity and dividend capacity relative to interest expense and preferred dividends, although there can be substantial variability in these figures from year to year. Companies with higher scores for this sub-factor tend to have stronger earnings and cash flow coverage metrics than companies with lower scores.

The earnings coverage ratio is calculated on a consolidated basis (US GAAP, IFRS, or an equivalent standard) and assesses consolidated earnings (pre-tax, pre-interest expense and preferred dividend coverage of consolidated interest expense and preferred dividends). The focus is typically on coverage of interest expense and preferred dividends although the numerator and denominator are also adjusted for pensions and leases. Because there can be regulatory restrictions on dividend capacity from an operating company to its holding company, the earnings coverage ratio is usually evaluated in the context of the reinsurer's actual flexibility in terms of cash available to be transferred to the holding company.

When analyzing these coverage ratios, we generally consider any differences that may exist between interest expense and the cash payments associated with interest. We also typically assess the interrelationship between cash flow coverage and earnings coverage by considering a) whether material earnings are generated in regions where dividend extraction is more difficult, b) if the parent has meaningful and consistent sources of cash flow from unregulated entities, and c) the relative levels of dividend capacity compared to earnings capacity. In instances where dividend capacity significantly exceeds earnings capacity, this may indicate that dividend capacity is unlikely to be replenished should a significant dividend be made.

In addition to these metrics, analysts also may consider holding company liquidity, measuring the extent to which financial debt obligations, covering near-term debt maturities, interest expense and preferred and common stock dividends, are covered by readily realizable assets (i.e., cash, investment-grade bonds, and all publicly traded equities). This is relevant in light of the large proportion of debt typically issued by a parent company and the aforementioned regulatory restrictions regarding dividend up-streaming by operating companies. As with the coverage ratios, we also may assess the extent to which a holding company is unduly reliant on subsidiaries where dividend extraction is difficult, as well as any other liquidity resources that could be drawn upon if necessary.

We also recognize that it is important for a reinsurer to maintain the confidence of capital providers. Ready access to capital is necessary for many reinsurers after a severe unexpected event, to fund an acquisition, or simply to expand internal growth plans. The inability to access the capital markets on attractive terms can significantly impair a company's financial flexibility. As a result, we view reinsurers' access to the capital markets - which can be limited by outsized financial leverage or poor coverage - as important given the inherent volatility of the business.

We additionally may consider a company's back-up lending facilities, letter of credit arrangements, and the conservatism of covenants, if any, embedded in borrowing arrangements. Strong back-up facilities with limited restrictive covenants enhance financial flexibility for a company, particularly in times of stress.

In assessing financial flexibility, we also consider the country in which a company is domiciled. We believe that the ability to raise debt and equity is limited by the scale and sophistication of a country's capital markets. As a result, our financial flexibility scores are typically capped by the local currency bond rating of the country in which the reinsurer would seek capital. This cap also applies to the local subsidiaries of foreign reinsurance groups, even if the foreign reinsurance group has strong financial flexibility.

## EXHIBIT 9

**Summary of Relevant Metrics - Financial Flexibility**

	Aaa	Aa	A	Baa	Ba	B	Caa
Adjusted Financial Leverage	$x \leq 15\%$	$15\% < x < 25\%$	$25\% \leq x < 35\%$	$35\% \leq x < 45\%$	$45\% \leq x < 55\%$	$55\% \leq x < 65\%$	$x \geq 65\%$
Total Leverage	$x \leq 15\%$	$15\% < x < 25\%$	$25\% \leq x < 35\%$	$35\% \leq x < 45\%$	$45\% \leq x < 55\%$	$55\% \leq x < 65\%$	$x \geq 65\%$
Earnings Coverage--EBIT/ int exp + pref div (5-year average)	$x \geq 14x$	$14x > x > 9x$	$9x \geq x > 5x$	$5x \geq x > 2x$	$2x \geq x > 0x$	$0x \geq x > (2x)$	$x \leq (2x)$

Source: Moody's Investors Service

## Operating Environment

### Why It Matters

Although our analysis of reinsurers is focused predominantly on company-specific characteristics and on business and financial parameters in the context of a reinsurer's operations within its industry sector, an important component of our analysis – particularly in developing markets – is the extent to which external conditions can exert a meaningful influence on reinsurers' credit profiles.

The Operating Environment serves to capture relevant economic, social, judicial, institutional and general business conditions in a particular country as regards the (re)insurance sector. Country-specific trends and developments can over time have as much of a bearing on reinsurers' long-term viability as the intrinsic strength of their own operations. Considerations can include the trajectory of economic development relative to other countries, major social or political developments, and the degree of utilization, recognition and acceptance of insurance as a legitimate vehicle for asset accumulation and wealth protection.

### Relevant Metrics:

The Operating Environment incorporates scores for multiple factors in two categories – Insurance Systemic Risk, and Insurance Market Development – by country, based on the country in which an insurer operates. For insurers that have meaningful operations in multiple countries or jurisdictions, we consider a blended approach to evaluating the overall Operating Environment score.

Three of the five country-specific components of the Operating Environment score that pertain to Insurance Systemic Risk are based on macro-level indicators from our sovereign rating methodology<sup>20</sup> and country research. The remaining two components – pertaining to Insurance Market Development – assess the degree of development of the insurance sector in a given country.<sup>21</sup>

<sup>20</sup> For more details on our sovereign rating methodology, a link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Publications" section.

<sup>21</sup> We generally assess the degree of development of the insurance sector in a given country based on indicators or data such as those captured by Moody's.

## Insurance Systemic Risk

**Economic Strength:** We use our published factor score for a sovereign's Economic Strength.

**Institutions and Governance Strength:** We use our published factor score for a sovereign's Institutions and Governance Strength.

**Susceptibility to Event Risk:** We use our published factor score for a sovereign's Susceptibility to Event Risk.

In each case, the broad alpha or alphanumeric sovereign factor score is mapped to a numeric as described below.

## Insurance Market Development

**Insurance Penetration (%):** *Total (life and non-life) industry-wide insurance premiums (excluding cross-border business) as a percentage of GDP.* Insurance penetration assesses the significance of a country's insurance market in the national economy.

**Insurance Density (percentile-rank):** Percentile-rank, worldwide, of total (life and non-life) industry-wide insurance premiums (excluding cross-border business) per capita. Insurance density assesses the extent of utilization of insurance protection in a given country.

## Interpreting the Operating Environment Metrics:

In our view, the better the operating environment, the less it impinges on the intrinsic strength of a reinsurer's credit profile. To the extent that the operating environment is considered more favorable than the reinsurer's own intrinsic credit profile, it is typically not a material consideration in the rating analysis. Furthermore, operating environments at the A or higher rating level are considered to be sufficiently strong so as to be neutral with respect to reinsurers' credit profiles, and are therefore not considered. Consequently, operating environments have only a neutral-to-negative impact on our ratings for reinsurers. Additionally, we believe that the weaker the operating environment, the greater influence it has on a reinsurer's overall credit profile, as the structural strength of the insurance industry and contractual agreements increasingly come into question.

## Insurance Systemic Risk

**Economic Strength** – The intrinsic strength of an economy provides critical indications of a sovereign's resilience to external shocks. A sovereign's ability to generate sufficient revenue to service debt over the medium term relies on sustained economic growth and prosperity, i.e., wealth.

**Institutions and Governance Strength** – The strength of institutions and governance are important determinants of a sovereign's creditworthiness because they influence the predictability and stability of the legal and regulatory environment. Institutions and governance provide a strong indication of a government's willingness to repay its debt. They influence the sovereign's capacity and willingness to formulate and implement economic, fiscal and monetary policies that support growth, socioeconomic stability and fiscal sustainability, which in turn protect the interests of creditors over the long term.

**Susceptibility to Event Risk** – Susceptibility to sudden, extreme events that could severely impact a country's economy or its institutions, or strain public finances is an important indicator of a sovereign's creditworthiness. Event risks are varied and typically include domestic political and geopolitical risks, government liquidity risk, banking sector risk and external vulnerability risk. We believe that such events could have significant negative implications for financial institutions such as (re)insurance companies.

### Insurance Market Development

**Insurance Penetration and Density** – Insurance markets around the world vary significantly in their degree of development with respect to the range of product offerings, utilization, and the significance of insurance as a means of risk mitigation and asset protection. Whereas Insurance Penetration considers the importance of the industry sector relative to the overall national economy, Insurance Density considers its importance relative to the population base of a country, thereby providing a helpful demographic perspective. Taken together, these two measures offer a more balanced perspective than either one taken in isolation. Broadly speaking, and all other things being equal, the higher the penetration and density levels, the more highly developed the insurance market, including the scopes of coverage provided, and the greater the perceived utility of the product. We also note that the particularities of different countries' insurance market structure and insurance accounting can significantly influence their penetration and density levels. Nevertheless, we believe that insurance penetration and density provide a meaningful basis of macro-level differentiation among countries, with respect to the utilization and development of insurance.

### Calculating the Operating Environment Score

The Operating Environment score is derived by combining the scores for Insurance Systemic Risk, composed of Economic Strength (25%), Institutions and Governance Strength (50%) and Susceptibility to Event Risk (25%), with Insurance Market Development, composed of Insurance Penetration (50%) and Insurance Density (50%).

For Insurance Systemic Risk, we start with the published factor scores for the sovereign's Economic Strength and Institutions and Governance Strength, which are expressed on an alphanumeric scale, and Susceptibility to Event Risk, which is expressed on a broad alpha scale.<sup>22</sup> We then convert these scores to numeric scores using the two Mapping Sovereign Rating Methodology Scoring tables below (Exhibits 10 and 11), and we combine them according to the weights described in the prior paragraph. Specifically, the numeric equivalent score for each sovereign methodology factor assigned score is multiplied by its weight, with the results then summed to produce a numeric Insurance Systemic Risk factor score.

<sup>22</sup> Broad alpha scores ranging from Aa to Caa are mapped at the midpoint of the associated alphanumeric scores; e.g., for an Aa broad alpha score, we would use Aa2, which maps to a numeric equivalent of 1.71 using the exhibit for Mapping Sovereign Rating Methodology Scoring for Susceptibility to Event Risk.

## EXHIBIT 10

**Mapping Sovereign Rating Methodology Scoring for Economic Strength and Institutions and Governance Strength\***

Economic Strength and Institutions and Governance Strength	Numeric Equivalent
aaa, aa1	2.00
aa2, aa3	1.71
a1	1.43
a2	1.14
a3	0.86
baa1	0.57
baa2	0.29
baa3	0.00
ba1, ba2	-0.29
ba3	-0.57
b1	-0.86
b2	-1.14
b3	-1.43
caa1, caa2	-1.71
caa3, ca	-2.00

\*The effect of this mapping is to compress the alphanumeric sovereign factor scores and convert them to a numeric score for use in the scorecard for reinsurers.

Source: Moody's Investors Service

## EXHIBIT 11

**Mapping Sovereign Rating Methodology Scoring for Susceptibility to Event Risk**

Susceptibility to Event Risk	Numeric Equivalent
aaa	2.00
aa	1.71
a	1.43
baa	0.57
ba	0.00
b	-0.86
caa	-1.71
ca	-2.00

Source: Moody's Investors Service

The numeric Insurance Systemic Risk score is then mapped back to an alphanumeric score as shown in the table below.

The Insurance Market Development factor is based on a simple averaging of separate indicators for Insurance Penetration (total premiums – life and non-life – as a percentage of GDP) and Insurance Density (total premiums – life and non-life – per capita). Insurance Market Penetration is mapped to the global rating scale directly as indicated in the table below. Insurance Density is assessed by country, and then measured or estimated on a worldwide percentile-rank basis, with premiums denominated in US dollars. The Insurance Market Development factor is calculated using three-year averages. These results are then mapped to our global rating scale as shown in the table below.



Modifiers (1, 2, 3) for broad alpha categories from Aa to Caa are produced by interpolating the numerical result to the upper, middle and lower tercile of each factor range as indicated in the following table.

EXHIBIT 12

**Summary of Relevant Metrics:**

Indicator	Factor Weights	Sub-Factor Weights	Aaa	Aa	A	Baa	Ba	B	Caa
Insurance Systemic Risk	2/3		2.0	2.0 - 1.0	1.0 - 0.5	0.5 - 0	0 - (0.5)	(0.5) - (1.0)	<(1.0)
Insurance Market Development	1/3								
Insurance Penetration (% GDP)		50%	>=6.5%	5.5%	4.5%	3.5%	2.5%	1.5%	<1.5%
				-6.5%	-5.5%	-4.5%	-3.5%	-2.5%	
Insurance Density (percentile-rank)		50%	>=90%	75%	60%	45%	30%	15%	<15%
				-90%	-75%	-60%	-45%	-30%	

\* An indicator's alphanumeric scoring bands are based on an equal-width partition of the corresponding broad alpha scoring band for the indicator.

Source: Moody's Investors Service

Having calculated the Insurance Systemic Risk and Insurance Market Development indicators, and mapping each to our global rating scale, these two factors are, in turn, mapped to Aaa to Caa3 (1-19; please see the first table in Appendix 1, which shows alphanumeric and numeric equivalents). The final Operating Environment score is then determined by averaging these numeric scores with a 2/3 weight for Insurance Systemic Risk and a 1/3 weight for Insurance Market Development, and then mapping the result (rounded to the nearest whole number between 1 and 19) to Aaa to Caa3, using the first table in Appendix 1. Absent extraordinary systemic (e.g., economic, social, institutional, political, and judicial) or market development considerations that may not be adequately reflected in these metrics, we generally expect to apply the Operating Environment result without further modification.

## Other Scorecard Considerations in Determining the Standalone Credit Profile: Notching Factors

### Management, Governance and Risk Management

We evaluate an insurer's management, governance, and risk management processes as part of our credit assessment. However, an insurer's management, governance, and risk management only affect the scorecard-indicated outcome to the extent we believe they are not reflected in the Preliminary Standalone Outcome derived from the Business Profile, Financial Profile and Operating Environment discussed above. Notching for these factors has typically been limited. That said, in some instances further assessment of management, governance or risk management may lead to upward or downward notching. Considerations in this factor include:

- » Key person risk. A high dependence on a single executive or group of executives can pose increased risks, because the loss of a single person could adversely affect the insurer's future fundamentals. For example, an insurer whose corporate customers closely associate the chief executive with the institution itself could suffer loss of business, earnings and ultimately reduced capital if the chief executive were to leave, absent adequate succession planning.
- » Strategy and management. A radical departure in strategy, a shake-up in management, or an untested team can all herald sudden change that increases the uncertainty about risk profile. An aggressive growth plan can also signal an elevated risk appetite, while clear weaknesses in risk management can increase exposure to adverse developments. Any concerns regarding the rigor of Board or management oversight may also be considered here.

- » Dividend policy. An aggressive dividend policy may imply reduced financial flexibility. Management teams are often slow to reduce established dividend levels out of concern over negative signaling and adverse share price impact. (The same can be said of share buybacks, although to a lesser extent, as the timing and certainty of execution of even announced buyback programs leave greater management discretion).
- » Compensation policy. Similarly, an aggressive compensation policy, for example, widespread use of high bonus payments relative to salaries, and skewed towards cash, may encourage short-term risk-taking behavior to the detriment of bondholders.

We may reduce our Preliminary Standalone Outcome if we judge that any of these factors has a material bearing on the insurer's overall risk profile. Typically, this would be one notch but could be more if we perceive multiple and/or more deep-seated and serious issues. We may also adjust our Preliminary Standalone Outcome upwards, for example where we perceive sustained exemplary stewardship over time, or exceptional risk management and controls, with a tangible impact on the insurer's risk profile.

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### Accounting Policy and Disclosures

Relevant and timely financial information is a critical part of any financial analysis. Many reinsurers prepare financial information under generally accepted accounting principles either developed by their home country or based on international standards. Financial information is also generally prepared on a regulatory basis of accounting that may be different from generally accepted accounting principles. The presence of a strong government/independent body for financial standards is considered a positive factor when evaluating an accounting regime.

Disclosure of financial information varies widely on a global basis and within regions. In certain locations, regulatory bodies provide access to financial information, although the depth of that information also varies. Some companies have chosen to provide market participants with easy access to their own financial data, which we view favorably.

The consistent application of financial information is a fundamental presumption of financial analysis. When evaluating accounting principles, we consider how well financial reporting mirrors economic reality. Where we believe the economics of a transaction are not consistent with financial reporting, we may make analytic adjustments to metrics derived from financial statements to facilitate our analysis.

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### Sovereign and Regulatory Environment

Deterioration in sovereign credit quality can directly affect the credit standing of insurers domiciled within the sovereign, and, more generally, tends to be associated with macroeconomic and financial market trends that are unfavorable for all.<sup>23</sup> Issuers in the same sovereign environment are exposed to some degree to the transmission of shocks across sectors in the economy and the domestic banking system. In addition, they are subject to defensive sovereign actions that can include austerity measures, changes in tax or regulatory policies, and interference during a crisis. Given this linkage, sovereign credit quality can constrain the IFSR of an insurer.

Our cross-sector methodology that discusses how sovereign credit quality can affect other ratings describes how we consider the insurer's geographic diversification, direct exposure to government debt and product characteristics in analyzing these impacts. Insurers with high geographic diversification, low direct exposure

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<sup>23</sup> See our methodology that discusses how sovereign credit quality can affect other ratings. A link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Publications" section.

to government debt and product characteristics less sensitive to sovereign risks can have an IFSR above the sovereign rating, but generally no more than two notches above.

## Moving from the Standalone Credit Profile to the IFSR — Assessing Support

While the above factors are critical in order to determine the standalone credit profile of reinsurers, the analytic consideration of support - explicit or implicit - from a parent company or affiliate is necessary to determine the IFSR, which can be higher than the company's standalone credit profile. It is important to note, however, that a well-capitalized, profitable reinsurance operating company with a highly leveraged parent or a weak affiliate often has a lower IFSR than it would have were it a free-standing company because of the pressure those factors can place on its earnings and capital.

### Support from a Parent Company or Affiliate

The credit rating of a reinsurer can ultimately be affected by its relationship to its parent, a subsidiary, or affiliate companies through either explicit or implicit support.<sup>24</sup> We incorporate support from a parent company or affiliate into the rating by narrowing the spread (expressed in number of rating "notches") between the standalone credit profile of the entity/security and the rating of the entity providing the support.<sup>25</sup>

Ultimately, our assessment of the extent to which the affiliation benefits the rating is based on a number of variables, including the supporting company's level of commitment to the country / region of the affiliate, brand name sharing, our assessment of how important this entity is to the overall enterprise business model, its size relative to the whole, its geographic proximity to the supporting entity, existence of shared regulatory oversight, full or partial ownership, and its integration with the rest of the organization from a management, distribution, and operating perspective, as well as our view of the company's ability and willingness to support that entity. Support is evaluated incorporating an assessment of past actions of the support provider, current public statements of support and our assessment of the outlook for future support.

Our judgment of how the prospective supporting entity is likely to behave in the future is strongly influenced by our assessment of its prospective economic motivations. Accordingly, strong public statements of support would not be a persuasive reason to raise the rating of a weaker subsidiary if a sound economic rationale for doing so seems lacking. Although support may provide uplift to a company's rating, it may not necessarily raise it to the same level as that of the supporting entity.

While, in most instances, support is incrementally positive, there are instances where group affiliation may constrain the rating of an entity/security relative to its standalone level. For example, if the reinsurer is affiliated with weak or highly-leveraged entities, such association usually, in turn, weakens the reinsurer. Capital often flows from stronger to weaker companies within a controlled group, and frequently before regulatory action can occur.

Explicit support is usually intended to transfer the credit of the supporting entity to the supported affiliate or obligation. Explicit support is generally in the form of a capital maintenance agreement, minimum net

<sup>24</sup> For additional discussion of our rating guidance related to support, see our cross-sector methodology on rating non-guaranteed subsidiaries, which includes credit considerations for assigning subsidiary ratings in the absence of legally binding parental support. A link to an index of our sector and cross-sector rating methodologies can be found in the "Moody's Related Publications" section. In addition, affiliate companies generally refer to companies outside of the analytic unit being rated.

<sup>25</sup> When this occurs, our research typically describes the relationship between the analytic unit and the supporting organization and provides a discussion of the standalone credit profile of the analytic unit.

worth agreement, or some type of direct guarantee. It can also take the form of management contracts, marketing arrangements, reinsurance agreements, or tax-sharing agreements.

In analyzing explicit support, we consider the specific legal nature and enforceability of the support, as well as its possible termination. Explicit support, depending on its structure, can achieve credit transference and bring the affiliate's rating up to that of the supporting entity. However, we also make an assessment as to whether the extension of this support (as well as with implicit support) will weaken the credit profile of the parent or affiliate.

Where support is present, the IFSR typically receives one or two notches of uplift from the standalone credit profile. Although rare, three or more notches of uplift is possible although typically only when strong explicit support is provided. In addition, uplift such that the supported entity's rating is equal to the supporter's rating is rare without meaningful explicit support. This can be the case even where the company's management states that the subsidiary is core to its ongoing strategy and operation, primarily due to the risks that the supporter may change its strategy or the supporter's regulator may constrain support in times of stress, particularly if support is to be provided outside of their own jurisdiction.

Where the owner-supporter is a government and we are using this methodology to assign a BCA, to incorporate support we use our methodology that discusses government-related issuers and the joint default analysis approach described therein. For clarity, support from a non-government owner is incorporated using support portion of the reinsurers scorecard, whereas support from a government owner is considered outside of the reinsurers scorecard.

### Factoring in Support from Other-Than-Related Entities

Our ratings of reinsurers do not typically reflect an expectation of government support. Based on our observations, we believe government support would neither be widely offered nor sufficiently reliable nor predictable to be routinely incorporated into our reinsurance ratings. Local and national governments have allowed some reinsurers to fail without intervention. In the limited cases where such support is received, we consider its credit implications on a case-by-case basis. If we believe government support is long term in nature, or if the insurer is directly owned by the government, we may apply the rating methodology for government-related issuers when evaluating the credit profile of the reinsurer.<sup>26</sup> (Please see the Assigning Insurance Financial Strength and Instrument Ratings section below).

If the reinsurer is part of a bancassurance group, and there is clear evidence that failure of the reinsurer would have negative implications on the creditworthiness of banking operations, the likelihood of support by the government may increase. However, we expect such support to be rarely applied and focused on limiting any damage to the bank franchise.

### Reinsurance Sidecars

Reinsurance sidecars are a type of start-up reinsurer that present certain challenges within the reinsurance rating methodology framework.

A sidecar is a special purpose reinsurer that represents a joint venture between a (re)insurer and third-party investors. The sidecar takes insurance risk by either accepting exposures from the sponsoring (re)insurer or accepting risk directly from reinsurance buyers. In either case, the sponsoring (re)insurer provides the underwriting expertise and claims management.

<sup>26</sup> A link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Publications" section.

Like other start-ups, the lack of an operating history limits the use of income statement based financial metrics for sidecars. However, the past performance of the sponsor, as well as the sidecar's business plan and structural features, are usually sufficient to dimension a range into which the sidecar's business and financial attributes can be placed within the Rating Summary Profile.

Due to their unique structural features, however, our general approach to rating sidecars also uses both quantitative and qualitative considerations beyond those contained in the reinsurance rating methodology. A key component in analyzing sidecars is the use of a stochastic financial model to assess catastrophe and investment risk relative to capital to derive modeled probabilities of default and expected loss. Other considerations may include an assessment of key structural features and the legal documentation regarding the sidecar's operating parameters.

For more details regarding how we assign ratings to reinsurance sidecars, please refer to Appendix 2.

## Other Rating Considerations

Ratings may include additional factors that are not in the scorecard, usually because they may have a meaningful effect in differentiating credit quality, but only in some cases. Such factors include financial controls and the quality of financial reporting; the quality and experience of management; environmental and social considerations; exposure to uncertain licensing regimes; and possible government interference in some countries. Regulatory, litigation, liquidity, technology and reputational risk as well as changes to consumer and business spending patterns, competitor strategies and macroeconomic trends also affect ratings.

Following are some examples of additional considerations that may be reflected in our ratings and that may cause ratings to be different from scorecard-indicated outcomes.

### Special Rating Situations

In a few, very special – and typically adverse – situations, a single rating factor or sub-factor may be so important to a company's financial health and solvency that it overrides all of the others, despite its nominal weighting in the scorecard. This would typically occur in highly adverse situations, where a company's solvency or liquidity is at stake. Examples of this would include the breach of local capital-solvency or risk-based capital thresholds that precede regulatory intervention, or concerns of a looming liquidity crisis – e.g., a material holding company debt maturity with a highly uncertain source of repayment.

If a rated entity has cliff-like rating triggers,<sup>27</sup> its susceptibility to events may be exacerbated.

Special Rating Situations often deal with information that is not necessarily captured by point-in-time ratios, or annual / quarterly regulatory or reporting requirements. For this reason, we may stress critical solvency ratios and liquidity needs to identify potentially severe pressure points, and the resultant scenario may be considered in an additional view of the scorecard.

### Financial Institutions with Limited Financial History

Most rated insurers have many years of financial history and lengthy operating track records that generally act as the basis for our forward-looking credit analysis. Insurers with limited financial history may undergo rapid evolution initially, before developing readily distinguishable and stable operating characteristics.

<sup>27</sup> Rating triggers are typically used in credit agreements covering funded bank loans and unfunded credit lines (providing back-stop liquidity) and in bond indentures and reinsurance contracts. Creditors often use rating triggers in an attempt to protect themselves in the event of credit deterioration. A rating trigger typically provides creditors with certain rights in the event that a borrower's credit ratings change to predetermined levels. These rights run the gamut from step-ups in loan pricing (not very risky) to events of default that would enable the creditor to "put" or accelerate the debt (very risky).

Financial institutions are highly confidence-sensitive. A demonstrable track record can be instrumental in building customer and market trust, which creates franchise value and supports the institution's performance during a down cycle.

The franchise value of start-up insurers is usually weak, and most tend to lack product depth, market share, operating experience as an institution (rather than as a collection of individuals) and a record of resilience through a full credit cycle. Their systems, policies and procedures tend to be less robust than those of established insurers.

For start-ups that lack a financial history of at least several years and in cases of a material transformation in an insurer's business, such that its financial history does not provide a good indication of future results (collectively, insurers with limited financial history), existing financial history provides less insight into the future credit profile. In these cases, our baseline projections may reflect more-conservative expectations than management's projections. In addition, we are likely to make downward adjustments to several factors in our scorecard in order to reflect the considerable uncertainty around our baseline expectations of future operations and financial profile. To the extent these risks and uncertainties are not fully captured in the scorecard, they may be reflected in an assigned IFSR that is lower than the scorecard-indicated outcome.

Insurers with limited financial history may benefit from external support. When material, we incorporate that support into our ratings. In assessing the level of expected support, we generally consider whether the company's status as a start-up could affect the willingness of the support provider to step in should support be needed. For a highly publicized start-up subsidiary of a parent with a solid credit profile, we may expect a high level of support. Certain parent companies and affiliates, conversely, could be less willing to provide support if the reputational and financial risks attached to failure of an early-stage business venture were lower than for subsidiaries with long track records and entrenched businesses in their home markets. We generally expect that governmental support for start-ups, typically small players in the early years of operations that are not systemically important, to be low. Exceptions could include government-owned start-ups and start-up insurers of long-term strategic importance to government policy initiatives.

### Financial Controls

We rely on the accuracy of audited financial statements to assign and monitor ratings in this sector. The quality of financial statements may be influenced by internal controls, including the proper tone at the top, centralized operations, and consistency in accounting policies and procedures. Auditors' comments in financial reports and unusual financial statement restatements or delays in regulatory filings may indicate weaknesses in internal controls.

### Additional Metrics

The metrics included in the scorecard are those that are generally most important in assigning ratings to companies in this industry; however, we may use additional metrics to inform our analysis of specific companies. These additional metrics may be important to our forward view of metrics that are in the scorecard or other rating factors.

### Environmental Risks, Including Climate Change

Reinsurers have significant exposure to the economic consequences of climate change relating primarily to their insured risks and, to a much lesser extent, their investments. Climate-change risks arise primarily from weather-related catastrophe exposures and potential claims on liability policies. The ability of reinsurers to re-price risk on an annual basis somewhat mitigates this risk.

The effects of climate trends on the frequency and severity of catastrophic events are difficult to predict. Climate change adds complexity to underwriting and an extra layer of risk modeling and pricing uncertainty.

A concentration of insured high-value properties along coastlines and the increased severity of weather-related catastrophic events magnify the volatility for these firms and result in a number of risk management challenges associated with the assessment, measurement and mitigation of these risks.

Climate change also affects liability policies. Reinsurers are exposed to potential losses from liability insurance provided to corporations that face litigation alleging damages resulting from carbon emissions, and from companies' failures to disclose the risks of climate change.

### Social Issues

For issuers in this sector, we also consider social issues that could materially affect the likelihood of default and severity of loss, for example through adverse impacts on business reputation, brand strength and employee relations.

## Assigning Insurance Financial Strength and Instrument Ratings

IFSRs are opinions of the ability of insurance companies to pay punctually senior policyholder obligations and claims and also reflect the expected financial loss suffered in the event of default.<sup>28</sup> IFSRs are assigned to legal entities.

In contrast, our long-term debt and preferred stock ratings are assigned to specific instruments issued by either a holding or operating company. The relationship between IFSRs and instrument ratings depends on the legal and regulatory framework in a particular jurisdiction and the relative standing of policyholders and instrument holders in the event of insolvency, bankruptcy, reorganization or liquidation of the entity. The relationship between the ratings for these different classes of creditors is discussed in our cross-sector methodology providing guidance on assigning ratings to instruments issued by insurers.<sup>29</sup> For issuers that benefit from rating uplift from government ownership or other government support, we may assign a Baseline Credit Assessment.<sup>30</sup>

## Global and National Scale Ratings

With the extension of credit ratings to a broader range of markets, our rating scales have evolved to provide comparability on both a globally and nationally consistent basis.

We have developed two rating scale conventions, namely Global Foreign and Local Currency Ratings (GFC and GLC Ratings) and National Scale Ratings (NSRs).<sup>31</sup> By convention, reference to an insurer's IFSR is understood to refer to the Local Currency IFSR on the global rating scale, unless otherwise specified. Foreign Currency IFSRs are the same as the Local Currency IFSRs, except where the Local Currency IFSR is above the country's Foreign Currency Bond Ceiling, in which case it will be the same as the Foreign Currency Bond Ceiling.

<sup>28</sup> Please refer to *Rating Symbols and Definitions* for more details. can be found in the "Moody's Related Publications" section.

<sup>29</sup> A link to an index of our sector and cross-sector credit rating methodologies can be found in the "Moody's Related Publications" section.

<sup>30</sup> For an explanation of the Baseline Credit Assessment, please refer to *Rating Symbols and Definitions* and to our cross-sector methodology for government-related issuers. A link to an index of our sector and cross-sector methodologies and a link to *Rating Symbols and Definitions* can be found in the "Moody's Related Publications" section.

<sup>31</sup> See our cross-sector methodology for mapping national scale ratings from global scale ratings. A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

## Assumptions

Key rating assumptions that apply in this sector include our view that sovereign credit risk is strongly correlated with that of other domestic issuers, that legal priority of claim affects average recovery on different classes of debt sufficiently to generally warrant differences in ratings for different debt classes of the same issuer, and the assumption that access to liquidity is a strong driver of credit risk.

Our forward-looking opinions are based on assumptions that may prove, in hindsight, to have been incorrect. Reasons for this could include unanticipated changes in any of the following: the macroeconomic environment, general financial market conditions, industry competition, disruptive technology, or regulatory and legal actions.

## Limitations

In the preceding sections, we have discussed the scorecard factors, many of the other rating considerations that may be important in assigning ratings, and certain key assumptions. In this section, we discuss limitations that pertain to the scorecard and to the overall rating methodology.

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### Limitations of the Scorecard

There are various reasons why scorecard-indicated outcomes may not map closely to actual ratings.

The scorecard in this rating methodology is a relatively simple tool focused on indicators for relative credit strength. Credit loss and recovery considerations, which are typically more important as an issuer gets closer to default, may not be fully captured in the scorecard. The scorecard is also limited by its upper and lower bounds, causing scorecard-indicated outcomes to be less likely to align with ratings for issuers at the upper and lower ends of the rating scale.

The weights for each sub-factor and factor in the scorecard represent an approximation of their importance for rating decisions across the sector, but the actual importance of a particular factor may vary substantially based on an individual company's circumstances.

Factors that are outside the scorecard, including those discussed above in the "Other Rating Considerations" section, may be important for ratings, and their relative importance may also vary from company to company. In addition, certain broad methodological considerations described in one or more cross-sector rating methodologies may be relevant to ratings in this sector.<sup>32</sup> Examples of such considerations include the following: how sovereign credit quality affects non-sovereign issuers, the assessment of credit support from other entities, the relative ranking of different classes of debt and hybrid securities, and the assignment of short-term ratings.

We may use the scorecard over various historical or forward-looking time periods. Furthermore, in our ratings we often incorporate directional views of risks and mitigants in a qualitative way.

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<sup>32</sup> A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.



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### General Limitations of the Methodology

This methodology document does not include an exhaustive description of all factors that we may consider in assigning ratings in this sector. Companies in the sector may face new risks or new combinations of risks, and they may develop new strategies to mitigate risk. We seek to incorporate all material credit considerations in ratings and to take the most forward-looking perspective that visibility into these risks and mitigants permits.

Ratings reflect our expectations for an issuer's future performance; however, as the forward horizon lengthens, uncertainty increases and the utility of precise estimates, as scorecard inputs or in other rating considerations, typically diminishes. In any case, predicting the future is subject to substantial uncertainty.

## Appendix 1: Using the Scorecard

This appendix describes how we use the scorecard to arrive at an alphanumeric scorecard-indicated outcome.

Alphanumeric categories from Aaa to C are mapped to numeric values of 1 through 21, as follows:

Alphanumeric Categories	Numeric Value
Aaa	1
Aa1	2
Aa2	3
Aa3	4
A1	5
A2	6
A3	7
Baa1	8
Baa2	9
Baa3	10
Ba1	11
Ba2	12
Ba3	13
B1	14
B2	15
B3	16
Caa1	17
Caa2	18
Caa3	19
Ca	20
C	21

Source: Moody's Investors Service

Qualitative sub-factors are scored on a broad alpha scale based on the scoring descriptions (with an equivalent numeric score based on the midpoint of that alpha category), and these sub-factor scores are combined to produce an alphanumeric factor score. A numeric value for each score is mapped from the table above. A numeric value between 1 and 18 is established for each financial metric through linear interpolation. Taking, for example, the scoring ranges for the Financial Flexibility factor, a company with adjusted financial leverage of 22% would map to a numeric score of 3.6, and fall within the Aa range for that metric, and a company with financial leverage of 30% (mapping to a 6.0 numeric score) would fall within the A range. The weightings per the table below are then applied to arrive at an overall numeric value for each scorecard factor. The numeric value by scorecard factor is mapped back to the Aaa through C scale shown above.

Each scorecard factor is assessed and then weighted according to its importance within our rating approach for the industry. The Operating Environment score, to the extent it corresponds to a broad alpha category of Baa or below, is accorded a weight as shown in the following table. These weights apply regardless of the modifier (1, 2 or 3). The Operating Environment's weight is variable and increases toward the lower end of the rating scale for scores at the Baa level or below. Importantly, the Operating Environment component is reflected in a reinsurer's credit profile only to the extent that it exerts a downward influence.

	Aaa	Aa	A	Baa	Ba	B	Caa
Operating Environment Weights	n/a	n/a	n/a	20%	40%	60%	80%

Source: Moody's Investors Service

Once the weighted average result (based on the company-specific business and financial factors) is calculated, it is multiplied by one minus the Operating Environment weight, and then added to the result of the Operating Environment weight multiplied by the numeric value associated with the Operating Environment component. Using those weightings, a weighted average is calculated, which is then mapped back to the Aaa through C scale shown above. The result is oriented to the IFSR in the local or foreign currency. This scorecard-indicated outcome may be different from the final rating because it does not consider the analyst's input to the individual factors, or management and governance, special rating situations, and accounting policy and disclosures, as well as implicit/explicit support.

The weightings shown below are our assessment of the typical relative importance of the company-specific factors and sub-factors, and of the Operating Environment for reinsurers, but in assigning ratings, individual factors or sub-factors may have greater or lesser weight depending on the specific characteristics of the insurer. The metrics are primarily calculated based on public information. Non-public financial data or public financial data modified due to accounting and reporting formats in other than US GAAP or IFRS may also be used.

	Factor Weighting	Metric Weighting (relative to factor weights)
<b>BUSINESS PROFILE</b>		
<b>Factor 1: Market Position, Brand and Distribution</b>	<b>20%</b>	
Relative Market Share Ratio (NPW relative to the average NPW of the Top 40 reinsurers)		50%
Direct Reinsurance Premiums as % GPW		50%
<b>Factor 2: Business and Geographic Diversification</b>	<b>15%</b>	
Business and Geographic Diversification		100%
<b>FINANCIAL PROFILE</b>		
<b>Factor 3: Asset Quality</b>	<b>10%</b>	
High Risk Assets % of Shareholders' Equity		40%
Reinsurance Recoverables % Shareholders' Equity		30%
Goodwill + Intangibles % Shareholders' Equity		30%
<b>Factor 4: Capital Adequacy</b>	<b>20%</b>	
Gross Underwriting Leverage		50%
Gross Natural Catastrophe Exposure at 99.6% annual aggregate PML		25%
Net Natural Catastrophe Exposure at 99.6% annual aggregate PML		25%
<b>Factor 5: Profitability</b>	<b>10%</b>	
Return on Capital (ROC)		50%
Sharpe Ratio of ROC*		50%
<b>Factor 6: Reserve Adequacy</b>	<b>10%</b>	
Loss Reserve Development % Beginning Net Reserves**		100%
<b>Factor 7: Financial Flexibility</b>	<b>15%</b>	
Adjusted Financial Leverage		25%
Total Leverage		25%
Earnings Coverage		50%
<b>Subtotal – company-specific factors</b>	<b>100%</b>	
<b>OPERATING ENVIRONMENT</b>	<b>Variable (see above)</b>	

\* When calculating the Sharpe ratio, if the average ROC of the analytic unit is 0 or negative, this ratio is not meaningful, and the weight of this sub-factor is reallocated to the ROC sub-factor.

\*\* If the reserve adequacy sub-factor is not used, its weight is proportionally distributed among the remaining scorecard sub-factors in the Business Profile and Financial Profile factors.

Source: Moody's Investors Service

Differences between the scorecard-indicated outcome and the standalone credit profile may exist due to analytic judgment regarding the weighting of the factors, the importance of the other analytic considerations, or other unique fundamentals of the company not appropriately captured or weighted by the scorecard. Furthermore, the standalone credit profile may be different from the actual rating due to affiliate support or sovereign considerations.

## Appendix 2: Reinsurance Sidecars: Principles

A reinsurance sidecar is a special purpose reinsurer that represents a joint venture between a (re)insurance sponsor and third-party investors. Most of these joint ventures run for a limited time, usually between one to three years, but they can be renewed. Sidecars allow investors to invest in insurance risks -- typically property catastrophe reinsurance -- by leveraging the underwriting expertise of the sponsor. A sidecar can gain exposure to insurance risk by providing reinsurance exclusively to the sponsor ("exclusive sidecars") or to other (re)insurers ("market-facing sidecars"). Exhibit 1 (see below) provides more details about corporate structures of sidecars. Unless a sidecar has a credible track record (and/or a public financial strength rating), it will likely have to earmark collateral for potential claim obligations -- sometimes up to the full limit of exposure -- by placing the seed capital and premiums in a collateral trust account. Sponsors like sidecars because they allow them to maintain or expand capacity, structure away reinsurance credit risk (if they are ceding risk to the sidecar), and receive attractive fee income to boot, without having to tap the reinsurance market or raise capital on their own balance sheets. Reinsurers of modest size like sidecars because they allow them to "punch above their weight." Investors like them because they are an uncorrelated asset class, a way to enhance Sharpe ratios. They can be structured to court a range of investors -- hedge funds and private equity funds for common equity, CLOs and credit funds for subordinated loans, and banks and pension funds for senior securities.

Our approach to rating debt securities of sidecars reflects both quantitative and qualitative considerations discussed in the following Principles that are in addition to the criteria contained in our methodology for rating traditional reinsurers. Quantitatively, we compute the probability of default  $P(D)$  and expected loss  $E(L)$  to the debt using a stochastic financial model. This approach involves the following steps: (i) assessing the promise of interest and principal to investors; (ii) examining the potential loss scenarios and their associated probabilities; (iii) calculating  $P(D)$  and  $E(L)$  relative to the promised interest and principal; (iv) comparing  $P(D)$  and  $E(L)$  to Moody's Idealized Cumulative Default and Expected Loss Rates with the same weighted average life, in order to derive a rating.

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### Sidecars Are Not Cat Bonds

Unlike cat bonds, sidecars arise from direct negotiations between (re)insurance companies and equity investors. The sponsors/cedants want to buy reinsurance protection from the capital markets, but wish to do so on terms and conditions that are more familiar to them than those offered by cat bond contracts. The investors tend to be those who have developed reinsurance expertise through their prior experience with cat bonds but also include investors that have little or no prior experience in the space.

Sidecars are similar to cat bonds in that both can be used to transfer cat risk to investors: both can remove credit risk for the cedants, both rely heavily on peril modeling, and both can offer multi-year contracts. But from the cedant's perspective, sidecars resemble traditional reinsurance companies -- and differ from cat bonds -- in three important ways.

First, most sidecars reimburse their cedants for actual losses incurred — that is, on an indemnity basis — whereas some cat bonds employ non-indemnity, index triggers.<sup>33</sup> Cedants typically prefer indemnity contracts because they can avoid basis risk,<sup>34</sup> use reinsurance accounting rather than derivative accounting, and receive fee income through ceding and profit commissions. Importantly, indemnity contracts allow for broad inclusion of worldwide or nationwide portfolios, which would be difficult to accommodate in cat bonds with parametric or modeled triggers.

Secondly, sidecars have attracted new investors to this asset class, in addition to the usual investors such as cat bond funds. Sidecars, unlike cat bonds, allow for equity interests, which in turn leads to direct negotiation between equity investors and sponsors, greater customization, and deal features that can shift benefits and risks between stakeholders. Equity investors may be guided by cash flow models that help them negotiate to ROE targets. Moreover, sidecar debt can be issued as loans rather than bonds. These loans can provide for mandatory prepayments under certain circumstances, which means lenders face reinvestment risk but they do not have to wait until final losses are determined before they get some of their money back.

The third difference between sidecars and cat bonds has to do with how risk is transferred to investors. Sidecars can use quota share (QS) reinsurance arrangements to transfer risk to investors because equity investors want to share in the upside. Cat bonds on the other hand use excess-of-loss (XOL) arrangements. In QS reinsurance, the reinsurer reimburses the cedant for a fixed percent of losses, in return for the same percent of premiums, net of a ceding commission. In XOL reinsurance, the reinsurer protects the cedant against a layer of losses above a certain level (attachment point), up to some other level (exhaustion point), in exchange for an agreed consideration. There is no sharing of premiums.

Each form of reinsurance speaks to different motivations that can be important to understanding the credit risk. Cedants use QS as a form of capital substitute to enable them to maintain or increase writings which would otherwise require an increase in capital and reserves. Cedants use XOL as a form of protection against large single losses or a large accumulation of losses.

QS and XOL also differ in the extent of coverage provided to the cedant. QS not only reimburses the cedant for large losses but for small losses too, without any loss limits per risk or event. QS also provides protection to the cedant against (what underwriters call) the “risk of change”, which means that the reinsurer (investor) would share in losses resulting from inadequate rates charged by the cedant (sponsor).

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## Principles for Analyzing Sidecars

### Principle #1: Cat modeling is done by math, business is done by people. Sidecars are a mix of both.

Put another way, sidecar participants see value in direct negotiation. All else equal, sidecar debt investors are better served by an equity investor who is knowledgeable about reinsurance to ensure a ‘fair fight’ during negotiations between the sponsor and investors. For this reason, we typically form a view on the

<sup>33</sup> Cat bonds can be structured with various types of payment triggers. A payment trigger determines whether a natural or man-made catastrophe qualifies for coverage and if so, the payments due to the sponsor from the cat bond vehicle. Indemnity triggers mirror traditional reinsurance contracts because payments are based on the actual size of losses incurred by the sponsor. Sponsors like this approach because they can avoid basis risk, which is the risk that the payout determined by the trigger calculation will differ from the actual loss incurred by the sponsor. With indemnity triggers, however, investors need to fully understand the sponsor's portfolio and trust that the sponsor will settle claims in a way that will not disadvantage them. Because of these complications to investors, many cat bonds use index-based triggers. Index-based triggers expose sponsors to basis risk but increase transparency to investors. These triggers fall into three broad categories: industry-loss, modeled loss, and parametric indices, or some hybrid of these. With industry-loss indices, payments are triggered by an estimate of the aggregate insurance industry loss from a catastrophe event, where the estimate is derived from a reporting service such as Property Claim Services (PCS). Modeled loss indices are similar, except that the estimate of industry loss (or the sponsor's loss) is based on a vendor's catastrophe model. A modeled loss is calculated by running the reported physical parameters of a catastrophe (e.g., wind speed of a hurricane) against the vendor's database of industry exposures or against a pre-defined synthetic portfolio that approximates the sponsor's exposures. With parametric indices, payments are triggered simply by the occurrence of a catastrophe with certain physical parameters (e.g., magnitude and location of an earthquake).

<sup>34</sup> Basis risk is the risk to the sponsor that the payout determined by the trigger calculation will differ from the actual loss incurred by the sponsor.

likely motivations of the parties at the negotiating table by considering the following: Why does the sponsor prefer this structure? Are the sponsor's proposed management fees and performance fees reasonable? If the sponsor is the exclusive cedant, what reinsurance sits below and above this sidecar reinsurance contract? Are the ceding and profit commissions reasonable? What does the ceding commission say about the diversification of the underlying portfolio? (In traditional markets, ceding commissions are generally higher for better diversified portfolios.)

### Principle #2: Structural features regulate behavior.

Structural features in sidecars are often just business rules for traditional insurance concepts like operating leverage, reserve leverage, and reserve development. These rules are established upfront and regulate the behavior of the stakeholders. Similar to how regulators would step in — to restrict dividends, to limit business written — if certain metrics were breached at an insurance company, the structural features do the same for the sidecar. And just as regulators seek to protect the best interests of the policyholder, the structural features seek to protect the best interests of the cedant(s). The difference is that, in the case of exclusive sidecars, the parties can negotiate these features to shift some of the benefits (and risks) from the sponsor to the investors.

Not all sidecars have elaborate structural features. The simplest sidecars are market-facing vehicles that earmark collateral for the full limit of exposure. These sidecars do not require elaborate structural features because they tie up all their capital as collateral and cannot free up any capital until claim obligations are resolved.

A popular feature among exclusive sidecars is a minimum collateral test. The test is formulaic. The idea is that if the sidecar does not have enough capital to meet this test, the amount of risk ceded to the sidecar will be reduced and payments to investors will be restricted. Sponsors view the test as protection; equity investors view it as a constraint. Debt investors view the test with more ambivalence. A restrictive test would limit the risk that the sidecar can take on — a credit positive. But if the test is designed with a large reserve cushion to protect the sponsor, more of the investor's money will be tied up in the vehicle for a longer period of time, and more money will be exposed to extension and commutation risk (Principle #3).

### Principle #3: Sidecars and cat bonds are not the same when it comes to risk.

Sidecar investors are exposed to various risks. Modeling risk is discussed in Principle #5. Risk of change is discussed in Principle #4. Four other risks are discussed here. Cat bonds are also exposed to these risks, but differ in how they address each one.

**Adverse selection** is the possibility that the cedant(s) might pass on the bad parts of its portfolio to investors and keep the good parts for itself. For sidecars, this may be mitigated by including a cedant's full portfolio (e.g., all property cat business worldwide) or by establishing specific rules to govern the selection of qualifying business. For cat bonds with parametric or modeled triggers, including the full portfolio may add complexity if risks are spread out.

**Moral hazard** is the possibility that the cedant(s) might have less incentive to limit its losses once it has transferred the risk to investors (e.g., relaxed underwriting policy or relaxed claim settlement practices). For sidecars, this may be mitigated by using a quota share structure. Profit commissions can provide further incentive for the cedant(s) to underwrite business carefully. But again, the sharing of fortunes is not symmetric; it is important to consider whether the ceding and profit commissions are reasonable (Principle #1). For cat bonds, moral hazard may be mitigated by having the cedant(s) retain a percentage of losses in the reinsured layer (i.e., co-participation). For both indemnity cat bonds and sidecars, the wording in the net retention clause (warranty) is critical, especially limitations on what reinsurance the cedant(s) can buy on its retained share, to ensure it has enough "skin in the game".

**Extension and commutation risk.** It could take years to determine exact losses. If there is a delay in repaying investors while losses are determined, an investor's annual rate of return will be reduced (extension risk). On the other hand, if obligations between the cedant(s) and investor are settled prematurely based on the cedant's loss estimates, investors face the risk of overestimation (commutation risk). For indemnity contracts, whether sidecars or cat bonds, extension risk may be mitigated by payment/coupon step-ups while losses are determined; commutation risk may be mitigated by using an independent party to verify loss estimates or by providing an avenue for arbitration. Regardless, the commutation process will be subjective (which is why we typically put a probability distribution around the tail in our rating analysis). For this reason, some cat bonds employ non-indemnity triggers that allow parties to determine quickly and objectively whether a payment is triggered and how much.

**Deviation from the Expected Portfolio:** As the cedant(s) writes new business, the risk in the portfolio could deviate from what was contemplated at inception. Three strategies for controlling this risk are: 1) using rules to define the exact contracts or exposures that can be included in the portfolio, 2) compensating investors for the extra risk they assume, and 3) using trigger resets to "refresh" the deal periodically.

The first strategy has limitations because cedant(s) cannot always control how many or which contracts they write; it depends on their clients' needs. But most sidecars and cat bonds do restrict the lines of business or geographies that can be included in the portfolio.

The second strategy is inherent in sidecars with quota share structures. If the cedant(s) grows the risks in the portfolio, and presumably collects more premiums for those risks, then the investor will share in those premiums as well. Of course, if the cedant(s) charges premiums that are inadequate for the extra risk, then investors will not be sufficiently compensated for the extra risk (Principle #4).

The third strategy — use of periodic trigger resets — is an important distinction between sidecars and cat bonds. Cat bonds may use them, sidecars generally do not. Trigger resets keep the probabilities of debt attachment and exhaustion constant from year to year, no matter how much more (or less) business the sponsor/cedant(s) writes or what losses are incurred. Some sidecar features may partially reset the deal, but the resets are never perfect because of competing interests. For example, suppose large losses in year 1 reduce equity capital to \$1. Clearly, the equity investor will want to write as much business as possible in year 2 to try to recoup his losses (though the rules may prevent doing so) rather than keep the probability of debt attachment constant. But lack of trigger resets can also be a credit positive in sidecars because retained earnings in one year can be carried over to the next.

Example: How Trigger Resets Affect Expected Loss

**Exhibit 2** (see below) provides further evidence that sidecars do not generally have constant probabilities of attachment. The graphs show which year of losses — year 1, year 2, or year 3 — correlate most to the probability of default to debt principal (ignoring interest and other considerations for the moment). Each graph shows rank sum correlations based on 100,000 simulation scenarios. Note that the year 2 loss matters most for the sidecar with no trigger reset. By contrast, all three years of losses matter equally for the cat bond with trigger reset.

Constant probabilities of attachment and exhaustion can make the math simpler. **Exhibit 3** (see below) shows an ad hoc way of deriving the probability of default on debt principal, assuming the sidecar has perfect trigger resets and ignoring interest payments and special features (which we believe are unrealistic assumptions). The approach has significant limitations, but it may be somewhat useful for those who do not have access to the deal model. Our preferred approach is to run simulations against a financial model (or deal model) to derive the probability of default  $P(D)$  and expected loss  $E(L)$  (relative to the promised interest and principal) over a multi-year horizon, allowing structural features to play out in the model.  $P(D)$  and  $E(L)$



are then mapped to Moody's Idealized Cumulative Default and Expected Loss Rates with the same weighted average life in order to arrive at a rating. Our default and expected loss rates can come out higher or lower than those derived using the ad hoc approach, depending on the structure and loss assumptions. (Our ratings also contemplate other risks discussed in these Principles, some of which cannot be easily quantified.)

#### Principle #4: "Risk of change" in premium levels affects sidecars

Sidecars with quota share structures are exposed to what underwriters call the "risk of change", meaning that the sidecar would share in any losses stemming from inadequate rates charged by the cedant(s).

In our scenario analysis, we commonly consider scenarios with reduced rates (and reinstatement premiums). In deciding how much to reduce them, we find it useful to have knowledge about the portfolio's layer profile (aggregate limits of liability plotted against attachment points and against renewal dates by geography), a rough sense for who the underlying clients are, and a breakout of underlying lines (residential/commercial/surplus/marine/retro line split). For a particular territory and peril, rate-on-line should generally be higher for lower attachment points. A pricing squeeze directly impacts sidecars but not cat bonds, but a loosening of terms and conditions impacts both indemnity cat bonds and sidecars. In a softening market, cedants will not only demand lower prices but also more favorable contract terms. One enhancement that reinsurers may be willing to offer is coverage for Extra Contractual Obligations (ECO). ECO refers to (usually) punitive damages awarded by a court against a (re)insurer above and beyond the coverage provided by the (re)insurance contract, typically for bad faith, fraud or negligence when dealing with a claim (we're including Excess of Policy Limits (XPL) claims here). Sidecar investors usually have to follow all original settlements, meaning they are obligated for their share of ECOs and, in some cases, compromise and ex gratia payments as well. This is important because catastrophe models do not explicitly account for these extra contractual claims (see Principle #5).

#### Principle #5: Cat curves embed 'risk on risk': our four C's

Industry catastrophe models estimate insured losses based on *estimated* damages (vulnerability function) from *estimated* hazards (Mother Nature) on *estimated* exposures (company's data). This layering of 'risk on risk' suggests that model outputs are highly uncertain.

Model outputs are often summarized in the form of a curve that shows the probability 'p' that a given loss 'L' will be exceeded. 'L' could be annual losses from a single catastrophe occurrence (in which case it is called an Occurrence Exceedance Probability (OEP) curve) or annual losses from multiple catastrophe events (in which case it is called an Aggregate Exceedance Probability (AEP) curve). We use the AEP curve in our analysis. The point is that both 'p' and 'L' are uncertain.

To reflect this 'risk on risk' in the AEP curve, we adopt a "Four C's" approach—Composition, Calibration, Conservatism, and Comparison.

- » **Composition** (or more accurately decomposition): **Exhibit 4** shows a combined (all perils, all regions) AEP curve decomposed into contributions from each peril-region zone. European Windstorms and U.S. Hurricanes contribute the largest share of the risks in this example, and more toward the tail of the curve. An important consideration is whether the moderate extent of diversification justifies the ceding commission paid to the sponsor. This graph provides leads for further inquiry. For example, data quality tends to be better in the U.S. than in other parts of the world but if the sponsor uses aggregate level models, which rely on industry average assumptions about property characteristics rather than full property-specific information, then the benefits of better data are negated. If the portfolio has significant exposure to UK winter storms and flooding, collection of detailed location data is important because models can be very sensitive to the location of the risk. Data quality tends to be less detailed in

other parts of Europe and problematic in countries like Japan where buildings are numbered by the order in which they are built.

- » **Calibration:** Returning to our example, since U.S. Hurricane is one of the biggest perils. We typically consider where the historical or pro forma losses from Hurricanes Katrina/Rita/Wilma ("KRW") fall on the curve. Our baseline is that a scenario like KRW could happen as frequently as once in every 15 years. If the sponsor's AEP curve suggests something more remote, we would likely calibrate (dial up) the curve so that KRW falls within a 15 year return period.
- » **Conservatism:** Exhibit 5 is a series of questions we typically ask sponsors to evaluate their level of risk tolerance (i.e., conservatism or lack of conservatism) in their aggregation management and cat modeling practices. Here are some rules of thumb that we use to decide how much to penalize or give credit to sponsors for ('+' means we typically dial up their loss curve, '-' means we give credit or dial down their loss curve):
  - Use of aggregate level models, not detailed level models, for pricing and/or aggregation management: (+5%-10% for pricing, +5-10% for aggregation management);
  - Aggregation methodology: lack of zonal limits (+10-20%), aggregating exposures at a peril-region level first before convoluting those curves to generate the overall curve (-5%);
  - Secondary perils that can be modeled but are not (+ or - % varies depending on a comparison of modeled results with and without these secondary perils turned on);
  - Secondary uncertainty, demand surge/loss amplification, near-term climate assumptions: penalized if these features are not turned on (+% varies depending on a comparison of modeled results with and without these features switched on);
  - Unmodeled elements: (a) unmodeled perils and regions for which commercial models are available (+% varies depending on amount of exposure), (b) unmodeled perils and regions for which commercial models are not available (+% varies depending on amount of exposure), (c) unmodeled elements of modeled contracts (+3-10% for loss adjustment expenses, +5% for ECOs and ex gratia), (d) unmodeled classes (+% varies depending on amount of exposure);
  - Low resolution data (+5-10%), lack of procedures to check for under-reporting of sums insured (+5-10%), lack of rigorous exposure adjustments to data (+5-10%).

**Comparison:** Finally, we usually compare a sponsor's AEP curve to that of another company with a similar portfolio. To do so, we typically normalize each curve by dividing dollar losses by the sponsor's projected annual premiums. If Company A's curve lies below Company B's curve, and assuming they have very similar portfolios, then Company A may be understating modeled losses or making overly optimistic rate assumptions.

## Appendix 2 – Exhibit 1

### One possible corporate structure for a sidecar

A sidecar can be structured as a market-facing reinsurer or an exclusive reinsurer. A market-facing sidecar operates in the reinsurance market much like a traditional reinsurer except that underwriting and claims management are handled by the (re)insurance sponsor or a team hired by the sponsor. The sponsor receives a management fee and/or performance fee for its services. An exclusive sidecar sells reinsurance to only one cedant, the sponsor itself, usually through a quota share reinsurance agreement.

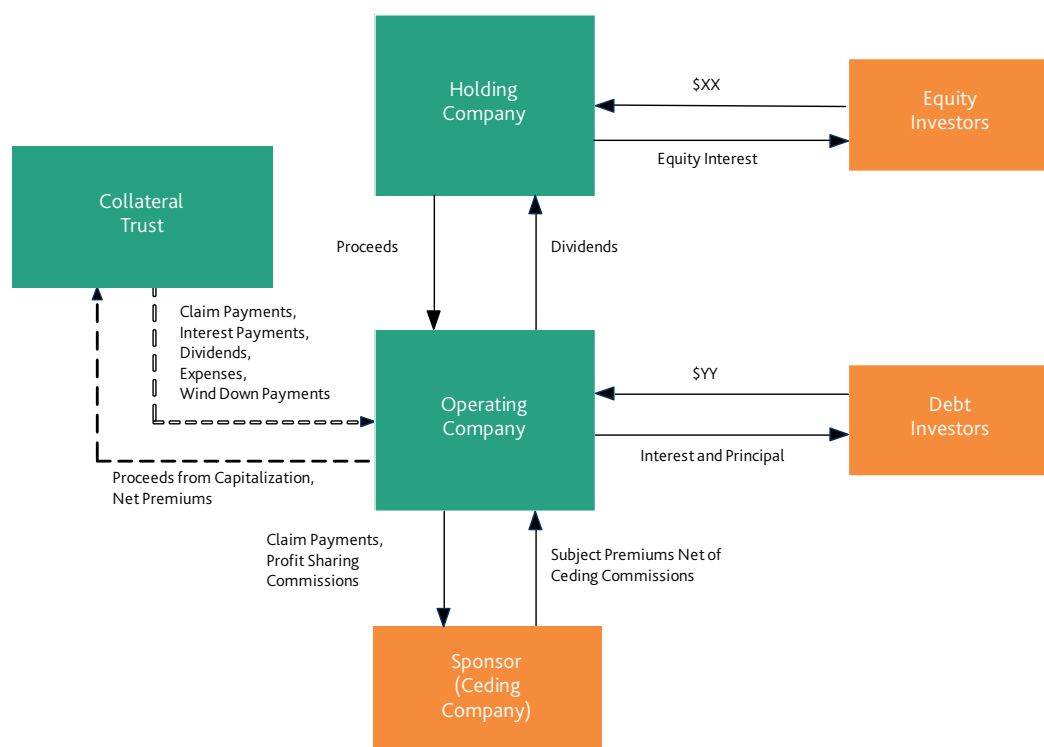
One popular corporate structure for those exclusive sidecar transactions is shown below. A new holding company, operating company, and collateral trust are set up. Investors capitalize the vehicle. The operating company (sidecar) and sponsor enter into a reinsurance contract whereby the sponsor passes on a portion

of its risk and premiums to the operating company, often through a pro rata arrangement. The sidecar relies exclusively on the underwriting and claims expertise of the sponsor. In exchange for this expertise and as reimbursement for underwriting expenses, the sponsor deducts a ceding commission from the sidecar's share of premiums. In addition, the sponsor will usually receive a profit commission to the extent the ceded business is profitable.

The initial proceeds from investors, along with the sidecar's share of premiums (net of ceding commissions), are deposited into the collateral trust. As losses are incurred, money is funneled out of the trust to pay the sponsor for the sidecar's share of losses. Trust funds can be released to pay interest and dividends, and to return capital to investors, only if amounts in the trust exceed amounts specified by pre-defined rules. These rules are intended to ensure there are enough funds in the trust to reimburse the sponsor for losses (see Principle #2). If trust funds fall below certain thresholds, the amount of business ceded to the sidecar may also be reduced going forward.

The reinsurance contract between the sponsor and sidecar may cover multiple underwriting years, but it varies. The sidecar may have the option to extend the deal by one additional underwriting year if equity investors lose money in prior years. Once the underwriting periods end, the capital structure begins to unwind and capital is gradually returned to investors based on pre-defined rules. After a certain loss development period, obligations between the sponsor and sidecar are extinguished through a commutation (see Principle #3).

#### One Possible Corporate Structure for an Exclusive Sidecar (Where the Sponsor is the Sole Cedant)



Source: Moody's Investors Service

## Appendix 2 – Exhibit 2

### Sidecar (no trigger reset) vs. Cat Bond (with trigger reset)

Each diagram shows — based on 100,000 simulation scenarios — the rank sum correlations between the probability of attaching the debt within three years and the year 1, year 2, and year 3 losses (ignoring other risk factors for the moment). For the sidecar without trigger resets, the year 2 loss matters most, but losses in all three years matter equally for the cat bond with trigger resets. Sidecars generally do not have constant probabilities of attachment over the life of the deal.

EXHIBIT 2A

#### Sidecar (no trigger reset)

Rank Sum Correlation with Default Probability

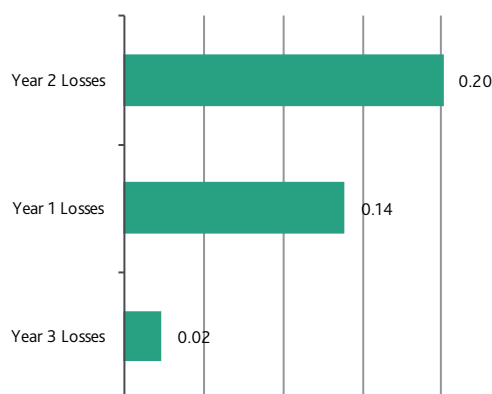


EXHIBIT 2B

#### Cat Bond (with trigger reset)

Rank Sum Correlation with Default Probability

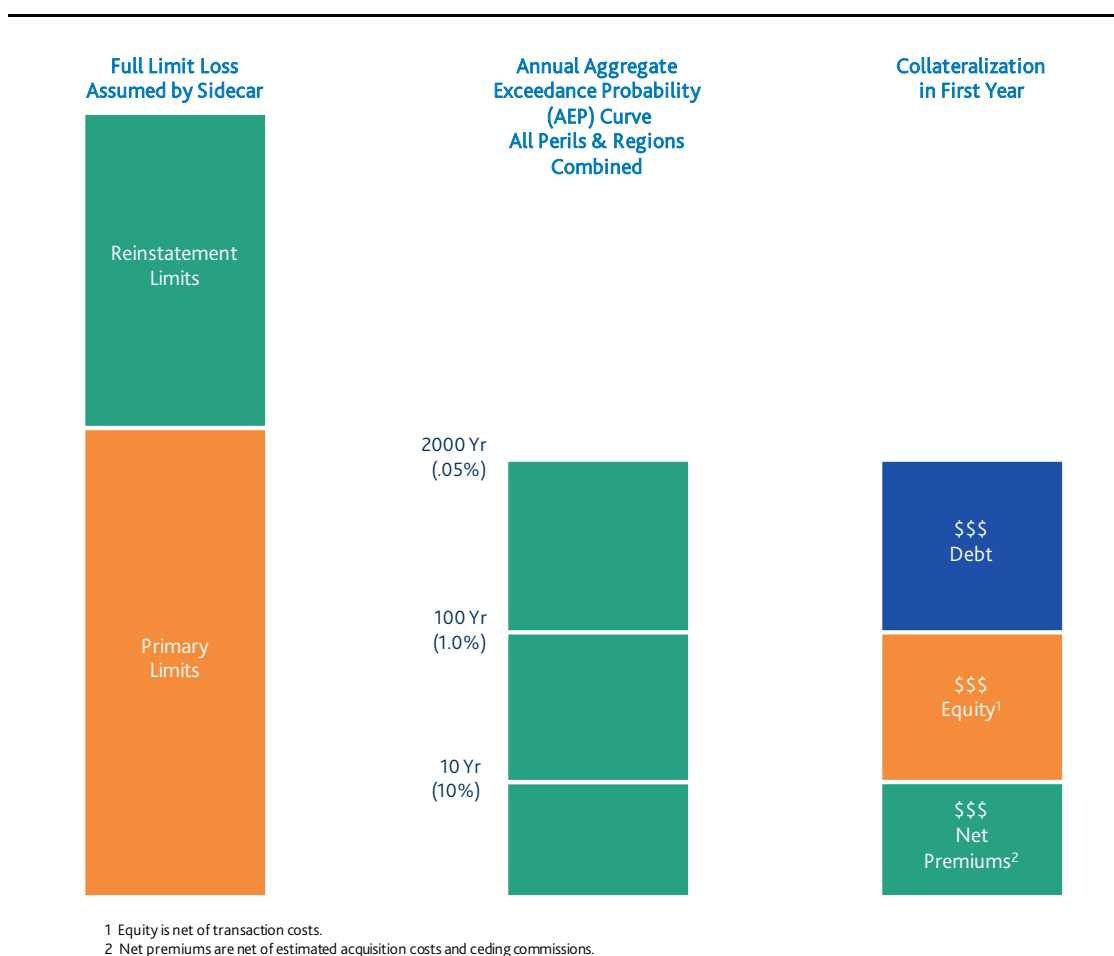


Source: Moody's Investors Service

## Appendix 2 – Exhibit 3

### An unlikely scenario that nonetheless provides insights for analyzing sidecars

In this theoretical scenario, a sidecar has debt that attaches at a 1-in-100 year annual aggregate loss (1% per annum) **in the first year**. The weighted average life of the debt is 2 years. The sidecar does not have a periodic trigger reset, but let us assume that it does. In other words, the probability of attaching the debt is somehow held constant for both years. The probability of surviving the first year would be 99%. Given survival for the first year, the probability of surviving the second year would be 99%. The probability of surviving both years is  $(99\%)(99\%) = 98.0\%$  and the probability of failing (attaching the debt) within two years  $= 1 - 0.98 = 2.0\%$ . Mapping this to Moody's Idealized Default Rates, with a two year horizon, would indicate a rating of Ba1 (assuming probability of default and expected loss were the same, and absent any other considerations). Again, we emphasize this scenario is extremely unlikely, because sidecars generally do not have trigger resets, but it offers analytical insights, particularly in the absence of access to the deal model (financial model). Our preferred approach is to run simulations against a financial model to derive the probability of default and expected loss relative to promised interest and principal over a multi-year horizon, allowing structural features to play out in the model. These numbers are then mapped to Moody's Idealized Default and Expected Loss Rates assuming a time horizon equal to the weighted average life. Our default and expected loss rates can come out higher or lower than those derived using this ad hoc approach, depending on the structure and our loss assumptions.



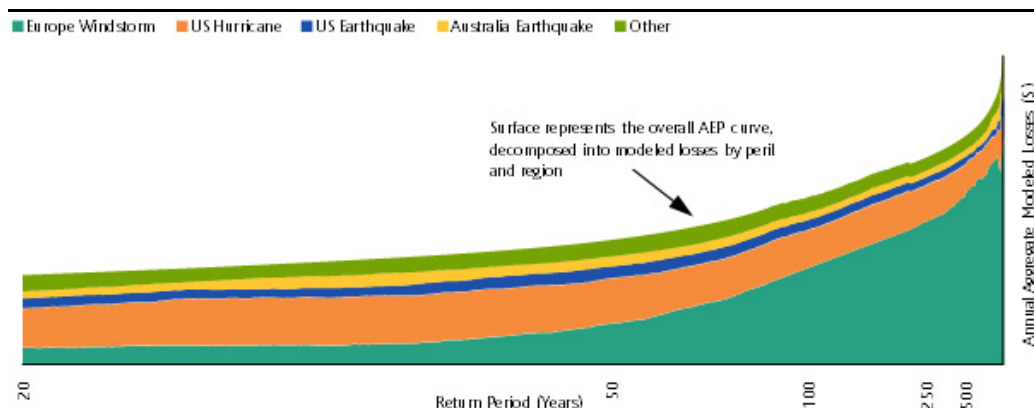
Source: Moody's Investors Service

## Appendix 2 – Exhibit 4

### Composition/Decomposition of an Annual Aggregate Exceedance Probability (AEP) Curve

Below is an example of an annual Aggregate Exceedance Probability (AEP) curve. The curve summarizes the model output generated by industry vendor models. It shows the probability (x-axis) that aggregate losses (y-axis) will be exceeded in a single year. The exceedance probability (x-axis) is expressed as a return period, which is just the reciprocal of the exceedance probability. For example, a return period of 100 years means that losses corresponding to that point are expected to be exceeded once in 100 years. An AEP curve can be created for a single peril-region (e.g., Florida hurricane) or for all perils and regions combined (i.e., overall AEP curve). Most often, we will use the overall AEP curve in our financial modeling.

It is helpful to decompose the overall AEP curve into losses from individual peril-regions so that we can see where most of the risk is coming from. If the company provides us with AEP curves for individual peril-regions, we can use those individual curves to decompose the overall AEP curve. This process is performed using Monte Carlo simulation, assuming independence between each curve. So for each iteration, the overall simulated loss is equal to the sum of individual simulated losses for each peril-region. In that way, the overall simulated loss is decomposed into component losses from each peril-region. We then use moving averages to smooth out the component losses in order to plot the graph below.



Source: Moody's Investors Service

## Appendix 2 – Exhibit 5

### Questionnaire regarding catastrophe modeling and aggregation management practices

[Below are a list of questions that are typically pertinent to our analysis of sidecars. We often request that the sponsor provide this information, or the information may be taken from the transaction documents.]

#### I. Aggregation Management

[The company (sponsor) will sometimes limit its risk appetite (e.g., self-imposed liability limits) for different territories and perils. The aggregation management process accumulates exposures across all business lines to ensure that the company has not unknowingly exceeded its pre-defined risk appetite. In sidecar transactions, the process also addresses proper identification of contracts/treaties falling within the relevant portfolio and the way in which results from different models, for different perils and territories, are combined to create the overall annual Aggregate Exceedance Probability (AEP) curve. Ideally, the aggregation management process for a sidecar transaction would resemble that used by the sponsor on a company-wide basis.]

- 1) What controls are in place to ensure correct identification of contracts that fall within this transaction? [The following may merit extra focus: legacy IT systems, lack of third party verification.]
- 2) How do you define your risk appetite? Do you set maximum liability limits for a particular peril, region, or peril/region combination? [Ideally, limits are fairly balanced across perils and regions, without any one peril or region dominating the others. Note that the company may set limits for exposures aggregated across all business lines, some of which may fall outside the sidecar portfolio.]
- 3) What percent of the exposures, by premiums and liability limits, are NOT modeled using commercially-available models? [A high percentage requires further inquiry. See Question I.4 below.]
- 4) List exposures, perils, regions, and contract elements that are not modeled. As % of policies/contracts, % premium, % limits? How are they accounted for? [Some companies use gross-up factors for different unmodeled elements; others apply a load to the model output. Secondary perils are addressed in questionnaire section IV.3]
  - a) Unmodeled perils/territories for which commercial models are available? [Exposure may be minimal but verify.]
  - b) **Unmodeled perils/territories for which commercial models are not available?** [e.g., flood (other than storm surge due to US Gulf and East Coast hurricanes and UK coastal flooding due to Euro

- winter storms), freeze in Europe, liquefaction in Japan, landslides from earthquakes in all regions, China earthquake, meteors, volcanoes, riots, etc.]
- c) **Unmodeled elements of modeled contracts?** [e.g., contingent business interruption, multiple locations, LAE, hazardous waste cleanup, bylaws, denial of access, debris removal, power outages, ECOs, XPL, ex gratia payments, etc.]
  - d) **Unmodeled classes?** [e.g., retro, ILW, marine, offshore energy, aviation, etc.]
- 5) **Does the sponsor use detailed level models or aggregate level models for aggregation management?** [Aggregate models like AIR CATRADER or RMS ALM run on data that does not contain property specific information. They use industry average assumptions about construction, occupancy, age, etc., or prorate an industry modeled loss based on the portfolio's exposure in a given region. Aggregate models may be appropriate if the exposure profile resembles that of industry averages, which means that the portfolio should contain a large number of risks and be well diversified. Detailed models like AIR CLASIC/2 or RMS DLM run on property-specific information inputted by the user. This information can include the address, property characteristics, property values, and policy details. A company may use detailed models for pricing but aggregate models for aggregation management. Tradeoff between the two types of models? Detailed models may take 2 days to run, aggregate models may take 2 hours. (Speed of underwriting can be an important differentiator in competitive markets.)]
- 6) **How is the overall annual Aggregate Exceedance Probability (AEP) curve for all perils and regions on a combined basis derived?** [Conservative way: Generate AEP curves (i.e., aggregate exposures) for individual peril-regions first, and then convolute those curves (using a simulation/DFA tool), assuming independence, to generate the overall AEP curve. Less conservative way: Aggregate all perils and regions simultaneously to derive the overall AEP curve. The former path is more conservative because it assumes, for example, that a Florida hurricane can wipe out half the limits on a treaty that has no reinstatements and then a subsequent earthquake can wipe out full limits on the same treaty, even though only half the limits would be available to cover the earthquake. It would also assume that a Florida hurricane can wipe out limits on a treaty in September (possible), a California earthquake can wipe out reinstated limits on the same treaty in October (possible), and a Northeast hurricane can wipe out limits again in November (impossible unless there is a second reinstatement).]
- 7) **Follow-up question: how many simulation draws do you use to create the overall AEP curve?** [It is important that there be enough draws to capture extremely infrequent events. Something north of 250,000 draws may be reasonable.]

## II. Overview of Cat Modeling Process

- 1) **How many people make up the cat modeling and aggregation management teams and what is their level of experience?** [Majority of contracts may be underwritten during concentrated renewal season(s), which places large demands on resources during short periods of time.]
- 2) **Quantify the stability of the book, as best you can.** [If a (re)insurer has long standing relationships with clients, it may have more clout to impose high data standards, even as the market softens.]
- 3) **Does the sponsor remodel all contracts submitted to it, even renewals?** [Familiarity with a contract or lack of resources may encourage shortcuts.]
- 4) **Describe the workflow — from submission to modeling to aggregation management to pricing — and any feedback loops.** [Typically, we review for an absence of Missing links, evidence of active communication, and early involvement of aggregation management team. If a contract/treaty would cause the company to exceed its risk appetite, there would be no need to underwrite it. The sooner modelers and actuaries get involved in the submission process, the better the chances of getting timely and sufficient data.]

- 5) What would cause the sponsor to walk away from a submission (other than price)? What % of submissions does the sponsor quote and % quoted but lost? [Some companies walk away because of poor data, the broker, etc. Quoting 100% of submissions can be a sign of high risk tolerance.]
- 6) **Does the sponsor do all the modeling and data cleansing in-house?** [Third parties may use different, perhaps less informed assumptions. If the modeling work is outsourced, strict guidelines and procedures must be well documented.]

### III. Use of Catastrophe Models

- 1) Why did the sponsor choose this model for a given territory and peril, and does the sponsor blend different results for different models for certain contracts? [For reinsurers, the answer may be that most of their clients use a particular model. Some companies blend results from different models using weighting factors.]
- 2) When does the sponsor use aggregate level models, and when are detailed level models used? [See Question I.5. Detailed level models are preferred in general for pricing and aggregation management but this may not be possible given time constraints or poor data.]
- 3) Does the sponsor assume a near-term or long-term view of landfalling hurricane frequency? [Near-term view is more conservative.]
- 4) What internally developed models does the sponsor use? [If an internally developed model is used in lieu of a commercially available model, we typically request an explanation of the differences between the two models.]
- 5) What post-model adjustments are made to model outputs? [Companies may adjust model outputs to account for client-modeled retrocession business, deficiencies in clients' data, and other soft factors.]

### IV. User Assumptions for Commercially Available Models

- 1) **Does the sponsor 'switch on' secondary uncertainty?** [Secondary uncertainty is the variability around a loss estimate given that a particular event has occurred. For example, there is uncertainty associated with converting wind speeds to damage levels in the models for hurricanes. This is generally viewed as standard practice.]
- 2) **Do the sponsor 'switch on' loss amplification (RMS) /demand surge (AIR)?** [Claim costs following an extreme event tend to increase because of greater demand for materials and labor to repair damaged property ("occurrence demand surge").]
- 3) Does the sponsor model all secondary perils? If not, what would be the difference in modeled results with all secondary perils switched on? [Secondary perils are indirect causes of loss triggered by a main peril. Modeling firms also have industry modeled loss estimates with and without these secondary perils turned on, which may be helpful in deciding how much to adjust the sponsor's cat curves.]
  - a) Storm surge following US Gulf and East Coast hurricanes?
  - b) Fire following earthquakes in Continental US and Japan?
  - c) Sprinkler leakage following earthquakes?
  - d) Coastal flooding in the UK triggered by European winter storms?
- 4) **How does the sponsor allow for inuring reinsurance in the modeling process?** [Aggregate level models cannot give benefit for inuring per risk reinsurance (which may lead to some conservatism). Companies may use ad hoc approaches to reflect the benefit of inuring reinsurance and special contract features.]



## V. Exposure Data

- 1) **Describe your data collection procedures and the age of your IT systems.** [Legacy IT systems may not be able to accommodate detailed data needed for modeling. Reinsurers often send out questionnaires to clients/brokers.]
- 2) **When you receive a submission, describe the types of "sanity checks" done to ensure accuracy of the data?** [e.g., market share check — industry has \$10 billion loss in Florida, client has 4% market share — but the client shows you a \$100 million modeled loss]
- 3) How much data is low resolution or unknown?:
  - a) **What percent of location data are only geocoded to the ZIP code level or worse?** [Vendor models produce losses which vary significantly by address, even within a zip code, e.g., earthquake losses differ by soil type, coastal flooding in UK.]
  - b) In what percent of cases are one or more primary property attributes missing (e.g., construction type, occupancy, year built, number of stories, square footage)? [There is no universal standard for coding these factors so the company may have to spend a lot of time to re-code them.]
  - c) In what percent of cases are values for buildings, contents, business interruption captured in the data? [We have observed that this very important data is not always present.]
- 4) How important is the unknown data?
  - a) What is known about the locations with low geocoding resolution or unknown attributes? Are they high hazard areas or high total-insured-value locations?
  - b) Does the sponsor adjust low resolution and unknown attribute data based on the importance of that data?
- 5) Data accuracy checks at the portfolio level:
  - a) How does the sponsor check to make sure exposure data is not missing?
  - b) How does the sponsor assess whether the data is plausible?
  - c) What is the vintage of the exposure data run in the models? How does the sponsor ensure that all of the policy data is of appropriate vintage?
- 6) Data accuracy checks at the location level:
  - a) How does the sponsor check for illogical/questionable combinations of building, financial, and policy attributes (e.g., wood structures greater than 10 stories tall)? What are the results?
  - b) How does the sponsor check for illogical building valuations? [e.g., mobile home with a value of \$1 million]
  - c) How does the sponsor detect bulk coding (i.e., coding numerous locations with the same attribute)?
  - d) **How does the sponsor detect bias in the coding of attributes?** [e.g., bias towards using construction codes with low vulnerability such as steel frame]
  - e) What third-party data sources are used to verify geocoded location and attribute information? What are the results from these comparisons?
  - f) What third-party data sources are used to assess building valuations? What are the results from these comparisons?

- 7) **How often does the sponsor go back to the client/broker/cedant with more questions about the data?** [High percentage may suggest adherence to high data standards or a need to make expectations better known upfront.]
- 8) **What exposure adjustments are made on clients' data? On what % of the data?** [e.g., to account for expected exposure growth between the time the data was submitted to the in-force period of the contract; to account for expected underwriting changes going forward; to account for under-reporting of sums insured.]
- 9) **Does the sponsor model historical events for submissions and compare them with actual loss histories? On what % of submissions?** [Purpose: to check that the client's exposure data reasonably reflects loss potential.]

### Appendix 3: Incorporating Stress Testing in Our Analysis: The Pre-defined Stress Scenario

In order to capture the risk to an insurer's credit profile posed by potentially volatile economic and financial conditions, as well as the possibility of catastrophic loss events, we typically consider stress scenarios as a fundamental part of our rating analysis. This appendix explains our approach and, more specifically, our pre-defined stress scenarios.

Combining results of a pre-defined stress scenario with an expected case allows us to gauge the impact of stress on capital of an individual insurer and relative to a group of insurers. Our stress scenario is generally focused on short-to medium-term shock losses to earnings/capital and not on every risk faced by insurers. We also perform supplemental insurer-specific stress tests when an insurer's business profile does not lend itself well to the pre-defined stress scenario.

Our ratings reflect our assessment of the insurer's relative credit profile in a forward-looking expected scenario, but also considers the volatility of a company's credit profile implied by the results of our stress scenario. We generally expect that an insurer can withstand moderate stress while maintaining a credit profile consistent with its assigned rating. In cases where a more severe stress scenario indicates that the company's credit profile would deteriorate dramatically (e.g., by the equivalent of three or more rating notches), we would in most cases assign a rating lower than indicated by our analysis of the expected case scenario.

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#### Our Stress Test Scenario Analysis Focuses on Common Near-to-Medium-Term Risks

We apply a specific stress scenario that is generally focused on short- to medium-term shock losses to earnings/capital and not on every risk faced by insurers (e.g., not on particularly long-term risks, such as prolonged low interest rates). While we recognize the lack of complete coverage of all risks, we typically assess shock events that offer the insurer limited time to correct for and manage through over a short time horizon. We consider long-term risks faced by insurers and we may additionally undertake reinsurer-specific stress analysis when an insurer's business profile does not lend itself well to the pre-defined stress test. However, we do not typically consider stress scenarios where the outcome is subject to meaningful variability that is contingent on management's future actions.

Our stress scenario analysis, when combined with an expected case, allows us to gauge the relative impact of stress on the capital and credit profile of an insurer compared to the performance of a group of insurers.

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#### Key Risks Subject to the Stress Scenarios

In the table below, we identify the key "shock" risks we assess. In addition, we summarize the stress scenario we postulate for each key risk. Rather than trying to create stress scenarios that mimic specific historical events, we develop scenarios by specifying defined stresses to key financial attributes. This uniform application of stress analysis facilitates peer comparison.

Although we attribute no specific event probability to our stress scenario, we consider each scenario to be severe.

Key Risk Area	Risk	Stress Scenario <sup>35</sup>
Investments	The risk that investments perform worse than expected	See Exhibit 3A below
Catastrophes	The risk of significant underwriting losses arising from a major natural catastrophe like a hurricane or earthquake or a pandemic event	1-in-250-year aggregate event
Loss reserves	The risk of unfavorable development on loss reserves	3%, 5% or 7% increase in loss reserves (rate determined by types of insurance written between personal, diversified and commercial lines)

Source: Moody's Investors Service

Of note, our investment stress analysis is based on economic loss, instead of market value, because of the industry's strong liquidity profile and the nature of its (mostly) non-puttable liabilities (or puttable, with a meaningful penalty to the policyholder in terms of amount reimbursed or coverage forfeited). That said, we generally supplement our economic-loss-based investment scenarios analysis by considering the sensitivity of those results to actual market value losses in times of severe market dislocation. In certain instances, we may use the greater of actual market value losses or economic losses for our analysis of investment stress.

## Investment Economic Loss Percentages

EXHIBIT 3A

Investment Category	Stress Scenario Percentages
Cash	0%
<b>Fixed maturities<sup>36</sup></b>	
Aaa/Aa/A	0.5%
Baa	3.5%
Ba	11.7%
B	32.5%
Caa and below	50%
<b>Mortgage/real estate</b>	
Commercial mortgage loans	3.5%
Other mortgage loans	3.5%
Real estate investments	20%
<b>All other</b>	
Non-redeemable preferred securities	5%
Other equity securities	25%
Alternatives	25%
Derivatives	10%
All Other (including corporate and other loans)	10%

Source: Moody's Investors Service

<sup>35</sup> The information necessary to complete the stress test is sourced from public and private sources. When full information is not available, estimates may be used. In addition, adjustments to information may be warranted upon review.

<sup>36</sup> Our fixed income factors are derived from the two-year expected loss after notching down from current rating levels. We adjust for material impairments taken for the lowest-rated instruments.

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### Adding Up Stress for the Stress Test Scenario

Once stress losses from all sources are derived, we assess the impact on capital adequacy. While we recognize the likelihood of each risk occurring simultaneously is low, historical results have shown cycles in insured losses and the potential for confluent events to affect investment returns. For this scenario analysis, each risk is summed without the benefit of diversification to create a severe stress scenario.<sup>37</sup> The diversification benefit is less relevant given our objective to look for those insurers whose results deviate materially from the average.

In interpreting the results of the stress test on a subsidiary of a larger group, we consider the extent to which unencumbered excess<sup>38</sup> cash available at an unregulated holding company or affiliate would likely be made available to the operating company(ies)<sup>39</sup> as a capital contribution, if need be. Our analysis of excess cash considers the ongoing permanence of funds maintained outside of the operating company that is above and beyond any amount that would lead to a narrowing of standard debt notching practices for the holding company.

Below is our pre-defined stress scenario template for a reinsurance company. In this scenario, investment losses are based on idealized expected losses. When the actual market value of investment losses (calculated as the unrealized loss excluded from opening equity) exceeds severe stress economic investment loss, we may replace the economic loss with the market value of investment loss.

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<sup>37</sup> We do consider losses after tax benefits, although we reduce the tax benefit from local statutory rates to reflect recoverability risk.

<sup>38</sup> E.g., after interest expense and other debt service coverage needs as well as expected shareholder dividend needs.

<sup>39</sup> Scenario testing is performed on an analytic unit basis, which may include more than one legal operating company.

**Pre-defined Stress Scenario - Equity Impact Analysis**

Beginning Reported Surplus or Equity

Exclude Unrealized Gains or Losses on Investments

Adjusted Beginning Surplus or Equity

**Equity Roll Forward:**

Recurring Operating Income Before Taxes

**Less Stress Losses:**

Catastrophe Losses

Investment Losses

Adverse Development on Loss Reserves

Total: Stress Losses

EBIT

Tax Expense (Benefit)

Net Income

Preferred Dividends

Net Income to Common Shares

Change in Surplus or Equity

**% Change in Adjusted Beginning Surplus or Equity Due to Stress Losses***Source: Moody's Investors Service***How Ratings Reflect the Stress Scenarios**

We typically prepare an alternate view of the scorecard that shows the pre-defined stress scenario analysis. Each insurance scorecard includes an adjusted score for each scorecard factor. We combine the adjusted factor scores to arrive at the scorecard-indicated outcome.<sup>40</sup>

While a company's expected performance is already reflected in the adjusted scores, a separate set of adjusted scores are typically prepared for our pre-defined stress scenario (which is severe). The adjusted scores for this severe scenario are generally lower than our expected case adjusted scores. Lower adjusted scores are typical for several financial profile key factors, such as asset quality, capital adequacy, profitability and financial flexibility. In addition, some Business Profile scores may be lower under the pre-defined stress scenario. In many cases, the magnitude of the difference is directly influenced by the relative results of our stress testing.

In cases where the pre-defined stress scenario indicates that the company's credit profile would deteriorate dramatically (e.g., by the equivalent of three or more rating notches), the assigned rating would typically be lower than the expected case scorecard-indicated outcome, in recognition of the potential downside risk to the insurer's credit profile if the stress case were to occur over the medium term.

<sup>40</sup> In certain instances, assigned ratings may reflect uplift where warranted from support from a parent or affiliate. Our scenario testing is performed on a standalone basis before consideration of support.

## Moody's Related Publications

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