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CSPI Ratings

Industry Credit Guidelines for Global Automobile Manufacturers

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Summary

(***Editor's Note:*** *We originally published this criteria article on 12 August 2021. We republished it following our periodic review completed on 28 April 2023.)*

These criteria describe CSPI Ratings' analytical approach to assess global automobile original equipment manufacturers, which are commonly known as auto OEMs. CSPI Ratings defines an auto OEM as a company that primarily engages in the design, manufacture and sales of motor vehicles, both passenger and commercial.

The criteria for auto OEMs are built on top of the rating framework presented in CSPI Ratings' General Corporate Rating Criteria. In order to more precisely reflect the risk profile of auto OEMs, CSPI Ratings makes some adjustments to our General Corporate Rating Criteria on weightings allocated to sub-factors of the operation profile and makes sales volume a primary factor in assessing operating scale. For auto OEMs with material captive finance operations, we also assess how such operations affect the OEMs' business profile, financial profile and the overall credit profile. Regardless of the extent of impact on the OEMs' profile, we exclude captive finance operations' financials from our analysis on OEMs to better reflect the financial profile of OEMs' core business.

In this report, we address how we derive the indicative credit score (ICS) for auto OEMs. The ICS will then be combined with four additional adjustment factors to achieve an issuer's stand-alone credit profile (SACP). A corporate issuer's credit rating is the result of the company's SACP and the possible external supports from either a supporting parent or a government which this company is important to and has close ties with. The detailed discussion regarding additional adjustments and external support can be found in our General Corporate Rating Criteria.

In CSPI Ratings' view, the automobile manufacturing sector has high industry risk. Given the fact that passenger vehicles are big-ticket consumer discretionary items, the industry is highly exposed to macroeconomic, social and political trends. The profitability and free cash flow of auto OEMs tends to be volatile as the cycles of consumer spending and auto OEMs' capital expenditure are constantly fluctuating. Similarly, commercial vehicle demand and OEMs' financial conditions are also highly sensitive to macroeconomic cycles. In addition, the industry faces the threat of technological disruption from frontier technologies such as autonomous driving, vehicles connectivity, powertrain electrification and shared mobility.

CSPI Ratings also reckons that the impact of the macro environment on auto OEMs cannot be overlooked. The business operations of auto OEMs with a global footprint are highly subject to various macro factors in different jurisdictions, including industry regulations and policies, as well as the efficiency of the financial system.

CSPI Ratings' criteria are mostly in line with our General Corporate Rating Criteria when it comes to assessing auto OEMs' financial profiles. Against this backdrop, we adjust auto OEMs' financial metrics to avoid distortions to leverage and profitability ratios caused by captive finance operations, Besides, a partial-consolidation approach might be used to calculate the leverage and profitability ratios when an auto OEM's profit contribution from joint ventures (JVs) is substantially large. In this case, we believe the partial consolidation approach better reflects some operating risks that are put off the balance sheet under the equity accounting method for JVs.

Industry Definition

In CSPI Ratings' view, auto OEMs are defined as companies primarily engaged in designing and manufacturing of motor vehicles, both passenger and commercial, while selling their products to customers via their own or independent distribution networks. These companies usually procure the majority of their components from third-party suppliers, while some core components, such as engines, are produced in-house. In general, auto OEMs have their own production facilities and research and development (R&D) centres. However, some automobile companies, especially nascent companies, adopt an asset-light business model by outsourcing production to other auto OEMs and focusing on R&D, supply chain management as well as sales and marketing.

Within auto OEMs' corporate structure, the captive financing operation primarily facilitates sales of OEMs' products by providing financing services to dealers and/or end customers to support their funding needs.

Indicative Credit Score (ICS)

These criteria use a matrix of the business profile and financial profile to derive an indicative credit score (ICS) for a corporate issuer. A detailed explanation of how we derive the ICS of a corporate issuer can be found in our General Corporate Rating Criteria.

Business Profile Analysis

CSPI Ratings' General Corporate Rating Criteria outline the way we assess a corporate's business profile by combining factors of the Macro Environment and Industry & Operation Risk Profile into the assessment.

The industry risk profile is evaluated on a five-point scale system, with '5' being the highest score and lowest industry risk, and '1' being the lowest score and highest industry risk. Our assessment reveals that the automobile manufacturing industry risk profile is 'High' with a score of 2.

The business profile of an individual auto OEM is determined by looking at a combination of the macro environment, industry risk profile and its operation risk profile. The operation risk profile is the key element in our assessment but we consider the macro environment important as well, as any auto OEM with a global footprint is highly subject to macro factors in different jurisdictions including industry regulations, government policies and the efficiency of the financial system.

Macro Environment

The assessment of the macro environment is explained in details in our General Corporate Rating Criteria. In addition, we also make considerations on the following key macroeconomic factors for the auto manufacturing industry:

- The development of a country's infrastructure and industrial activities, in particular the availability of auto part supply chain that could affect the ease and costs of automobile production;
- The state of auto financing market; and
- The regulatory framework for the overall automobile industry, including but not limited to policies on setting up manufacturing facilities and supportive sector policies on development, production and sales.

Industry Risk Profile

Under CSPI Ratings' General Corporate Rating Criteria there are six key risk factors we assess for a specific industry. These include concentration risk, entry barrier risk, growth perspective risk, profitability level and trend risk, substitution risk and cyclicality risk.

Based on a holistic understanding of the above six risk factors, we assess the automobile manufacturing industry risk score as 'High' with a score of 2.

Exhibit 1: Industry risk score of the Automobile Manufacturing Industry

Sub-factors	Score
Concentration Risk	Medium Risk
Entry Barrier Risk	Medium Risk
Growth Perspective Risk	High Risk
Profitability Level & Trend Risk	High Risk
Substitution Risk	Medium Risk
Cyclicality Risk	High Risk

Concentration Risk

In our view, the automobile manufacturing industry is considered to have medium concentration risk. Concentration risk represents the impact on an industry caused by either having too much or too little market competition. If the industry is too fragmented, unnecessary rivalries can result in harmful activities such as price wars that hurt profitability. If, on the other hand, the industry is too concentrated, such as in a monopoly, duopoly or oligopoly, the efficiency of market participants may be compromised, thus affecting the quality of products and services. We consider a moderate level of industry concentration desirable to maintain healthy competition.

We believe that the automobile manufacturing industry is reasonably concentrated. We estimate that the top 10 auto OEMs accounted for over 70% of worldwide vehicles sales in 2015-2020. The evaluation of medium concentration risk reflects our view that the level of concentration in the automobile manufacturing industry will remain relatively healthy in the medium to long term despite the existence of a large number of small-scale OEMs that intensify competition. We think that on the one hand, there is some headroom for industry consolidation and/or alliance formation as the small-scale OEMs will find it hard to survive in an environment of sluggish demand for automobiles and given the high level of capital spending required to keep competitive in the Automated, Connected, Electric and Shared (ACES) battleground. On the other hand, the increasing demand for new energy vehicles (NEVs) will lead to the entrance of more NEV-focused start-ups.

Entry Barrier Risk

Our assessment reveals that the entry barrier risk in the automobile manufacturing industry is medium. The key factors include economies of scale, supply chain management, technological know-how and industry regulations.

To elaborate, the automobile manufacturing industry is very capital-intensive. As auto OEMs need to make tremendous initial and recurring investments in production facilities, this puts small-scale OEMs in a disadvantageous position when competing with scalable peers, and acts as a physical barrier to new entrants.

The capability to deal with the complexity of the supply chain serves as another roadblock for new entrants. An internal combustion engine (ICE) passenger car has roughly 30,000 components. The process of procuring these parts from a wide variety of suppliers is a tough logistical challenge for new industry players to master. Without strong control over the supply chain that assures effective cost management and efficient production lead time for OEMs, new auto OEMs would struggle to survive.

Technological barriers for this industry are also high in our view. An automobile is a complex system in which a large number of components of various functions have to work well with each other in order to ensure a safe and reliable performance of the automobile. To achieve this, a substantial know-how, much of it gained over years of experience, is essential.

However, regulatory barriers are in general moderate in the automobile manufacturing industry, in our view. Baseline requirements of obtaining permits for production and meeting minimum standards of quality and safety are not overwhelmingly difficult, although some countries, such as China, have more stringent requirements to prevent overcapacity. Besides, regulations on the auto industry are relatively milder compared to some other industries, such as mining or airlines, where governments set up tough regulatory barriers to protect the environment or maintain sovereignty. In this respect, we note that barriers on environmental regulations are increasing in the auto manufacturing industry, for example with the tightening of ICE emission requirements. In addition, with the adoption of more automated and connected vehicles, there could be more stringent regulations on safety and information security.

In recent years, auto OEMs have also faced increasing threats from potential rivals in the technology sector with strong DNA in software and information technology. The automobile manufacturing industry is undergoing a shift from being mechanical

hardware-defined to software-defined, as the trend of ACES radically changes the way auto OEMs produce and the way consumers perceive an automobile. Given this shift, we believe that the entry barriers for the industry have also been weakened by this transition.

Growth Perspective Risk

We assess the growth perspective risk of the automobile manufacturing industry as high. In comparison with fast-growing industries like mobile handsets, application software and internet media, the automobile industry only registered mild revenue growth between 2009 and 2019, before the industry was negatively impacted by the coronavirus pandemic in 2020. Global new cars sales volume and industry revenue growth rates have lost steam after peaking in 2010, despite the boom in China's new cars sales during the past decade. With the normalisation of vehicle sales growth in China, the largest auto market globally amid the macroeconomic growth normalisation and higher sales base, we believe that the automobile manufacturing industry will continue to see stagnant growth in the medium to long run until new growth drivers emerge. This is not to mention the increasing popularity of ride hailing service and the car sharing concept, which could also impact the demand for privately-owned automobiles.

Profitability Level and Trend Risk

We evaluate the profitability level and trend risk of the automobile manufacturing industry to be high. Our research showed that between1996 and 2019, EBITDA margins for global auto OEMs were in a range of 6% and 12%. The uptrend in EBITDA margin that began in 2009 started to wane in 2017. This loss in momentum was attributable to several factors including slowing worldwide automobile consumption, mounting competition, higher costs related to tightened emissions standards and rising capital expenditure in areas such as ACES. We believe that these factors will continue to create volatility in sector profitability in the foreseeable future.

Substitution Risk

The substitution risk of the automobile manufacturing industry is considered medium in our assessment. Alternative methods for short-to-medium distance travel, such as subways and high-speed rail, pose a risk to the demand for passenger automobiles, while commercial vehicle usage is also challenged by alternatives such as mass-transit systems for hauling people as well as railway and air freight for hauling goods. In addition, increasing awareness on ICE automobiles' pollutant emissions and the time lost due to traffic congestion has led to more consumers' switch to other less polluting and more time-efficient means of transportation. A particular example is the inner-city travel in places like Europe where the use of bicycles and scooters has become more popular. All in all, we believe that there is moderate replacement risk for automobiles due to the prevalence of alternative transportation for short-to-medium distance travel.

Cyclicality risk

We believe the automobile manufacturing industry has high cyclicality risk. Demand for both passenger and commercial vehicles is highly subject to cycles of the economy, product replacement and OEMs' capital spending. As durable and discretionary consumer goods that take up a considerable proportion of a buyers' disposal income, passenger automobile consumption has a strong correlation with the overall economic outlook, while similar logics are also applied to commercial vehicle demand, with corporate more willing to spend during macroeconomic upcycles. Hence, a booming economy usually implies better propensity to spend on automobiles, while the opposite is the case in uncertain times.

Consumption on automobiles is also affected by the replacement cycle. For instance, passenger car owners tend to replace their existing cars after several years of ownership. The cycle length is dependent on market consumption habits and can vary in different scenarios. For example, the replacement cycle for private passenger cars is usually 7-8 years in China.

Auto OEMs' capital spending is also subject to cyclicality, as capacity expansion and investment in new technologies varies over the time. To conclude, the combination of the aforementioned cycles leads to a large degree of sensitivity to auto OEMs' profit. For instance, as a decision to expand capacity made during an economic boom, or an uptrend in the replacement cycle can take years to complete, the OEM involved may find itself in the midst of the downcycle by the time the new capacity becomes available. This may then lead to idle capacity and margin pressure.

In our stress tests, CSPI Ratings reviewed how badly revenue and EBITDA margins of some major industries could be affected under economic downturns. Notably, the automobile manufacturing industry shows a high degree of vulnerability in revenue and EBITDA margin when the economy falls into recession. The average drop of the revenue and EBITDA margin of this industry from the peak under our three stress-testing cases are 5% and 23%, respectively, ranking the industry in a lower position among the major industries we examined.

Operations Profile

CSPI Ratings considers five operational sub-factors when assessing a corporate issuer's operations profile. These are:

(1) operating scale;
(2) products, services and technology (PST);
(3) brand image and market share (BIMS);
(4) operating efficiency; and
(5) business diversity.

These five sub-factors will be assessed on a seven-point numeric scale, with '7' as the highest score and lowest risk, and '1' as the lowest score and highest risk.

Exhibit 2: Sub-factors for Operations Profile

Weight	Score Range	Sub-factors
20%	1-7	Operating Scale
25%	1-7	Products, Services & Technology
20%	1-7	Brand Image & Market Share
20%	1-7	Operating Efficiency
15%	1-7	Business Diversity

We assign weightings of 20%, 25%, 20%, 20% and 15% to each of the five sub-factors, which are different from the weightings we assign to these sub-factors in the General Corporate Rating Criteria, which are 20%, 20%, 15%, 25% and 20%. This is because we believe that we should give higher weightings to Products, Services & Technology and Brand Image & Market Share rather than to Operating Efficiency and Business Diversity when assessing the operations profile of auto OEMs. In our opinion, the PST sub-factor is more critical to an auto OEM's long-term core competence, especially when frontier technologies in autonomous driving, vehicles connectivity, electrification and shared mobility become more important. Apart from that, we also think that brand image and market position are also important differentiators for an auto OEM against its peers, thus deserving a higher weighting when we consider the operations profile.

The rating scale or the weighted score for the Operations Profile is banded into the descriptive categories shown in Exhibit 3.

Exhibit 3: Translation table for weighted average assessment scores to Operations Profile

Weighted Average Assessment Score	Operations Profile
>6.5 - 7	Excellent
>5.5 - 6.5	Very Strong
>4.5 - 5.5	Strong
>3.5 - 4.5	Moderate
>2.5 - 3.5	Weak
>1.5 - 2.5	Fairly Weak
1.0-1.5	Vulnerable

Operating Scale

CSPI Ratings measures an auto OEM's operating scale primarily by sales volume. This differs from our guidance in the General Corporate Rating Criteria, in which we use revenue as the primary measuring factor for operating scale. We believe that there are some limitations by relying on revenue to measure operating scale for auto OEMs. To begin with, for an auto OEM that primarily manufactures luxury models, which have limited production and sales volumes but very high selling prices,

its revenue might inflate its operating scale. Secondly, in many cases, consolidated revenue fails to reflect the operating scale of JVs, as it only captures volume sold on a consolidated basis while the aggregate sales volume also takes into consideration the volume contributed by JVs. Lastly, in some cases revenue of auto OEMs also includes a meaningful portion of other businesses, such as captive finance, which could also affect the operating scale measurement.

While sales volume is the primary determinant of operating scale when we evaluate auto OEMs, we still consider revenue as an additional reference factor. Indeed, we believe that a consideration of revenue makes our analysis more cross-industry comparable and that we may also make adjustments to our evaluation on operating scale based on Exhibit 4 if there is a large discrepancy between sales volume and revenue size.

CSPI Ratings understands that some auto OEMs that make commercial or special-purpose vehicles, as well as those OEMs focusing on niche markets such as luxury and NEV, are smaller in scale by nature compared with OEMs manufacturing mainstream passenger vehicles. When evaluating the operating scale of these auto OEMs, we will make additional adjustments rather than strictly following the scoring rules set in Exhibit 4. By doing so, we seek to avoid punishing auto OEMs that make niche-market products and whose scale are constrained by the niche market size.

Exhibit 4: Operating Scale

Score	Sales Volume
7	More than 8 million
6	6 – 8 million
5	4 – 6 million
4	3 – 4 million
3	2 – 3 million
2	1 – 2 million
1	Less than 1 million

Products, Services & Technology (PST)

CSPI Ratings deems PST an essential factor for auto OEMs to survive and remain competitive in the long run. There are some key points that we pay more attention to when assigning a score to PST of an auto OEM. These points serve as supplementary guidance on top of our General Corporate Rating Criteria:

Products

- **Product quality:** product quality is one of the crucial factors for auto OEMs to maintain their long-term reputation and to achieve customer loyalty. We assess the product quality of an auto OEM principally based on its product recall track record, direct consumer feedbacks on quality as well as quality surveys and reports published by reputable third parties such as JD Power. In addition, we believe that the warranty an OEM is willing to offer for its products can also offer some hints on its product quality.

- **Product pipeline:** product pipeline is a way to measure an auto OEM's capability in product research and development. In our view, the ability to regularly launch brand-new or facelift models is tremendously important, as it enables the auto OEM to constantly capture consumers' attention to its brands and products. In the passenger car segment, car buyers love to consider options and hence tend to compare different products before making decisions. As such, OEMs that have wider spectrum of products with timely refreshments tend to command a better market position in general.

- **Product popularity:** having products with high praises and those that are highly sought-after are indirect proof of product competitiveness. This can be gauged by considering product reviews by reputable media such as Top Gear and Car & Driver, and order backlog of vehicle models.

- **Pricing premium:** the capability to command a price premium against peers' products is a reflection on an auto OEM's product competitiveness and can enhance the OEM's profitability. In general, premium or higher-end products tend to have higher manufacturers' suggested retail price (MSRP) than industry norm, and that suggests stronger bargaining power for auto OEMs with consumers.

Services

- **Distribution and service network:** an auto OEM's distribution and service network plays an important role in helping the OEM to effectively reach out to and serve customers. OEMs need to establish abundant sales and service outlets either through direct ownership or franchising to provide sales and after-sale services to their customers. In our opinion, the larger the number of sales and service points an OEM can establish, the broader the customer base it can create. With a wider distribution and service network, OEMs are also able to take better care of their customers throughout the lifecycle of their vehicles. This can lead to stronger loyalty and better reputation.

- **Availability of financing service:** automobile financing has been prevalent in developed markets for years and it is gaining higher penetration in some developing markets, such as China. Most global auto OEMs have their own captive finance businesses that offer financing services to both wholesalers and retailers. Such services can boost automobile consumption of OEMs by enhancing customers' purchasing power and improving customer stickiness.

Technology

- **Technological strength in core components and platform architecture:** in general, auto OEMs perform the role of assembling various components into a final product, but the capability to make core components/modules in-house can demonstrate the technological strength of OEMs. For example, we consider whether an auto OEM has the capability to design and manufacture high-performance and/or high-efficiency engines when assessing the technologies of that OEM. In addition, as many OEMs are putting greater focus on modular platform architecture, i.e., creating common platforms that allow different models to be built on the same platform with maximised efficiency via more component sharing, we also examine whether an auto OEM has the technology know-how to develop modular platforms.

- **Technology relating to ACES:** 'Automated, Connected, Electric, Shared', also known as ACES, is the technological frontier of the automobile manufacturing industry. It involves technologies related to autonomous driving, connectivity among vehicles and to the cloud, electric vehicles and the emerging mobility of car hailing and sharing. ACES represents a sign that the automobile manufacturing industry is radically transforming from a 'mechanical hardware-defined' past to a more 'software-defined' future. In other words, auto OEMs have to make their products more technologically advanced in order to gain market traction, especially towards younger generations. Therefore, we consider an OEM's efforts in ACES, such as NEV product portfolio and pipeline, when dealing with the assessment on technology.

- **Technology development expenditure:** we reckon that OEMs which emphasise on technology innovations tend to put up considerable amount of funding on R&D. As such, when considering OEMs' technology strengths, we also study quantifiable metrics such as R&D team size and R&D expenditure as a percentage of revenue.

We incorporate the aforementioned considerations into the scoring guidance below to give a greater sense of how our rating committee assesses PST for auto OEMs.

Exhibit 5: Products, Services & Technology (PST)

7	The company's products and services are essential, not substitutable and extremely desirable. The company is the technology leader and sets standards for the industry and controls most of the key industry patents. Its rivals are not able to close the technology and quality gap for a very long time.
6	The company's products and services are essential, desirable and the company has a substantial technology advantage over the vast majority of its competitors with various patent protections. Its rivals are not able to close the technology and quality gap for the foreseeable future.
5	The company's products and services are important to the industry. The company is a technology innovator in some aspects with some patent protection. However, the company's technology lead is not significant and it needs a lot of effort to maintain its position in its industry.
4	The company's products and services are generic and subject to substitution risk. The company is a technology innovator in some aspects with some patent protection. However, the company's technology lead is not significant and it needs a strong effort to maintain its position in the industry.
3	The company's products and services are generic and substitutable. The company is a technology follower in some aspects with very little patent protection. The company faces challenges in keeping up with technology development.
2	The company's products and services are easily replaced. The company is a technology follower in every aspect with no patent protection. The company has fallen behind the industry's technology development noticeably.
1	The company's products and services are obsolete and the company uses other players' technologies. The company is increasingly falling behind the industry's technology development and has no hope of catching up.

Brand Image and Market Share (BIMS)

CSPI Ratings believes that brand image is crucial for auto OEMs to maintain their core competitiveness. In our view, brand image can only be built over time and is supported by continuous dedication to improving products, services and technology. Marketing tactics are also pivotal to enhance brand image. Once successfully established, a strong brand image can provide OEMs with greater bargaining power over customers and secure better brand loyalty, as customers are willing to pay a price premium on products from those auto OEMs whose brands are of high value. Besides, given the increasing importance being placed on the topics of environment, society and governance (ESG) in recent years, we believe that corporate behaviours on ESG topics will have a significant impact on an auto OEM's brand image. In considering the ESG-related brand image, we examine ESG practices such as how great an OEM's efforts are in reducing its products' emission. We also consider ESG events that could hurt brand image, such as frauds on vehicle emission.

The concept of market share in the automobile manufacturing industry is usually measured by sales volume, sometimes within specific segments such as the premium market, and it is a quantitative indicator reflecting an auto OEM's brand recognition and its product competitiveness. Gaining market share is strategically important to OEMs as it can enhance brand recognition and achieve better economies of scale.

The aforementioned considerations with respect to how the rating committee will evaluate an OEM's brand image and market share are incorporated into Exhibit 6 – a general guidance on how to assign scores on BIMS.

Exhibit 6: Brand Image & Market Share (BIMS)

7	Top brand recognition with extremely high customer stickiness which creates insurmountable barriers for competitors. Dominant market share and lead over competitors by a very large margin, so no meaningful competition for the foreseeable future.
6	Very high brand recognition with very high customer stickiness which creates very strong barriers for competitors. Leading market share which is sustainable for the foreseeable future. A lead over the competition by a solid margin but some competitors are following closely behind.
5	High brand recognition with high customer stickiness which creates strong barriers for competitors. One of the leaders in terms of market share but needs to watch out for competitors as it could fall out of the leaders' group if technology trends, market conditions or customer preferences turn against the company.
4	Moderate brand recognition with some customer stickiness which creates some barriers for competitors. The company is not in a leading position in terms of market share but a close follower and not showing any sign of falling far behind. The company is able to keep up with market developments and maintain its market share.
3	Little brand recognition and not much customer stickiness; competitors can replace the company with some effort. Small market share which may not be sustainable if the company can't keep up with market developments and competitors step up their efforts to take market share from the company.
2	Very little brand recognition, no customer stickiness, widespread competition. Tiny market share which is not sustainable if competitors enter its market. The company cannot create much meaningful barriers to deter rivals.
1	No brand recognition, no customer stickiness, widespread competition. Negligible market share which is not sustainable if competitors enter its market. The company cannot create any meaningful barrier to deter rivals.

Operating Efficiency

Apart from the guidance on how to assess operating efficiency outlined in General Corporate Rating Criteria (Exhibit 7), CSPI Ratings specifically underscores some key indicators for auto OEMs in assessing their operating efficiency:

- **Capacity utilisation rate:** the automobile manufacturing industry is very asset-heavy, and auto OEMs with sufficiently large capacity tend to achieve better economies of scale. Therefore, how well an OEM can use its capacity, which is mainly measured by the capacity utilisation rate, offers some hints on its operating efficiency. In general, an auto OEM needs to achieve a certain level of capacity utilisation in order to break even, while a higher utilisation rate usually leads to better profitability. As such, OEMs with too much idle capacity are considered inefficient and usually demonstrate low gross profit margin. On the other hand, OEMs that consistently operate above their design capacity are also considered inefficient, as the long queuing time for their products could lead to customer switching to other OEMs' products.

- **Inventory level management at dealership:** inventory held in dealerships is also known as channel inventory. The ability to manage channel inventory at an optimal level can also demonstrate the operating efficiency of an auto OEM. While the optimal dealership inventory level can vary depending on factors such as product type and commonality, as well as dealership locations and inventory replenishment lead time, the general idea is that a high inventory level would lead to rising pressure for dealers on selling products and on working capital funding. This could force OEMs to give up some profit margin and offer monetary incentives to dealers for carrying out sales promotions, not to mention the possible brand image impact with such promotions. On the other hand, a shortage of inventory at dealership level could result in potential loss of customers to other OEMs. Therefore, CSPI Ratings will also consider dealership inventory data, if such data are available, when assessing auto OEMs' operating efficiency.

Exhibit 7: Operating Efficiency

7	6	5	4	3	2	1
Company's cost structure is the lowest in the industry, which has consistently led to highest profitability among its peers. Consistently demonstrates excellent ability to manage fixed and variable costs in cyclical downturns. Best working capital management capability, evidenced by consistently best cash conversion cycle in the industry.	Company's cost structure is at top end in the industry, which has consistently led to much higher profitability than its peers. Consistently demonstrates strong ability to manage fixed and variable costs in cyclical downturns. Strong working capital management, evidenced by consistently top performance on the cash conversion cycle in the industry.	Company's cost structure is better than the industry average, which has consistently led to higher-than-average profitability. Consistently demonstrates above average ability to manage fixed and variable costs in cyclical downturns. Good working capital management, evidenced by consistently above average cash conversion cycle in the industry.	Company's cost structure is average in the industry, which led to average profitability. Consistently demonstrates average ability to manage fixed and variable costs in cyclical downturns. Average working capital management, evidenced by average cash conversion cycle in the industry.	Company's cost structure is worse than the industry average, which has consistently led to below average profitability. Insufficient ability to manage fixed and variable costs in cyclical downturns. Average working capital management, evidenced by consistently below average cash conversion cycle in the industry.	Company's cost structure is worse than most peers in the industry, which has consistently led to low profitability. Very little ability to manage fixed and variable costs in cyclical downturns. Weak working capital management, evidenced by consistently poor performance on the cash conversion cycle in the industry.	Company's cost structure is the worst in the industry, which has consistently led to the lowest profitability. Incapable of managing fixed and variable costs in cyclical downturns. Worst working capital management, evidenced by consistently the worst cash conversion cycle in the industry.

Business Diversity

CSPI Ratings believes that business diversity in brands, products and services, as well as geography in terms of both production and sales is highly important for auto OEMs to mitigate their various risk exposures. As supplementary guidance on top of our General Corporate Rating Criteria (Exhibit 8), we highlight some key considerations below on how we assess auto OEMs' business diversity:

- **Geographical diversity:** we consider the geographical diversity in sales and production as paramount to auto OEMs. Selling products in different markets at scalable quantities expands OEMs global footprint and addressable market size, as well as helps OEMs to smooth sales volume fluctuations caused by various consumption cycles in different markets. On the production front, allocating manufacturing capacity into multiple strategically important geographical locations allows OEMs to reach out to scalable markets such as China, and/or take advantage of lower production costs in countries such as Mexico.

- **Product and service diversity:** most consumers welcome the availability of choices. Product diversity allows an auto OEM to address this characteristic of consumers and reduce their chance of switching to other OEM's products. To elaborate, we consider an auto OEM with a balanced vehicle type mix comprising sedans, SUVs and MPVs, and exposure in both passenger and commercial segments as a well-diversified entity versus those with limited product offerings. Apart from that, some OEMs also manage to build up scalable captive finance operations that tremendously support the OEMs' profitability in spite of industry downcycles or extreme events, such as the coronavirus pandemic.

- **Multi-brand strategy:** adopting a multi-brand strategy enables auto OEMs to tap into more market segments, such as both the premium and mainstream auto markets. A specific brand, in our view, is supposed to mainly cater for a specific group of consumers sharing similar product preferences. On the contrary, an auto OEM that operates multiple brands has broader customer reach and hence is more resilient to automobile consumption cycles given their diversified market segment exposure.

Exhibit 8: Business Diversity

7	Business diversity, geographic diversity, product diversity, supplier diversity, client diversity. At least five clearly defined and uncorrelated business lines, and other diversities are all fully achieved.
6	Business diversity, geographic diversity, product diversity, supplier diversity, client diversity. At least four clearly defined and uncorrelated business lines, and other diversities are all fully achieved.
5	Business diversity, geographic diversity, product diversity, supplier diversity, client diversity. At least three clearly defined and uncorrelated business lines, and other diversities are all fully achieved.
4	Business diversity, geographic diversity, product diversity, supplier diversity, client diversity. At least two clearly defined and uncorrelated business lines, and other diversities are mostly achieved.
3	Business diversity, geographic diversity, product diversity, supplier diversity, client diversity. Among these five types of diversities, three are mostly achieved.
2	Business diversity, geographic diversity, product diversity, supplier diversity, client diversity. Among these five types of diversity, two are reasonably achieved.
1	Business diversity, geographic diversity, product diversity, supplier diversity, client diversity. Among these five types of diversity, one or none is reasonably achieved.

Financial Profile Analysis

CSPI Ratings' financial profile analysis focuses on a variety of numeric and quantitative indicators designed to reveal the financial strength and leverage of each company. CSPI Ratings ranks the company's financial profile by analysing its cashflow-based leverage, financial volatility, debt structure, financial policy and profitability relative to peers. The financial profile assessment is based on an 18-point scale, which has both alphabetic and numeric scales, with 'aaa' as the highest profitability and lowest financial leverage, and 'ccc/ccc-' as the lowest profitability and highest financial leverage. Combining the Business Profile and Financial Profile, we will derive the indicative credit score (ICS) for a corporate issuer.

Exhibit 9: Sub-factors for Financial Profile

Sub-Factors	Weight	Ratios
Leverage Profile	30%	Debt/EBITDA
	20%	FFO/Debt
	30%	EBITDA Interest Coverage
	20%	Gross Debt/Total Capitalisation
Profitability Assessment		EBITDA Margin
		Return on Invested Capital

We adopt a notching approach to adjust a company's leverage profile to derive the financial profile by adjusting up and down the leverage profile based on the company's profitability. The approach we use to assess the financial profile of auto OEMs is mostly aligned with our General Corporate Rating Criteria, except for the adjustments we make to account for auto OEMs' captive finance operations, provided that issuers' disclosures are available to make such adjustments. More details on how to strip out the financials of captive finance operations when performing the financing ratios calculation, and on how to examine the potential impact of an auto OEM's captive finance operation on its credit rating will be laid out in the "Adjustments in the financial profile analysis to account for auto OEMs' captive finance operations" and "Adjustment Factors" sections.

Exhibit 1: Determining the Financial Profile

Leverage Profile	Profitability Assessment				
	VS	S	M	W	VW
aaa	aaa	aaa	aaa	aa+	aa
aa+	aaa	aa+	aa+	aa	aa-
aa	aa+	aa+	aa	aa-	a+
aa-	aa+	aa	aa-	a+	a
a+	aa	aa-	a+	a	a-
a	aa-	a+	a	a-	bbb+
a-	a+	a	a-	bbb+	bbb
bbb+	a	a-	bbb+	bbb	bbb-
bbb	a-	bbb+	bbb	bbb-	bb+
bbb-	bbb+	bbb	bbb-	bb+	bb
bb+	bbb	bbb-	bb+	bb	bb-
bb	bbb-	bb+	bb	bb-	b+
bb-	bb+	bb	bb-	b+	b
b+	bb	bb-	b+	b	b-
b	bb-	b+	b	b-	ccc+
b-	b+	b	b-	ccc+	ccc+
ccc+	b	b-	ccc+	ccc+	ccc/ccc-
ccc/ccc-	b-	ccc+	ccc/ccc-	ccc/ccc-	ccc/ccc-

In addition, we might use a partial consolidation approach to assess an auto OEM when its JV business operation is contributing to significant profit of the OEM. Under global accounting standards, the equity method is usually adopted in measuring the financial impacts of JVs on corporate. However, we think that this method might conceal some off-balance-sheet risks, especially when the corporate's profitability heavily relies on its JVs. In this case, we will combine the financials of JVs proportionately based on the percentage of shareholdings into the financials of the corporate. We then calculate the ratios we use to evaluate leverage and profitability on the partial-consolidation basis.

Leverage Profile

Leverage ratios CSPI Ratings uses to measure auto OEMs' leverage profile are in line with the ratios defined in our General Corporate Rating Criteria. There are four core leverage ratios, namely debt to EBITDA, fund from operations (FFO) to debt, EBITDA interest coverage, gross debt over total capitalisation, and two non-core leverage ratios for our supplementary analysis, namely operating cashflow over debt and free cashflow over debt. We believe these leverage ratios, which focus on the ability to service the debt and interest payment via operating profit and cash flow as well as free cash flow, can provide an appropriate approach to evaluate the leverage condition of auto OEMs. All ratios are calculated on an adjusted basis, and the definitions of these ratios are subject to CSPI Ratings' interpretation. For auto OEMs, specific adjustments are made to exclude the financials of captive finance operations.

Each of these ratios is assessed on a five-year weighted average basis with the chronological weights of 10%, 15%, 25%, 25% and 25% for the year t-2, t-1, t, t+1 and t+2 respectively, where t represents the current year. More weight is given to future years to emphasise that CSPI Ratings' ratings are forward-looking opinions on a company's creditworthiness. However, when a company goes through drastic transformation or changes in corporate structure such as mergers and acquisitions, large one-time capital investment or dividend payout among others, the historical financial data may not properly reflect what a company will be developed in the future. In these cases, CSPI Ratings applies the weights of 40%, 30%, 30% for the current year and subsequent two years.

If an auto OEM is expected to experience very high cashflow uncertainty in the coming years, or if the OEM's financial performance is irrelevant for some reason in some years, the criteria allow rating committees to adopt a weighting that properly reflects the OEM's true financial strength and credit profile.

Exhibit 11: Leverage Profile analysis ratios

		Debt/EBITDA		EBITDA Int. Cov.		Gross Debt/Cap (%)		FFO/Debt (%)	
Letter	**Numeric**	Low	High	Low	High	Low	High	Low	High
aaa	**18**	---	0.00	20	---	0	15	65	---
aa+	**17**	0.00	0.67	18	20	15	20	60	65
aa	**16**	0.67	1.00	16	18	20	23	56	60
aa-	**15**	1.00	1.33	14	16	23	27	52	56
a+	**14**	1.33	1.67	12	14	27	30	48	52
a	**13**	1.67	2.00	10	12	30	33	44	48
a-	**12**	2.00	2.33	9	10	33	37	40	44
bbb+	**11**	2.33	2.67	8	9	37	40	36	40
bbb	**10**	2.67	3.00	7	8	40	43	32	36
bbb-	**9**	3.00	3.33	6	7	43	47	28	32
bb+	**8**	3.33	3.67	5	6	47	50	24	28
bb	**7**	3.67	4.00	4	5	50	53	20	24
bb-	**6**	4.00	4.50	3	4	53	57	16	20
b+	**5**	4.50	5.00	2	3	57	60	12	16
b	**4**	5.00	5.50	1.5	2	60	63	8	12
b-	**3**	5.50	6.00	1	1.5	63	67	0	8
ccc+	**2**	6.00	7.00	0.5	1	67	70	-3	0
ccc/ccc-	**1**	7.00	---	---	0.5	70	---	---	-3

Toning Factors for Leverage Profile

Toning factors that CSPI Ratings adopts to fine-tune the preliminary leverage profile to reach the final leverage profile assessment on auto OEMs are in line with our General Corporate Rating Criteria.

Profitability Assessment

CSPI Ratings emphasises on EBITDA margin and return on invested capital (ROIC), after stripping out the impact of captive finance operation to assess auto OEMs' profitability. Relevant factors on auto OEMs' operating profitability includes product profitability, which is measured by gross profit margin, and the ability to control various operating cost and expenses. Therefore, EBITDA margin is a comprehensive reflection of auto OEMs' competitiveness in product development and cost management. Apart from that, ROIC also takes into consideration the invested capital and hence can demonstrate OEMs' efficiency in making use of capital. For absolute profitability, we compare an auto OEM's profitability with its peers in the same industry using a five-point scoring system in the numerous form of '5,4,3,2,1'. The highest profitability within the industry will be assigned a score of '5'.

CSPI Ratings does not only assess auto OEMs' absolute profitability, but also considers the long-term trend and volatility of their profitability. This help us to take a dynamic approach to evaluate OEMs' profitability by being forward-looking and considering the stability of profit over time. We use a three-point scale to assess the trend and volatility of profitability, namely 'outperform', 'average' and 'underperform'. The trend and volatility of profitability may be analysed based on the absolute EBITDA or other profit trends and volatility, or it may be assessed on the EBITDA margin or other margin trends and volatility.

We incorporate absolute profitability and the trend and volatility of profitability into our final profitability assessment, which is expressed in a five-point scale: 'very strong (VS)', 'strong (S)', 'medium (M)', 'weak (W)', and 'very weak (VW)'.

Exhibit 12: Determining the Profitability Assessment

	Level of Profitability				
Trend & Volatility	5	4	3	2	1
Outperform	VS	VS	S	M	W
Average	VS	S	M	W	VW
Underperform	S	M	W	VW	VW

In our view, the automobile manufacturing industry demonstrates low profitability for several reasons. First and foremost, automobile consumption accounts for a significant proportion of consumers' disposable income and therefore they are very sensitive to the auto price. Together with market competition, auto OEMs usually find it hard to raise prices drastically to compensate for their rising production and research & development costs. Meanwhile, the automobile manufacturing industry is asset-heavy with relatively high operating leverage. In our estimate, the majority of auto OEMs have gross profit margin range from low teens to about 20%, with few exceptional cases that have gross profit margins beyond 25%. Net profit margins are in the range of low single digits to low teens. As such, we use the profitability guidance for low level from our General Corporate Rating Criteria as in Exhibit 13.

Exhibit 13: Profitability Assessment

Numeric Score	EBITDA Margin		ROIC	
	Low	High	Low	High
5	20	---	15	---
4	12	20	10	15
3	6	12	5	10
2	3	6	2.5	5
1	---	3	---	2.5

Adjustments in the financial profile analysis to account for auto OEMs' captive finance operations

When deriving the leverage and profitability measures for auto OEMs, we make the best efforts to strip out the financials of their captive finance operations from various financial metrics, including revenue, EBITDA, net operating profit after tax (NOPAT), FFO, debt, cash, total capitalisation and invested capital, This is to avoid auto OEMs' financial measures being distorted by their captive finance operations, such as excessively high debt ratio due to the capital being raised to offer auto financing and leasing services.

Furthermore, when determining whether we need to examine the potential impact of an auto OEM's captive finance operation on the OEM's credit rating, we carry out a simple test to see if the OEM's captive finance operation materially alters its financial profile. To elaborate, we use the debt-to-EBITDA ratio as a simplified gauge of the financial profile and compare the leverage profile numeric scores derived from an auto OEM's debt-to-EBITDA ratios with and without excluding its captive finance operation's financials. If the difference is more than 4 points, we deem the potential impact as possibly material and will carry out further financial analysis on the captive finance operation. If the difference is equal to or less than 4 points, we will only carry out further studies if we believe that certain characteristics of the captive finance operation could pose a risk to the OEM's overall credit profile. One example is that the captive finance operation has high debt-to-equity ratio and a loan portfolio that is exposed to higher-than-normal default risk.

For auto OEMs with material captive finance operations as defined in the previous paragraph, we need to assess the operations' financial risks with respect to the OEMs' overall financial profile. Our risk grades include Low, Moderate and High. Depending on the captive finance operation's financial risk level, we adjust the Final Financial Profile of an auto OEM by up

to 6 numeric grades with downward basis. In most of the time, we think that the captive finance operation will not alter an auto OEM's overall financial profile. In some cases, however, a high-risk captive finance operation may weaken the otherwise moderate or strong financial profile of an OEM, while in a very rare case scenario, a low risk and well-run captive finance operation may strengthen the otherwise moderate or weak financial profile of an OEM.

Exhibit 14: Adjustment to auto OEMs' Final Financial Profile after considering their captive finance operations' financial risks

Financial Profile Assessment before considering captive auto finance		**Captive finance operation's financial risks**		
Numeric score range	Letter score range	Low	Moderate	High
13-18	aaa/aa+/aa/aa-/a+/a	No change	Down by 0 or 3 grades	Down by 3 or 6 grades
7-12	a-/bbb+/bbb/bbb-/bb+/bb	Up by 0 or 3 grades	No change	Down by 0 or 3 grades
1-6	bb-/b+/b/b-/ccc+/ccc/ccc-	Up by 0 or 3 grades	Up by 0 or 3 grades	No change

To assess the financial risks of captive finance operations, we consider two aspects, namely the loan portfolio quality and the leverage of the operation. For the loan portfolio quality, we first derive an initial loan portfolio quality grade ('Weak', 'Moderate', 'Strong', or 'Excellent') by examining the non-performing loan (NPL) ratio of the captive finance operation based on the criteria in Exhibit 15. This initial loan portfolio quality grade is subject to adjustment if there is a material deviation between the captive finance operation's NPL ratio and net loss ratio (subject to data availability).

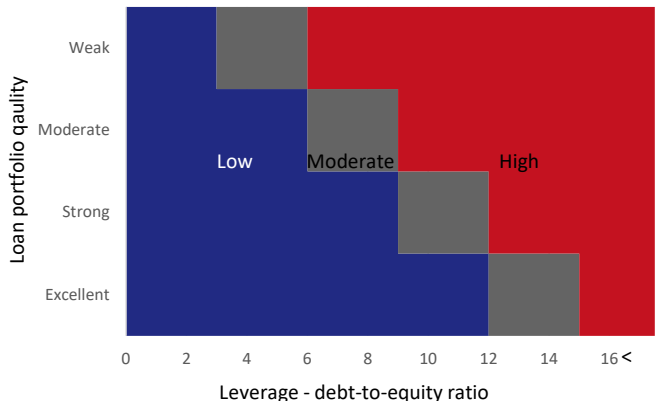
Exhibit 15: Initial loan portfolio quality categories

NPL ratio	Initial Loan Portfolio Quality Grade
0-1%	Excellent
1-3%	Strong
3-5%	Moderate
Above 5%	Weak

We then come up with a final loan portfolio quality grade after assessing the forward-looking trends of the loan portfolio. The trends we consider include, but are not limited to those related to NPL ratio, delinquency ratio and the change in riskier loan mix. We will adjust the final loan portfolio quality grade by a notch up if we see positive trends in the loan portfolio and a notch down if we see negative trends.

Our captive finance operation's leverage assessment is based on its debt-to-equity ratio. Together with the final loan portfolio quality grade, we derive the financial risk grade of captive finance operation based on the logics in Exhibit 16:

Exhibit 26: Financial risk of captive finance operation categories



Adjustment Factors

CSPI Ratings also evaluate the adjustment factors discussed in General Corporate Rating Criteria, together with an additional factor on captive finance operation if such operation is deemed material to possibly affect the OEM's credit profile. After considering all relevant adjustment factors, we come up with a SACP for auto OEMs in conjunction with rating factors addressed in the criteria above.

Liquidity (including considerations of liquidity risks posed by captive finance operations)

Considering the liquidity factor as included in General Corporate Rating Criteria, we also take into account the potential liquidity risk at the captive finance operation if deemed necessary. To elaborate, we study how the captive finance operation in an auto OEM funds its business and maintains its liquidity. The qualitative items for consideration include, but are not limited to, the source of funding, capability to raise fund, asset-liability duration and liquidity risk mitigation measures.

When assessing the funding source and funding capability of an auto OEM's captive finance operation, we look into areas like the funding diversity and the relationship of the captive finance operation with the financial market. When assessing the asset-liability duration, possible concerns we review include the level of reliance on short-term funding. Last but not least, we also check if the captive finance operation has sound measures to mitigate sudden or unexpected liquidity crunch by various reasons. If we have a Negative stance on the captive finance operations liquidity risk with reasonable concerns, we can assign one-notch extra downward adjustment to our overall liquidity adjustment, since we believe that a captive finance operation's liquidity issue can affect its parent OEM's liquidity, for example by reducing dividends payouts to the OEM or by lowering the OEM's funding availability.

Captive Finance Adjustment

We also assess the additional credit risks of an auto OEM's captive finance operation in the captive finance adjustment if deemed necessary. These risks include, but are not limited to country risk, currency risk, loan product type and concentration risk, as well as execution risk.

When assessing the country risk, we review if the captive finance operation has much higher country risk against that of the parent OEM, that is, having an auto loan portfolio which is more skewed towards countries with higher macroeconomic risks. When assessing the currency risk, we try to identify if the captive finance operation has significant asset-liability mismatch in terms of currency exposure. For the loan products, we study the loan type diversity and see if there are risks of high concentration towards limited borrowers (e.g. certain dealership group) and/or generally riskier loan type, such as finance leases that may be subject to vehicle residual value risk. Lastly, when assessing the execution risk, we check if the captive finance operation under review has any material weakness in its loan surveillance, payment collection and bad debt recovery protocols. If we have a Negative stance on the captive finance operations regarding the risks mentioned above, we can assign one-notch downward adjustment.

Stand-Alone Credit Profile (SACP)

The definition and application of stand-alone credit profile for auto OEMs align with General Corporate Rating Criteria.

External Support Assessment (ESA)

CSPI Ratings also takes into account the external supports for auto OEMs, which is consistent with General Corporate Rating Criteria.

Related Criteria and Research

- Rating Symbols and Definitions, 7 May 2018
- General Principles of Credit Ratings, 21 November 2017
- General Corporate Rating Criteria, 15 March 2018
- Corporate Financial Adjustments and Ratio Definitions, 7 May 2018

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