MOODY'S
INVESTORS SERVICE

RATING METHODOLOGY
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Rating Methodology

Manufacturing

This rating methodology replaces the *Manufacturing Methodology* published in March 2020. We have reordered and have made editorial updates to various sections of the methodology, and we have changed the presentation of the scorecard. These updates do not change our methodological approach.

Scope

This methodology applies to companies globally that are primarily* engaged in the manufacturing of product components, finished products or capital goods. These companies develop and produce a wide breadth of products, including ball bearings, electrical installation products, vacuum pumps and rail cars, to name only a few examples. Products range from commoditized components to highly engineered parts used in complex industries.

The manufacturing companies rated under this methodology serve a variety of end-markets, such as energy, medical, agriculture and construction. They may also provide related services. For example, some companies may provide services to the aerospace and defense or automotive end-markets; however, these end-markets do not represent the preponderance of business risk for the manufacturing companies rated under this methodology.

Companies that are primarily engaged in the manufacturing of automobiles or automotive parts, in the manufacturing of consumer durables, and in providing aerospace and defense products and services are covered under our methodologies for automobile manufacturers, automotive suppliers, consumer durables, and aerospace and defense companies, respectively.[1] Makers of metal, glass and plastic packaging, and medical products and device makers are also covered under separate methodologies.

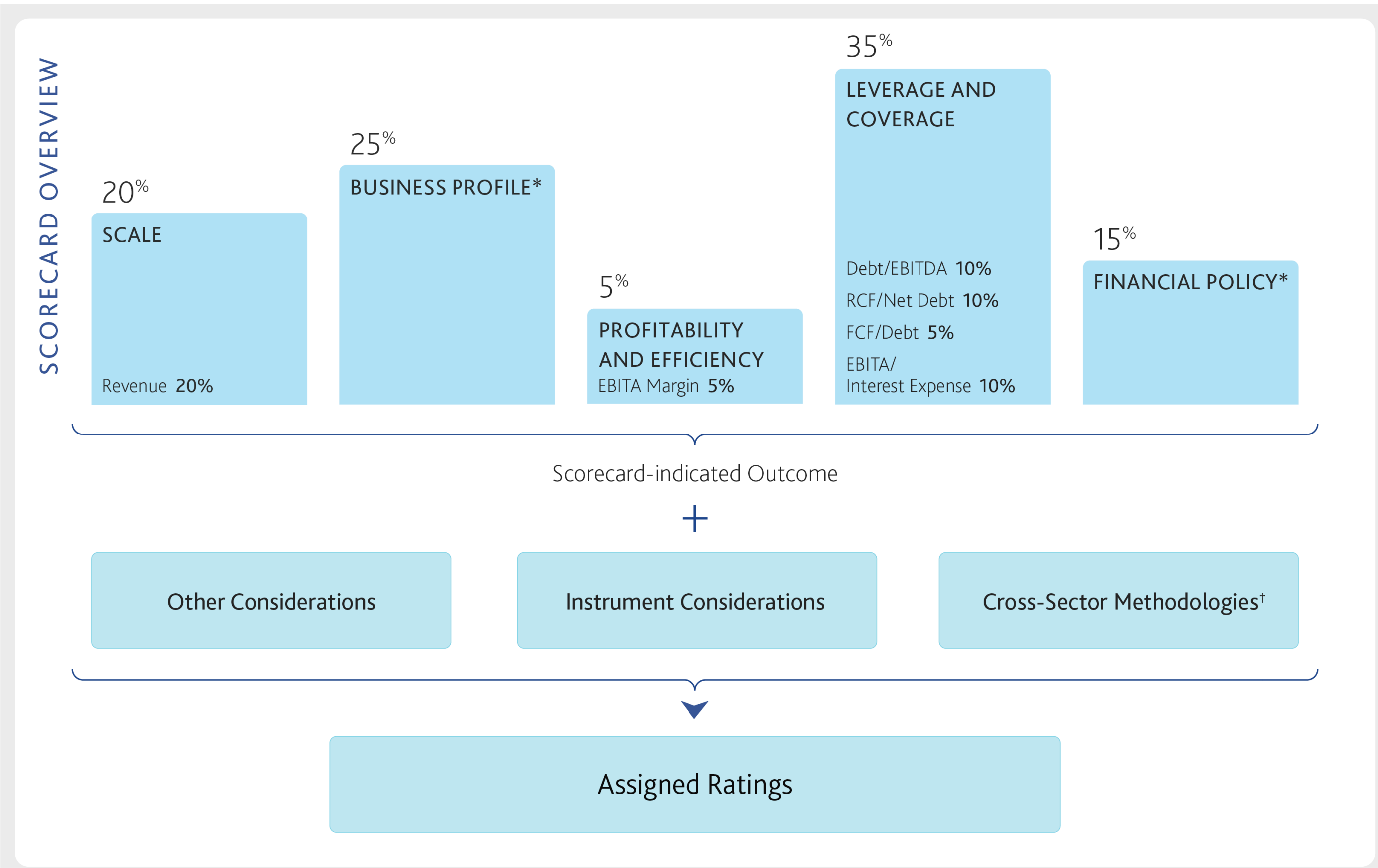
*The determination of a company's primary business is generally based on the preponderance of the company's business risks, which are usually proportionate to the company's revenues, earnings and cash flows.

Rating approach

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

The following schematic illustrates our general framework for the analysis of manufacturing companies, which includes the use of a scorecard.[2] The scorecard-indicated outcome is not expected to match the actual rating for each company. For more information, see the "Other considerations" and "Limitations" sections.

Exhibit 1
Illustration of the manufacturing methodology framework



* This factor has no sub-factors.
† Some of the methodological considerations described in one or more cross-sector rating methodologies may be relevant to ratings in this sector. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.
Source: Moody's Investors Service

Manufacturing scorecard

For general information about how we use the scorecard and for a discussion of scorecard mechanics, please see the "Using the scorecard to arrive at a scorecard-indicated outcome" section. The scorecard does not include or address every factor that a rating committee may consider in assigning ratings in this sector. Please see the "Other considerations" and "Limitations" sections.

Exhibit 2

Manufacturing scorecard

	SCALE (20%)	BUSINESS PROFILE (25%)	PROFITABILITY and EFFICIENCY (5%)	LEVERAGE and COVERAGE (35%)				FINANCIAL POLICY (15%)
	Revenue (USD Billion)[1] (20%)	**Business Profile (25%)**	**EBITA Margin (EBITA / Revenue)[2] (5%)**	**Debt / EBITDA[3] (10%)**	**RCF / Net Debt[4] (10%)**	**FCF / Debt[5] (5%)**	**EBITA / Interest Expense[6] (10%)**	**Financial Policy (15%)**
Aaa	≥ $50	Unassailable market positions across essentially all of its business segments globally and extremely stable revenue and margins, supported by extremely stable end-markets; a highly diverse portfolio of products in multiple business segments; and entire cost structure is extremely efficient and effective.	≥ 35%	≤ 0.5x	≥ 60%	≥ 25%	≥ 20x	Expected to have extremely conservative financial policies (including risk and liquidity management); very stable metrics; essentially no event risk that would cause a rating transition; and public commitment to a very strong credit profile over the long term.
Aa	$30 - $50	Commanding and defensible market positions across most of its business segments globally and highly stable revenue and margins, supported by highly stable end-markets; a highly diverse portfolio of products in multiple business segments; and a highly efficient and effective cost structure.	25% - 35%	0.5x - 1x	45% - 60%	20% - 25%	15x - 20x	Expected to have very conservative financial policies (including risk and liquidity management); stable metrics; minimal event risk that would cause a rating transition; and public commitment to a strong credit profile over the long term.
A	$15 - $30	Extremely strong and defensible market positions across its core business segments and stable revenue and margins, supported by mostly stable end-markets; a diverse portfolio of products in multiple business segments; an efficient and effective cost structure.	17% - 25%	1x - 1.75x	35% - 45%	15% - 20%	10x - 15x	Expected to have predictable financial policies (including risk and liquidity management) that preserve creditor interests; although modest event risk exists, the effect on leverage is likely to be small and temporary; strong commitment to a solid credit profile.
Baa	$5 - $15	Strong and defensible market positions in most of its core business segments and moderately stable revenue and margins, supported by end-markets that are characterized by solid long-term demand but subject to short-term volatility; a diverse portfolio of products in only one or two business segments; some volatility in input costs, but cost management that substantially mitigates the margin impact.	12% - 17%	1.75x - 3.25x	25% - 35%	10% - 15%	7x - 10x	Expected to have financial policies (including risk and liquidity management) that balance the interests of creditors and shareholders; some risk that debt-funded acquisitions or shareholder distributions could lead to a weaker credit profile.
Ba	$1.5 - $5	Operates in one or few business segments with leading market positions that are defensible in the near term but are subject to long-term competitive threats and revenue and margin volatility due to end-markets that are characterized by moderate short-term volatility; a somewhat concentrated portfolio of products; input costs that are volatile and cost management that only partially mitigates the margin impact.	7% - 12%	3.25x - 4.75x	15% - 25%	5% - 10%	4x - 7x	Expected to have financial policies (including risk and liquidity management) that tend to favor shareholders over creditors; above-average financial risk resulting from shareholder distributions, acquisitions or other significant capital structure changes.

	SCALE (20%)	BUSINESS PROFILE (25%)	PROFITABILITY and EFFICIENCY (5%)	LEVERAGE and COVERAGE (35%)				FINANCIAL POLICY (15%)
	Revenue (USD Billion)[1] (20%)	**Business Profile (25%)**	**EBITA Margin (EBITA / Revenue)[2] (5%)**	**Debt / EBITDA[3] (10%)**	**RCF / Net Debt[4] (10%)**	**FCF / Debt[5] (5%)**	**EBITA / Interest Expense[6] (10%)**	**Financial Policy (15%)**
B	$0.5 - $1.5	Operates in a highly competitive and fragmented market with a moderate ability to defend its position and is subject to high revenue and margin volatility due to end-markets that are characterized by high short-term volatility; a concentrated portfolio of products; input costs that are volatile and the company has little ability to mitigate the margin impact.	2.5% - 7%	4.75x - 6.25x	7.5% - 15%	0% - 5%	1.5x - 4x	Expected to have financial policies (including risk and liquidity management) that favor shareholders over creditors; high financial risk resulting from shareholder distributions, acquisitions or other significant capital structure changes.
Caa	$0.25 - $0.5	Operates in a highly competitive and fragmented market characterized by product substitution and is subject to extremely high and unpredictable revenue and margin volatility due to weak and highly volatile end-markets; offers one or few products; input costs are volatile and the company essentially has no ability to mitigate the margin impact.	0% - 2.5%	6.25x - 7.75x	0% - 7.5%	(5)% - 0%	0.75x - 1.5x	Expected to have financial policies (including risk and liquidity management) that create elevated risk of debt restructuring in varied economic environments.
Ca	< $0.25	Operates in an intensely competitive market that is approaching obsolescence.	< 0%	> 7.75x	< 0%	< (5)%	< 0.75x	Expected to have financial policies (including risk and liquidity management) that create elevated risk of debt restructuring even in healthy economic environments.

[1] For the linear scoring scale, the Aaa endpoint value is $75 billion. A value of $75 billion or better equates to a numeric score of 0.5. The Ca endpoint value is zero. A value of zero or worse equates to a numeric score of 20.5.
[2] For the linear scoring scale, the Aaa endpoint value is 50%. A value of 50% or better equates to a numeric score of 0.5. The Ca endpoint value is (5)%. A value of (5)% or worse equates to a numeric score of 20.5.
[3] For the linear scoring scale, the Aaa endpoint value is 0x. A value of 0x or better equates to a numeric score of 0.5. The Ca endpoint value is 12x. A value of 12x or worse equates to a numeric score of 20.5, as does a negative Debt/EBITDA value.
[4] For the linear scoring scale, when net debt is positive, the Aaa endpoint value is 80%. A value of 80% or better equates to a numeric score of 0.5. The Ca endpoint value is (5)%. A value of (5)% or worse equates to a numeric score of 20.5. When net debt is negative and RCF is positive, the numeric score is 0.5. When net debt is negative and RCF is negative or zero, the numeric score is 19.5.
[5] For the linear scoring scale, the Aaa endpoint value is 35%. A value of 35% or better equates to a numeric score of 0.5. The Ca endpoint value is (10)%. A value of (10)% or worse equates to a numeric score of 20.5.
[6] For the linear scoring scale, the Aaa endpoint value is 30x. A value of 30x or better equates to a numeric score of 0.5. The Ca endpoint value is 0x. A value of 0x or worse equates to a numeric score of 20.5.
Source: Moody's Investors Service

Discussion of the scorecard factors

In this section, we explain our general approach for scoring each scorecard factor or sub-factor, and we describe why they are meaningful as credit indicators.

Factor: Scale (20% weight)

Why it matters

Scale is an important indicator of the overall depth of a company's business and its success in attracting a variety of customers, as well as its resilience to shocks, such as sudden shifts in demand or rapid cost increases.

Larger manufacturing companies typically attract a greater breadth of customers and can better withstand cyclicality resulting from economic conditions and product cycles. A larger revenue base also generally leads to important economies of scale in raw material purchases and corporate functions, particularly important given the need for global supply chain management to control costs for most manufacturing companies. Larger manufacturers also tend to generate higher cash flow for capital reinvestment and debt reduction. In addition, they generally have greater access to the capital markets, which can reduce the cost of capital.

How we assess it for the scorecard

Scale is measured (or estimated in the case of forward-looking expectations) using total reported revenue in billions of US dollars.

Factor: Business Profile (25% weight)

Why it matters

The business profile of a manufacturing company is important because it greatly influences its ability to generate sustainable earnings and operating cash flows. Core aspects of a manufacturing company's business profile are its market position, the breadth and stability of the end-markets it serves, the diversity of its product offerings, as well as the effectiveness of the company's cost structure. These aspects of the business profile typically have a considerable impact on the stability of a manufacturing company's revenue and margins.

A company's market position is a meaningful indicator of its resilience to economic downturns and intensifying competition. A leading market position may indicate that a company's investments in manufacturing capacity, technology and R&D are translating into competitive advantages and may provide insight into the extent of the differentiation of its products and services. Companies with leading market positions are also generally more able to pass on increases in input costs to customers and have stronger negotiating power, which may allow them to achieve more favorable payment terms from customers. For example, advance payments from customers can reduce working capital needs and bolster liquidity. A leading position may also indicate high barriers to entry, which further reinforces a company's market position.

Manufacturers that provide diverse products and services to a broad range of end-markets can typically achieve more stable revenue and margins and therefore more stable cash flow, because different end-markets and products may follow different economic and product cycles. Companies with a high proportion of recurring revenue relative to total revenue, for example from long-term contracts, also typically benefit from lower volatility and greater predictability of cash flow. Revenue that is spread across a mix of more stable, predictable end-markets as well as more volatile end-markets allows a company to benefit from growth in more volatile businesses while mitigating fluctuations in cash flow if revenue from that business declines. For example, rising sales to the longer-cycle medical industry can offset declining sales in shorter-cycle industries such as the oil and gas sector when oil prices fall. Diversity across product and service offerings and end-markets also typically goes hand in hand with customer diversity, limiting a company's vulnerability to the potential loss of any one customer or set of customers. Geographic diversity also supports stability because economic trends can affect regions differently; a manufacturer with sales in different countries and regions can typically withstand weakness in one region better than a company with a more limited geographic presence.

A manufacturer's cost structure and its ability to control costs are also important indicators of its ability to withstand the cyclicality inherent in the manufacturing sector. A company with more effective cost controls has greater flexibility to quickly adjust its expense base, resulting in more stable margins through varied economic conditions than a company with little ability to mitigate the impact of higher costs on margins. Manufacturers with strong supply chain management and a broad geographic footprint can typically cushion the impact of fluctuations in input costs, including labor and raw materials, by sourcing lower-cost materials and shifting production to lower-cost locations, which may lead to more stable margins. Given the typically global sales and production of the manufacturing sector, a company with a broad geographic footprint of manufacturing plants can typically control costs better than a company with more limited options.

How we assess it for the scorecard

Scoring for this factor is based on a qualitative assessment of a manufacturer's market position across segments, the stability of its end-markets, and its cost control. We also consider historical and projected trends in revenue and margin, typically indicated by EBIT, operating and EBITA margins.

We generally assess a company's market position relative to its competitors and the overall competitiveness of the market. We may consider market share, which we generally estimate based on information provided by third parties and company financial disclosures, and we may also use non-public information. We may also consider whether barriers to entry are meaningful and reduce potential competition from new entrants. We assess market position across a company's business segments, typically where a segment comprises a suite of products and services generally oriented to serving a set of customers. Core segments are those that represent key competencies of the company and a material portion of the company's revenue and cash flow.

In our qualitative assessment of end-market stability, we typically consider the different industries or sectors of the manufacturer's customer base. For example, a manufacturer with a significant concentration of sales to a single volatile sector (such as oil and gas or automotive) would typically score lower on this factor than a company with customers diversified across multiple industries that are likely to be affected by different business or economic trends. We also assess diversity of the manufacturer's offering by considering the breadth of products and services across its segments, and we may also consider the contribution of revenue from each key segment, as well as geographic diversity (typically based on revenue from different regions or countries). We may also assess whether the company benefits from long-term agreements, which provide revenue visibility and stability.

We typically assess cost control based on historical and projected margin trends and may also consider the portion of fixed costs relative to variable costs and margins of a company's key business segments. We typically consider the effectiveness of a company's supply chain management, including its geographic footprint of plants, its access to suppliers and its ability to source key inputs at stable prices. Delayed deliveries, revenue shortfalls relative to forecasts, and margin deterioration may be indicators of poor supply chain management and volatile costs for key inputs. We may also consider plant utilization.

Generally, we do not expect a given company's business profile to exactly match each of the attributes listed for a given scoring category. We typically assign the factor score based on the alpha category for which the company has the greatest number of characteristics. However, there may be cases in which one characteristic is sufficiently important to a particular company's credit profile that it has a large influence on the factor score. For example, a concentration in volatile end-markets, such as truck or railcar manufacturing, may limit a company's score to Ba or lower even if the company has a strong market position and good cost control.

Factor: Profitability and Efficiency (5% weight)

Why it matters

Profits matter because they are needed to generate sustainable cash flow and maintain a competitive position, which includes an ability to invest in marketing, research, factories and personnel. High profitability sustained over time is generally an indicator of operating efficiency and competitive advantage.

Earnings before interest, taxes and amortization (EBITA), which incorporates depreciation expenses, as a percentage of revenue is a useful measure of profitability for manufacturing companies, which reinvest in property, plant and equipment to maintain their competitiveness.

How we assess it for the scorecard

EBITA MARGIN:

We use EBITA Margin, which is the ratio of earnings before interest, taxes and amortization (EBITA) to revenue.

Factor: Leverage and Coverage (35% weight)

Why it matters

Leverage and cash flow coverage measures provide important indications of a company's financial flexibility and ability to sustain its competitive position, as well as how much financial risk a manufacturer is willing to undertake.

A manufacturer with strong financial flexibility is better able to invest in product innovation and adapt to changing customer preferences and competitive challenges than a manufacturer with a constrained capital structure. The capital intensity of the manufacturing sector also makes financial flexibility critical to absorbing unexpected costs and withstanding industry cyclicality.

This factor comprises four quantitative sub-factors:

Debt / EBITDA

The ratio of total debt to earnings before interest, taxes, depreciation and amortization (Debt/EBITDA) is an indicator of debt serviceability and financial leverage. The ratio is commonly used in this sector as a proxy for comparative financial strength.

RCF / Net Debt

The ratio of retained cash flow to net debt (RCF/Net Debt) is an indicator of a company's cash generation (before working capital movements and capital expenditures, and after dividend payments) relative to its net debt (total debt minus cash and cash equivalents).

FCF / Debt

The ratio of free cash flow to debt (FCF/Debt) provides a different view of a company's ability to pay its debt, compared with the Debt/EBITDA and RCF/Net Debt ratios, because it compares cash flow generation after working capital movements, capital expenditures and dividends to total debt.

EBITA / Interest Expense

The ratio of earnings before interest, taxes and amortization to interest expense (EBITA/Interest Expense) is an indicator of a company's ability to meet its interest obligations.

How we assess it for the scorecard

Scoring for this factor is based on four sub-factors: Debt/EBITDA; RCF/Net Debt; FCF/Debt; and EBITA/Interest Expense.

DEBT / EBITDA:

The numerator is total debt, and the denominator is EBITDA.

RCF / NET DEBT:

The numerator is retained cash flow, and the denominator is net debt (total debt minus cash and cash equivalents).

FCF / DEBT:

The numerator is free cash flow, and the denominator is total debt.

EBITA / INTEREST EXPENSE:

The numerator is EBITA, and the denominator is interest expense.

Factor: Financial Policy (15% weight)

Why it matters

Financial policy encompasses management and board tolerance for financial risk and commitment to a strong credit profile. It is an important rating determinant because it directly affects debt levels, credit quality, the future direction for the company and the risk of adverse changes in financing and capital structure.

Financial risk tolerance serves as a guidepost to investment and capital allocation. An expectation that management will be committed to sustaining an improved credit profile is often necessary to support an upgrade. For example, we may not upgrade the ratings of a company that has built flexibility within its rating category if we believe the company will use that flexibility to fund a strategic acquisition, cash distribution to shareholders, spin-off, or other leveraging transaction. Conversely, a company's credit rating may be better able to withstand a moderate leveraging event if management places a high priority on returning credit metrics to pretransaction levels and has consistently demonstrated the commitment to do so through prior actions. Liquidity management[3] is an important aspect of overall risk management and can provide insight into risk tolerance.

Many manufacturing companies have historically used mergers and acquisitions to spur revenue growth, expand business lines, consolidate market positions, advance cost synergies or seek access to new technology. Companies have also undertaken significant divestitures of business units as an important component of their portfolio balancing strategies, with a goal of shedding lower performing businesses or those that no longer align with evolving strategic objectives. In such cases, we typically weigh the loss of earnings and cash flow from divested assets against the potential for improved margins and streamlining of the company's remaining portfolio of businesses.

How we assess it for the scorecard

We assess the issuer's desired capital structure or targeted credit profile, its history of prior actions, including its track record of risk and liquidity management, and its adherence to its commitments. Attention is paid to management's operating performance and use of cash flow through different phases of economic and industry cycles. Also of interest is the way in which management responds to key events, such as changes in credit markets and liquidity environment, legal actions, competitive challenges or regulatory pressures. Considerations include a company's public commitments in this area, its track record for adhering to commitments and our views on the ability of the company to achieve its target.

When considering event risk in the context of scoring financial policy, we assess the likelihood and potential negative impact of M&A or other types of balance-sheet-transforming events. Management's appetite for M&A activity is assessed, with a focus on the types of transactions (i.e., core competency or new business) and funding decisions. Frequency and materiality of acquisitions and previous financing choices are evaluated. A history of debt-financed or credit-transforming acquisitions will generally result in a lower score for this factor. We may also consider negative repercussions caused by shareholder willingness to sell the company.

We also consider a company's and its owners' past record of balancing shareholder returns and debtholder interests. A track record of favoring shareholder returns at the expense of debtholders is likely to be viewed negatively in scoring this factor.

Other considerations

Ratings may reflect consideration of additional factors that are not in the scorecard, usually because the factor's credit importance varies widely among the companies in the sector or because the factor may be important only under certain circumstances or for a subset of companies. Such factors include financial controls and the quality of financial reporting; corporate legal structure; the quality and experience of management; assessments of corporate governance, as well as 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.

Captive Finance Subsidiaries

Some manufacturers have captive finance subsidiaries that provide inventory financing for customers. Ownership of a captive finance subsidiary can be helpful during economic downturns because the captive finance subsidiary can be used to provide subsidies to customers that might otherwise curtail equipment purchases, which in turn helps the manufacturer maintain revenue.

Captive finance subsidiaries can also constrain a manufacturer's financial flexibility. This stress can result from the finance operation's need for supplementary equity capital and liquidity, which may be formalized in a support agreement.[4] We typically consider the likelihood and cost of the support that the company may extend to its captive finance subsidiary. For more details on how we assess the credit impact of a captive finance subsidiary on a manufacturing company, please see our methodology for rating captive finance subsidiaries of non-financial corporations.[5]

Advance Payments in Working Capital

Manufacturing companies that require custom-made machinery or turn-key plants to produce goods for specific customers tend to receive advance payments from those customers to contribute to the funding of working capital and mitigate some of the contract risk (e.g., cancellation or non-payment). Advance and progress payments often exceed a manufacturer's working capital requirements for a project, resulting in excess cash, although this typically reverses to positive net working capital. The cash balance sourced from prepayments may result in stronger net leverage ratios and a stronger liquidity position, even though the cash is dedicated to contract completion and therefore not available either to pay back the manufacturer's debt or to meet other liquidity needs.

We typically consider advance and progress payments part of working capital and not as explicit financial obligations because the payments, or customer credits, are provided by business partners to fund working capital. However, a sharp fall-off in new orders may precipitate a fast run-off of advance payments, exceeding cash releases from project completion and effectively creating new funding needs, for which most companies hold extra cash. An analysis of cash requirements and sources through the various stages of a cycle is an important consideration.

Guarantees, Letters of Credit and Bonding Lines

Manufacturers that supply equipment to construction projects typically provide letters of credit or bank guarantees for many kinds of commitments, such as firm bids and completion and performance guarantees, and warranty obligations. Access to sufficient committed credit or bonding lines for this purpose may therefore be an important consideration for some companies. The aggregate amount that would be sufficient would reflect the company's business growth, order cycle times, and the possibility that some bank guarantees may not be returned by the customer immediately upon fulfillment.

We do not normally add unfunded letters of credit, bank guarantees or performance bonds (typically reported in the notes to financial statements) to a manufacturing company's total debt because the underlying commitment will only become an obligation contingent upon triggering events, such as non-performance. The timing, likelihood and amount of any such obligations is often difficult to predict. As long as the manufacturer maintains a track record of reasonably on-time and on-budget delivery and incurs only modest warranty payments, we generally expect that drawings under letters of credit, bank guarantees or performance bonds will remain limited or unlikely.

Regulatory Considerations

Companies in the manufacturing sector are subject to varying degrees of regulatory oversight. Effects of these regulations may entail limitations on operations, higher costs, and higher potential for technology disruptions and demand substitution. Regional differences in regulation, implementation or enforcement may advantage or disadvantage particular issuers.

Our view of future regulations plays an important role in our expectations of future financial metrics as well as our confidence level in the ability of an issuer to generate sufficient cash flows relative to its debt burden over the medium and longer term. Regulatory considerations may also play a role in our assessment of a company's business profile, to the extent these affect its cost structure or competitive position. In some circumstances, regulatory considerations may also be a rating factor outside the scorecard, for instance when regulatory change is swift.

Environmental, Social and Governance Considerations

Environmental, social and governance (ESG) considerations may affect the ratings of companies in the manufacturing sector. For information about our approach to assessing ESG issues, please see our methodology that describes our general principles for assessing these risks.[6]

Manufacturing is a broad sector, and the credit impact of environmental risks, including air, soil and water pollution, as well as the resulting costs of clean-up, may be higher in certain sub-sectors than in others. However, in most developed markets, clear regulation and compliance by companies may reduce the risk of unexpected costs. Manufacturers with operations in countries with less rigorous standards may face lower regulatory costs but possibly higher clean-up risks. The impact of these risks typically varies based on a manufacturer's business mix. Some manufacturers with asbestos exposure face cash payment requirements related to lawsuits or regulatory requirements. Companies that sell primarily high-value-add products and services, such as medical devices, communications equipment, and aerospace and defense products and services, can generally pass on to customers cost increases related to regulations, whereas companies that sell more commoditized products typically have to absorb cost increases. Manufacturers with exposure to the auto manufacturing end-market may face greater environmental risk because of the challenge of meeting regional emissions requirements. Demand trends for renewable products and innovations in energy technology may affect the competitive landscape, which in turn may advantage some companies and disadvantage others.

Social considerations relevant to manufacturers relate primarily to labor and product safety. A shrinking pool of more highly skilled workers, such as engineers, may pose a risk for some companies as they seek to keep pace with technological change. Workers in certain hazardous industries may face potential health and safety risks. Product recalls or redesigns may affect a manufacturer's supply chain. Most manufacturers sell to other businesses, rather than to consumers, but companies with a significant presence in auto manufacturing may have exposure to changing consumer preferences, given increasing awareness of the potential environmental damage from emissions, as well as a trend toward ride-sharing and autonomous vehicles.

Environmental and social issues may play a role in our assessment of a company's business profile, due to the potential impact of these issues on a manufacturer's competitive position and cost management.

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' reports on the effectiveness of internal controls, auditors' comments in financial reports and unusual restatements of financial statements or delays in regulatory filings may indicate weaknesses in internal controls.

Management Strategy

The quality of management is an important factor supporting a company's credit strength. Assessing the execution of business plans over time can be helpful in assessing management's business strategies, policies and philosophies and in evaluating management performance relative to performance of competitors and our projections. Management's track record of adhering to stated plans, commitments and guidelines provides insight into management's likely future performance, including in stressed situations.

Excess Cash Balances

Some companies in this sector may maintain cash balances (meaning liquid short-term investments as well as cash) that are far in excess of their operating needs. This excess cash can be an important credit consideration; however, the underlying policy and motivations of the issuer in holding high cash balances are often as or more important in our analysis than the level of cash held. We have observed significant variation in company behavior based on differences in financial philosophy, investment opportunities, availability of committed revolving credit facilities and shareholder pressures.

Most issuers need to retain some level of cash in their business for operational purposes. The level of cash required to run a business can vary based on the region(s) of operation and the specific sub-sectors in which the issuer operates. Some issuers have very predictable cash needs and others have much broader intra-period swings, for instance related to mark-to-market collateral requirements under hedging instruments. Some companies may hold large levels of cash at times because they operate without committed, long-term bank borrowing facilities. Some companies may hold cash on the balance sheet to meet long-term contractual liabilities, whereas other companies with the same types of liabilities have deposited cash into trust accounts that are off-balance-sheet. The level of cash that issuers are willing to hold can also vary over time based on the cost of borrowing and macroeconomic conditions. The same issuer may place a high value on cash holdings in a major recession or financial crisis but seek to pare cash when inflation is high. As a result, cash on the balance sheet is most often considered qualitatively by assessing the issuer's track record and financial and liquidity policies, rather than by measuring how a point-in-time cash balance would affect a specific metric.

Across all corporate sectors, an important shareholder-focused motivation for cash holdings, sometimes over very long periods, is cash for acquisitions. In these cases, we do not typically consider that netting cash against the issuer's current level of debt is analytically meaningful; however, the cash may be a material mitigant in our scenario analyses of potential acquisitions, share buybacks or special dividends. Tax minimization strategies have at times been another primary motivation for holding large cash balances. Given shareholder pressures to return excess cash holdings, when these motivations for holding excess cash are eliminated, we generally expect that a large portion of excess cash will be used for dividends and share repurchases.

By contrast, some companies maintain large cash holdings for long periods of time in excess of their operating and liquidity needs solely due to conservative financial policies, which provides a stronger indication of an enduring approach that will benefit creditors. For instance, some companies have a policy to routinely pre-fund upcoming required debt payments well in advance of the stated maturity. Such companies may also have clearly stated financial targets based on net debt metrics and a track record of maintaining their financial profile within those targets.

While the scorecard in this methodology uses certain leverage and coverage ratios with total (or gross) debt (including Debt/EBITDA and FCF/Debt), we do consider excess cash holdings in our rating analysis, including in our assessment of the financial and liquidity policy. For issuers where we have clarity into the extent to which cash will remain on the balance sheet and/or be used for creditor-friendly purposes, excess cash may be considered in a more quantitative manner. While we consider excess cash in our credit assessment for ratings, we do not typically adjust the balance sheet debt for any specific amount because this implies greater precision than we think is appropriate for the uncertain future uses of cash. However, when cash holdings are unusually large relative to debt, we may refer to debt net of cash, or net of a portion of cash, in our credit analysis and press releases in order to provide additional insight into our qualitative assessment of the credit benefit. Alternatively, creditor-friendly use of cash may be factored into our forward view of metrics, for instance when the cash is expected to be used for debt repayment. We may also cite rating threshold levels for certain issuers based on net debt ratios, particularly when these issuers have publicly stated financial targets based on net debt metrics. In cases where we believe that cash on the balance sheet does not confer meaningful credit support, we are more likely to cite gross debt ratios in our credit analysis, press releases and rating threshold levels.

Even when the eventual use for excess cash is likely to be for purposes that do not benefit debtholders, large holdings provide some beneficial cushion against credit deterioration, and cash balances are often considered in our analysis of near-term liquidity sources and uses. Such downside protection is usually more important for low rated companies than for highly rated companies due to differences in credit stability and the typically shorter distance from potential default for issuers at the lower end of the ratings spectrum.

Liquidity

Liquidity is an important rating consideration for all manufacturing companies, although it may not have a substantial impact in discriminating between two issuers with a similar credit profile. Liquidity can be particularly important for companies in highly seasonal operating environments where working capital needs must be considered, and ratings can be heavily affected by extremely weak liquidity. We form an opinion on likely near-term liquidity requirements from the perspective of both sources and uses of cash. For more details on our approach, please see our liquidity cross-sector methodology.[7]

Additional Metrics

he 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.

For example, free cash flow is not always an important differentiator of credit profiles. Strong companies with excellent investment opportunities may demonstrate multi-year periods of negative free cash flow while retaining solid access to capital and credit because these investments will yield stable cash flows in future years. Weaker companies with limited access to credit may have positive free cash flow for a period of time because they have curtailed the investments necessary to maintain their assets and future cash-generating prospects. However, in some cases, free cash flow can be an important driver of the future liquidity profile of an issuer, which, as noted above, can have a meaningful impact on ratings.

Non-wholly Owned Subsidiaries

Some companies in the manufacturing sector choose to dilute their equity stake in certain material subsidiaries, for example through an initial public offering, which may in some cases negatively impact future financial flexibility. While improving cash holdings on a one-off basis, selling minority interests in subsidiaries may have a negative impact on cash flows available to the parent company that may not be fully reflected in consolidated financial statements. The parent's share of dividend flows from a non-wholly owned subsidiary is reduced, and minority stakes can increase structural subordination, since dividend flows to minority interest holders are made before the cash flows are available to service debt at the parent company. While less frequent, sale of a minority stake may be accompanied by policies protective of the subsidiary that further limit the parent's financial flexibility; for instance restrictions on cash pooling with other members of the corporate family, limitations on dividends and distributions, or arms-length business requirements.

Minority stakeholders may have seats on the board of the subsidiary. In many cases, we consider the impact of non-wholly owned subsidiaries qualitatively. However, in some cases we may find that an additional view of financial results, such as analyzing cash flows on a proportional consolidation basis, may be very useful to augment our analysis based on consolidated financial statements.[8] When equity dilution or structural subordination arising from non-wholly owned subsidiaries is material and negative, the credit impact is captured in ratings but may not be fully reflected in scorecard-indicated outcomes.

For companies that hold material minority interest stakes, consolidated funds from operations typically includes the dividends received from the minority subsidiary, while none of its debt is consolidated. When such dividends are material to the company's cash flows, these cash flows may be subject to interruption if they are required for the minority subsidiary's debt service, capital expenditures or other cash needs. When minority interest dividends are material, we may also find that proportional consolidation or another additional view of financial results is useful to augment our analysis of consolidated financials. We would generally also consider structural subordination in these cases.[9] When these credit considerations are material, their impact is captured in ratings but may not be fully reflected in scorecard-indicated outcomes.

Event Risk

We also recognize the possibility that an unexpected event could cause a sudden and sharp decline in an issuer's fundamental creditworthiness, which may cause actual ratings to be lower than the scorecard-indicated outcome. Event risks — which are varied and can range from leveraged recapitalizations to sudden regulatory changes or liabilities from an accident — can overwhelm even a stable, well-capitalized firm. Some other types of event risks include M&A, asset sales, spin-offs, litigation, pandemics, significant cyber-crime events and shareholder distributions.

Parental Support

Ownership can provide ratings lift for a particular company in the manufacturing sector if it is owned by a highly rated owner(s) and is viewed to be of strategic importance to those owners. In our analysis of parental support, we consider whether the parent has the financial capacity and strategic incentives to provide support to the issuer in times of stress or financial need (e.g., a major capital investment or advantaged operating agreement), or it has already done so in the past. Conversely, if the parent puts a high dividend burden on the issuer, which in turn reduces its financial flexibility, the ratings would reflect this risk.

Government-related issuers may receive ratings uplift due to expected government support. However, for certain issuers, government ownership can have a negative impact on the underlying Baseline Credit Assessment.[10] For example, price controls, onerous taxation and high distributions can have a negative effect on an issuer's underlying credit profile.

Other Institutional Support

In some countries, large corporate issuers have received government or banking support in the event of financial difficulties because of their overall importance to the functioning of the economy. In Japan, our corporate ratings consider the support that has operated there for large and systemically important organizations. Over the years, this has resulted in lower levels of default than might otherwise have occurred. Our approach considers whether the presence of group and banking relationships may provide support when systemically important companies encounter significant financial stress.

Seasonality

Seasonality is an important driver of customer demand and can cause swings in cash balances and working capital positions for issuers. Higher volatility creates less room for errors in meeting customer demand or operational execution.

Cyclical Sectors

Scorecard-indicated outcomes in cyclical sectors may be higher than the rating at the top of the economic cycle and lower than the rating at the bottom of the cycle. While using annual financials in the scorecard typically provides very useful insights into recent or near-term results, ratings may also reflect our expectations for the progression of yearly results over a longer period that may include a full economic cycle. However, cyclicality itself poses many different types of risks to companies, and cycles do not reverse themselves with predictable regularity. A cyclical sector may also be affected by a secular decline or expansion. These considerations may be incorporated qualitatively in ratings.

Using the scorecard to arrive at a scorecard-indicated outcome

1. Measurement or estimation of factors in the scorecard

In the "Discussion of the scorecard factors" section, we explain our analytical approach for scoring each scorecard factor or sub-factor,[11] and we describe why they are meaningful as credit indicators.

The information used in assessing the sub-factors is generally found in or calculated from information in the company's financial statements or regulatory filings, derived from other observations or estimated by Moody's analysts. We may also incorporate non-public information.

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. Financial ratios,[12] unless otherwise indicated, are typically calculated based on an annual or 12-month period. 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 periods of several years or more.

All of the quantitative credit metrics incorporate our standard adjustments[13] 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.

2. Mapping scorecard factors to a numeric score

After estimating or calculating each factor or sub-factor, each outcomes is mapped to a broad Moody's rating category (Aaa, Aa, A, Baa, Ba, B, Caa or Ca, also called alpha categories) and to a numeric score.

Qualitative factors are scored based on the description by broad rating category in the scorecard. The numeric value of each alpha score is based on the scale below.

Exhibit 3

Aaa	Aa	A	Baa	Ba	B	Caa	Ca
1	3	6	9	12	15	18	20

Source: Moody's Investors Service

Quantitative factors are scored on a linear continuum. For each metric, the scorecard shows the range by alpha category. We use the scale below and linear interpolation to convert the metric, based on its placement within the scorecard range, to a numeric score, which may be a fraction. As a purely theoretical example, if there were a ratio of revenue to interest for which the Baa range was 50x to 100x, then the numeric score for an issuer with revenue/interest of 99x, relatively strong within this range, would score closer to 7.5, and an issuer with revenue/interest of 51x, relatively weak within this range, would score closer to 10.5. In the text or table footnotes, we define the endpoints of the line (i.e., the value of the metric that constitutes the lowest possible numeric score, and the value that constitutes the highest possible numeric score).

Exhibit 4

Aaa	Aa	A	Baa	Ba	B	Caa	Ca
0.5-1.5	1.5-4.5	4.5-7.5	7.5-10.5	10.5-13.5	13.5-16.5	16.5-19.5	19.5-20.5

Source: Moody's Investors Service

3. Determining the overall scorecard-indicated outcome

The numeric score for each sub-factor (or each factor, when the factor has no sub-factors) is multiplied by the weight for that sub-factor (or factor), with the results then summed to produce an aggregate numeric score. The aggregate numeric score is then mapped back to a scorecard-indicated outcome based on the ranges in the table below.

Exhibit 5

Scorecard-indicated outcome

Scorecard-indicated outcome	Aggregate numeric score
Aaa	x ≤ 1.5
Aa1	1.5 < x ≤ 2.5
Aa2	2.5 < x ≤ 3.5
Aa3	3.5 < x ≤ 4.5
A1	4.5 < x ≤ 5.5
A2	5.5 < x ≤ 6.5
A3	6.5 < x ≤ 7.5
Baa1	7.5 < x ≤ 8.5
Baa2	8.5 < x ≤ 9.5
Baa3	9.5 < x ≤ 10.5
Ba1	10.5 < x ≤ 11.5
Ba2	11.5 < x ≤ 12.5
Ba3	12.5 < x ≤ 13.5
B1	13.5 < x ≤ 14.5
B2	14.5 < x ≤ 15.5
B3	15.5 < x ≤ 16.5
Caa1	16.5 < x ≤ 17.5
Caa2	17.5 < x ≤ 18.5
Caa3	18.5 < x ≤ 19.5
Ca	19.5 < x ≤ 20.5
C	x > 20.5

Source: Moody's Investors Service

For example, an issuer with an aggregate numeric score of 11.7 would have a Ba2 scorecard-indicated outcome.

In general, the scorecard-indicated outcome is oriented to the corporate family rating (CFR) for speculative-grade issuers and to the senior unsecured rating for investment-grade issuers. For issuers that benefit from rating uplift from parental support, government ownership or other institutional support, we consider the underlying credit strength or Baseline Credit Assessment for comparison to the scorecard-indicated outcome. 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.[14]

Assigning issuer-level and instrument-level ratings

After considering the scorecard-indicated outcome, other considerations and relevant cross-sector methodologies, we typically assign a CFR to speculative-grade issuers or a senior unsecured rating for investment-grade issuers. For issuers that benefit from rating uplift from government ownership, we may assign a Baseline Credit Assessment.[15]

Individual debt instrument ratings may be notched up or down from the CFR or the senior unsecured rating to reflect our assessment of differences in expected loss related to an instrument's seniority level and collateral. The documents that provide broad guidance for such notching decisions are the rating methodology on loss given default for speculative-grade non-financial companies, the methodology for notching corporate instrument ratings based on differences in security and priority of claim, and the methodology for assigning short-term ratings.[16]

Key rating assumptions

For information about key rating assumptions that apply to methodologies generally, please see *Rating Symbols and Definitions*.[17]

Limitations

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

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 that can be used in most cases to approximate credit profiles of companies in this sector and to explain, in summary form, many of the factors that are generally most important in assigning ratings to these companies. 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 factor and sub-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 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.[18] 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.

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 considerations, typically diminishes. 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. In any case, predicting the future is subject to substantial uncertainty.

Moody's related publications

Credit ratings are primarily determined through the application of sector credit rating methodologies. Certain broad methodological considerations (described in one or more cross-sector rating methodologies) may also be relevant to the determination of credit ratings of issuers and instruments. A list of sector and cross-sector credit rating methodologies can be found here.

For data summarizing the historical robustness and predictive power of credit ratings, please click here.

For further information, please refer to *Rating Symbols and Definitions*, which is available here.

Moody's Basic Definitions for Credit Statistics (User's Guide) can be found here.

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Endnotes

1 A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.

2 In our methodologies and research, the terms "scorecard" and "grid" are used interchangeably.

3 Liquidity management is distinct from the level of liquidity, which is discussed in the "Other considerations" section.

4 Where present, formal support agreements are typically granted by the manufacturer for the benefit of the finance company and its creditors. In some cases, we may expect that support will be provided in the absence of a formal agreement.

5 A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.

6 A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.

7 A link to a list of our cross-sector methodologies can be found in the "Moody's related publications" section.

8 For example, in the case of an equity stake reduction in a subsidiary down to 75%, in the parent's financial statements, all revenue and EBITDA of the subsidiary would typically still be consolidated at the group level.

9 Proportional consolidation brings a portion of the minority subsidiary's debt onto the balance sheet, but this debt is structurally senior to debt at the parent company, because it is closer to the assets and cash flows of the minority subsidiary.

10 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 a list 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.

11 When a factor comprises sub-factors, we score at the sub-factor level. Some factors do not have sub-factors, in which case we score at the factor level.

12 For definitions of our most common ratio terms, please see *Moody's Basic Definitions for Credit Statistics (User's Guide)*. A link can be found in the "Moody's related publications" section.

13 For an explanation of our standard adjustments, please see the cross-sector methodology that describes our financial statement adjustments in the analysis of non-financial corporations.

14 A link to a list 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.

15 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 a list 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.

16 A link to a list of our sector and cross-sector rating methodologies can be found in the "Moody's related publications" section.

17 A link to *Rating Symbols and Definitions* can be found in the "Moody's related publications" section.

18 A link to a list of our sector and cross-sector methodologies can be found in the "Moody's related publications" section.

This publication does not announce a credit rating action. For any credit ratings referenced in this publication, please see the ratings tab on the issuer/entity page on www.moodys.com for the most updated credit rating action information and rating history.

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