

# ESG Industry Report Card: Autos And Auto Parts

May 13, 2019

*(Editor's Note: Our ESG Industry Report Cards include an analysis of ESG factors for a selection of companies. We intend to expand our ESG Industry Report cards to include more companies throughout the year.)*

## Key Takeaways

- The automotive industry has relatively high exposure to environmental risk, while social risks could become more relevant over the longer term due to changing consumer habits.
- Environmental regulation is leading the global auto industry toward carbon dioxide (CO2) neutral vehicle production.
- Sizable investments in technologies and new products are already putting operating margins and free cash flow under pressure.
- Consumer acceptance of electric vehicles will be key to manufacturers achieving CO2 targets and will be dependent on incentives by governments, improvement in vehicle performance (range in particular), and infrastructure availability.
- Sizable litigation-linked fines related to unlawful cartel agreements or software manipulation (such as "dieselgate") could further burden companies' cash flow and reduce headroom under the ratings for many issuers.

## The ESG Risk Atlas

To calibrate the relative ranking of sectors, we use our environmental, social, and governance (ESG) Risk Atlas (see "The ESG Risk Atlas: Sector And Regional Rationales And Scores," published May 13, 2019). The Risk Atlas provides a relative ranking of industries in terms of exposure to environmental and social risks (and opportunities). The sector risk atlas charts (shown below) combine each sector's exposure to environmental and social risks, scoring it on a scale of 1 to 6. A score closer to 1 represents a relatively low exposure, while 6 indicates a high sectorwide exposure to environmental and social risk factors (for details see the Appendix). This report card expands further on the Risk Atlas sector analysis by focusing on the credit-specific impacts, which in turn forms the basis for analyzing the exposures and opportunities of individual companies in the sector.

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## Environmental Exposure (Risk Atlas: 4)

The automotive sector has relatively high exposure to environmental risk. In three of the most critical markets globally, China, Europe, and the U.S., which together account for roughly 70% of annual global sales, environmental regulation is driving the industry toward carbon-neutral vehicle production. China has enacted regulations that limit average fleet CO<sub>2</sub> emissions to 117 g/km, Europe to 95 g/km, and the U.S. to 119 g/km by 2021.

During 2018, many European carmakers reported a widening gap between actual emissions and the regulatory targets, due to the combination of a switch from diesel to CO<sub>2</sub>-heavy petrol and a shift of consumers' preference toward higher-emitting sport utility vehicles (SUVs). In addition to CO<sub>2</sub>, automakers are exposed to regulations on nitrogen oxides (NO<sub>x</sub>) for diesel cars and particulate matter (PM). Some cities in Europe have already implemented city-center bans for old diesel cars. Consumers' increasing aversion to diesel, in particular in Europe, adds to the challenges in achieving CO<sub>2</sub> emission targets in 2020 and exposes automakers to potentially significant fines. Based on the current gap between actual emissions and targets (around 25 g/km in the EU), we estimate that fines could depress operating profits for all automakers with sizable operations in the EU. We identify CO<sub>2</sub> as a major risk for the profitability of automakers.

Compliance with environmental targets and transition to electric cars has demanded sizable investments from automakers and suppliers in technologies and new products, and we see this trend persisting over the next three years. We expect the return on these investments to be lower compared with petrol- or diesel-fueled vehicles until demand for electric vehicles reaches sufficient scale and battery costs decline further. In the meantime, we expect pressure on operating margins and free cash flows, as the industry's average research and development (R&D) and capital expenditure (capex) in 2019-2021 is likely to increase above the 2016-2018 level of 10%-11% of sales. At the same time, the pace of adoption of electric vehicles remains uncertain, since consumer acceptance will depend on government incentives, evolution of battery costs and range, as well as infrastructure suitability.

## Social Exposure (Risk Atlas: 4)

We believe rating sensitivity to social risks could become more relevant over the longer term and is linked to changing consumer habits and preferences for mobility services that could jeopardize the traditional ownership model and support emerging ones. Automakers will face growing competition from technology firms that are developing applications to cater to demand for mobility services. Moreover, to the extent that autonomous driving becomes profitable, businesses will push the application of this technology.

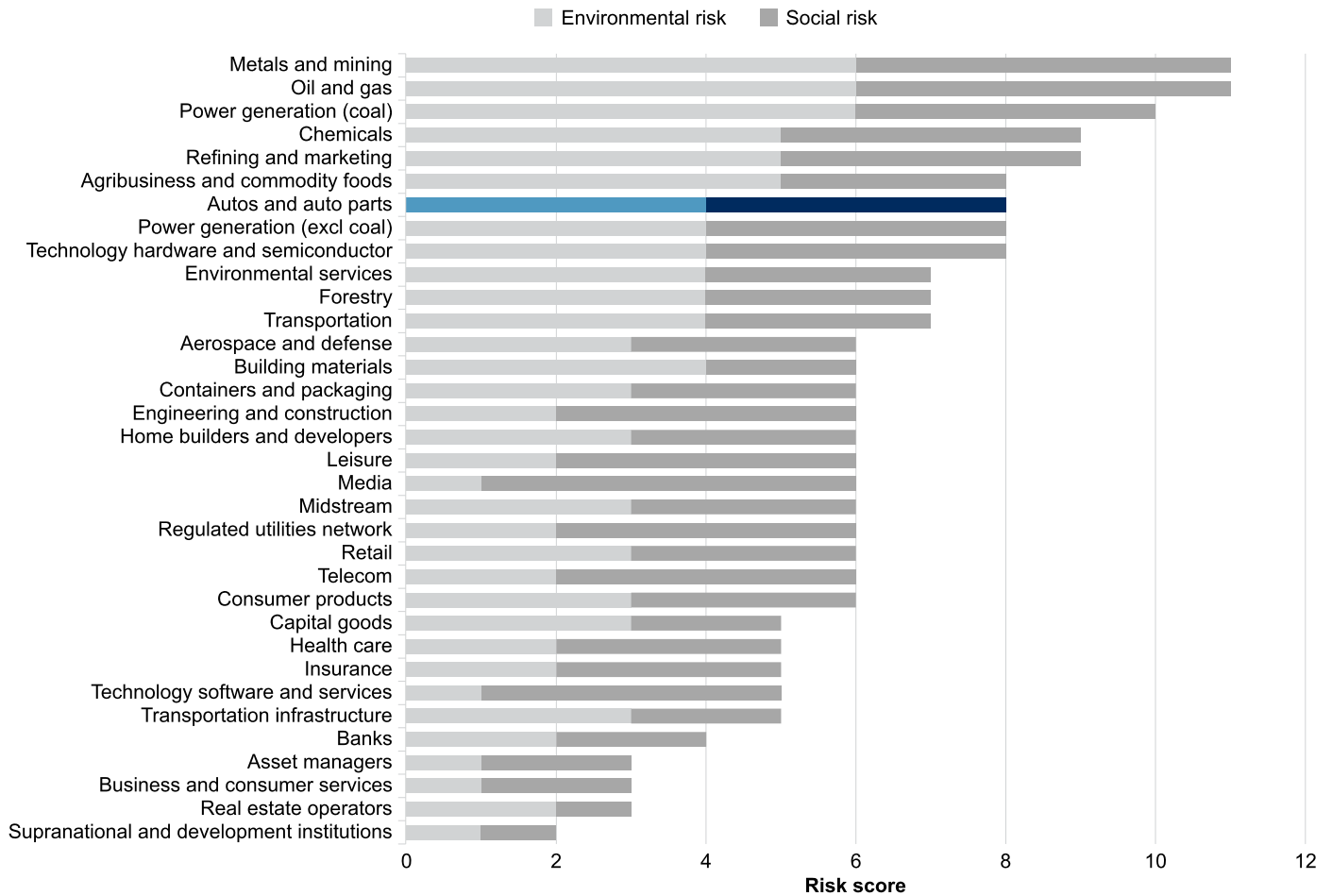
As a major employer, the automotive sector has a critical role to play for communities and governments, as evidenced by the latter's political support to the local industry. On the downside, the industry has contributed to the threat of increased trade barriers, such those potentially from the U.S. on European car imports. We have estimated such tariffs could reduce EBITDA by 15% for the top six European carmakers. As such, the sector is vulnerable to shifting political landscapes that can disrupt the otherwise highly efficient supply networks.

Subsequently, the workforce of automotive companies is vulnerable to sudden plant closures, and therefore the sector has a greater frequency of strikes from the highly unionized workforce.

## Governance

Although governance is best assessed on a company-by-company basis, the auto sector is regulated in various ways, so compliance with the limitations this imposes and experience in dealing with government agencies is important. Within the industry, investigations continue related to large product recalls, unlawful cartel agreements and manipulation (such as the "dieselgate" emissions testing scandal), and cyber-related breaches, which could negatively impact ratings in the sector.

## ESG Sector Risk Atlas



Source: S&P Global Ratings.  
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## ESG Risks In The Automotive Industry

Table 1

Company/Issuer Credit Rating/Comments	Country	Analyst
<p><b>Adient PLC</b> (B+/Negative/--)</p> <p>Since Adient operates 234 manufacturing facilities in 34 countries around the globe, the company is subject to a number of environmental laws and regulations. Estimating the ultimate level of liability involves a significant degree of uncertainty, given the complexity of determining relative liability among parties, the nature and scope of remediation, and the effect of legal decisions and risk assessment. We believe the company properly accrues for potential environmental liabilities and, therefore, do not expect them to have a material impact on its future operations, earnings, or cash flow. Reserves for environmental liabilities totaled \$8 million for the fiscal year ended Sept. 30, 2018. The company reviews the status of its environmental sites every quarter and may adjust its reserves. While past leadership has executed at a subpar level, we currently assess Adient's management and governance as fair, reflecting a reset in our expectations given the arrival of a new CEO in September 2018.</p>	U.S.	Lawrence Orłowski
<p><b>American Axle &amp; Manufacturing Holdings Inc.</b> (BB-/Stable/--)</p> <p>Environmental risks will have a meaningful influence on our assessment of American Axle's competitive advantage over the next few years. With higher-than-average exposure to electrification, its ability to offset losses in its engine and transmission-related business is highly dependent on higher content per vehicle in its differential and axle electrification businesses. A faster-than-expected transition to battery electric vehicles, coupled with slow adoption of the company's technology, represents a major downside risk. Through ongoing investments in lightweight axles and advanced drive units, the company has the technological capability to support the increased electrification of vehicle powertrains, at a competitive cost. We expect high R&amp;D costs leading to a ratio of selling, general, and administrative expenses (SG&amp;A) to sales approaching 6% over the next two to three years, with capex remaining high (5%-7% of sales). This will likely limit improvements in EBITDA margins and free operating cash flow (FOCF) over the coming years. Social risks remain somewhat high, but manageable. There have been work stoppages due to unfavorable negotiations in the past, since about 60% of its employees fall under collective bargaining agreements with various labor unions. Governance risks are low: American Axle is likely to extend its good track record of disciplined capital allocation and sound management of the executional risk related to launch activity. This should help the combined company navigate through operational issues that may arise as it works with its new customers to launch new technology.</p>	U.S.	Nishit K Madlani
<p><b>Aptiv PLC</b> (BBB/Stable/--)</p> <p>We expect Aptiv to spend about 8% of its revenue on R&amp;D and about 5%-6% of revenue on capex in current and future years, to remain competitive. R&amp;D expenditure as a percentage of sales is in line with global European and Japanese auto suppliers. While auto suppliers like Aptiv are important partners in helping automakers comply with emissions regulations, the ultimate cost of remediation and cleanups at company sites is difficult to predict. Still, based on environmental reserves of about \$4 million at the end of 2018, we see the impact as fairly immaterial, especially given the company's size and level of profitability. Social factors play a role in our ratings. A key factor behind our business assessment and forecasts of sales and profits is the focus on providing active safety technologies that consumers are demanding and regulatory agencies are promoting. Aptiv's technologies aim to protect vehicle occupants when a crash occurs, but also to reduce the risk of an accident in the first place through lane departure warning systems, automotive braking, adaptive cruise control, and gesture control. Aptiv has reserved \$50 million for product warranty liability as of the end of 2018. At this point, we believe the company's reserves are sufficient to cover the costs of product warranty litigation. We see Aptiv's management and governance as satisfactory, reflecting its success in positioning the company to target fast-growing areas such as active safety, as well as its operational expertise and consistent execution.</p>	U.S.	Lawrence Orłowski
<p><b>Beijing Automotive Group Co. Ltd.</b> (BBB+/Stable/--)</p> <p>We expect BAG to maintain high capex and R&amp;D spending for new energy vehicle (NEV) technological advancement in the coming two years. BAG's NEV subsidiary, BAIC BluePark New Energy Technology Co Ltd, was ranked No.2 according to the number of NEV credits in 2017 (under the Chinese government's NEV mandate each NEV sold generates a number of credits, depending on the vehicle's characteristics). We anticipate BAG will continue to spend 9%-11% of annual revenue on capex and R&amp;D, compared with the industry average of 8%-9%, to maintain its market leadership in the NEV segment and product upgrade. The high investment may have mild negative impact on its EBITDA margin and FOCF, but we believe BAG has a sufficient financial buffer to maintain its current rating. Although the sales of BAG's own proprietary brands are not satisfactory due to intensifying competition in China, BAG has successfully partnered with Daimler AG to localize the production of Mercedes Benz vehicles in China over the past few years. Product liability issues are inherent risks. BAG was subject to 69,358 recalls of NEV and other minor recalls in 2018. We believe the magnitude of recalls does not have significant impact on BAG's credit profile.</p>	China	Stephen Chan
<p><b>BMW AG</b> (A+/Stable/A-1)</p>	Germany	Eve Seiltgens

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BMW is a market leader in electromobility. It sold 142,617 electrified cars in 2018 and targets 500,000 by the end of 2019. Since 2013, BMW has sold 350,000 electrified vehicles (EVs) in total. However, meeting the emission target remains a challenge for BMW since about 50% of BMW's new cars have diesel engines in Europe. BMW's CO2 emissions in 2018 were stable compared with 2017, at 128g/km. A decline in the share of diesel vehicles was compensated by the sale of EVs. The company plans to offer 25 electric models by 2025, including 12 pure electrics, and increase sales of these models to 15%-25% of the total by 2025 to further improve its CO2 emissions. Higher investments in fleet modernization and electrification are likely to sustain BMW's solid market position and growth prospects, but will put pressure on margins in the short term. BMW spent about 14% of revenue on R&D and capex in 2018 and we expect similar numbers in 2019. EBIT margins in BMW's automotive segment decreased to 7.2% in 2018 from 9.2% in 2017, and we expect further margin pressure in 2019. Although BMW had several recalls in 2018 (e.g. its exhaust gas recirculation cooler), they have not significantly affected the company's operating results, reputation, or creditworthiness. Governance factors could become a credit concern if possible fines with regards to diesel exhaust gas emissions and antitrust continue to burden the company's cash flow. The recent announced possible fine of €1.4 billion due to an EU antitrust proceeding could burden the company's cash flow in 2019 or 2020.

**Robert Bosch GmbH** (AA-/Stable/A-1+)

**Germany**

**Eve Seiltgens**

Bosch develops and manufactures a wide range of systems and components for an electrified powertrain, such as electric motors, power electronics, and battery systems, as well as a new 48V battery for hybrids and an e-axle for electric vehicles. We believe that these products can help Bosch's customers manage the shift away from traditional engines. It targets €5 billion of electro-mobility sales by 2025. Bosch has consistently spent more than 13% of sales (including capitalized development costs) on R&D and capex in recent years--more than most its industry peers. We project the company will continue to spend heavily on electrification and automation of mobility, limiting the group's ability to raise its EBITDA margin beyond the projected 11%-13%. Furthermore, Bosch will reduce its worldwide CO2 emissions to zero by 2020 and invest about €1 billion in its locations' energy efficiency by 2030. Social factors do not have a negative impact on Bosch's credit quality. Various legal risks are covered by a provision of €1.2 billion as of Dec. 31, 2018, including those stemming from the supply of engine software to Volkswagen AG, Audi, Porsche, and several other automakers. Bosch has already reached several settlements in the U.S. and paid a total of about US\$450 million.

**BorgWarner Inc.** (BBB+/Stable/A-2)

**U.S.**

**Lawrence  
Orlowski**

We expect BorgWarner to spend about 4% of its revenue on R&D and 5%-6% of its revenue on capex in current and future years, to remain competitive. R&D expenditure as a percentage of sales is generally below the level of global European and Japanese auto suppliers. Social factors do not play a major role in our ratings on BorgWarner. We believe the company's reserves are sufficient to cover the costs of litigation. We see BorgWarner's management and governance as satisfactory, reflecting its success in implementing its strategic plans, its operational expertise, and management depth and breadth.

**China FAW Group Co. Ltd.** (A/Stable/--)

**China**

**Stephen Chan**

We anticipate the mandated investment in the NEV market will not materially affect the credit profile of FAW Group, which is in a net cash position with very limited operational debt. Under the dual-credit scheme, Chinese auto manufacturers need to achieve positive corporate average fuel consumption (CAFC) and NEV credits of 10% of production volume in 2019 and 12% in 2020 for greenhouse gas emission reduction. However, the overall dual credit generated by FAW Group was somewhat limited in 2017. Under our base case, we anticipate the company will allocate 1.5%-2.5% of revenue for its NEV capex and R&D for product upgrades in the coming 24 months. This investment may weaken FAW Group's EBITDA margin by 40-90 basis points and FOCF by Chinese renminbi (RMB)5 billion-RMB7 billion. Product liability issues are inherent risks in the auto industry. Although FAW-Volkswagen was subject to 1.09 million vehicle recalls in 2018, we expect the magnitude of recalls will not have a significant impact on FAW Group's operating results.

**Continental AG** (BBB+/Stable/A-2)

**Germany**

**Eve Seiltgens**

As a tier one supplier, Continental sells lightweight components, green tires, and powertrain components that help to reduce CO2 emissions. These accounted for about 40% of the company's €44 billion sales in 2018. We expect margin pressure through high R&D spending (about 10% of sales in Continental's auto segment) in the next few years, given the extensive upfront development costs that Continental will need to absorb for EVs, autonomous driving, connectivity and other technologies. S&P Global Ratings-adjusted EBITDA margins already decreased to 14% at end-2018 from 15.5% in 2017 and we expect similar or slightly weaker margins for 2019. Road and vehicle safety is particularly relevant for the company's auto and tire divisions because Continental was forced to recall steer tires for commercial vehicles in 2018. However, these recalls have not significantly affected the company's operating results, reputation, or creditworthiness. Continental's public disclosure and governance framework is consistent with accepted standards and there are no other governance-related issues.

**Daimler AG** (A/Stable/A-1)

**Germany**

**Eve Seiltgens**

Environmental factors are important for our analysis of Daimler since the company's average CO2 emissions for Mercedes Benz cars (excluding vans) in Europe increased to 132 g/km in 2018 from 125 g/km in 2017. The change in test procedure to WLTP is the main reason for the significant increase. The shift in sales from diesel to gasoline engines and increase in SUVs and all-wheel drive vehicles has also contributed. To achieve the challenging CO2 targets in 2021 and to avoid possible fines, Daimler plans to invest around €10 billion in the development of electric vehicles and plans to launch more than 10 purely electric cars in all segments, which should account for 15%-25% of its sales volume by 2025. Daimler has spent about 14% on R&D and capex in 2018 in its Mercedes Benz Car division and we expect similar numbers in 2019. The high investments in electrification are likely to sustain Daimler's solid market position and growth prospects but will put pressure on margins in the short term. EBIT margins its Mercedes-Benz Cars division already decreased to 7.8% in 2018 from 9.4% in 2017 and we expect further margin pressure in 2019. Social factors do not play a major role in our credit assessment. However, we

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monitor the risk related to product liability issues linked to road and vehicle safety. Governance factors could become a credit concern if the current governmental investigations with regards to diesel exhaust gas emissions significantly burden the company's cash flow.

<p><b>Dongfeng Motor Group Co. Ltd.</b> (A/Stable/--)</p> <p>We expect DFG will increase its capex and R&amp;D spending on new NEV models and technology upgrades in the coming two years. Up to 2017, the overall dual credit generated by DFG's parent, Dongfeng Motor Corp. (DFM), was somewhat limited. We anticipate DFG will increase its capex and R&amp;D by 2%-3% of revenue to strengthen its NEV capabilities and upgrade other products. We forecast its EBITDA margin will decrease by 30-80 bps and FOCF by RMB1.5 billion-RMB2.5 billion. In our base case, we believe DFG will still have a sufficient financial buffer to maintain its net cash position over the coming two years. Product liability issues are an inherent risk of the auto industry. Although DFG's joint ventures were subject to over 500,000 vehicle recalls in 2018, we don't expect this will have significant impact on joint ventures' operating results or dividend payment to DFG.</p>	<p><b>China</b></p>	<p><b>Stephen Chan</b></p>
<p><b>Fiat Chrysler Automobiles N.V.</b> (BB+/Positive/B)</p> <p>We regard FCA's agreement to pool its car fleet with Tesla's for CO2 emission testing as further evidence that there is a material risk that it could fail to meet the European CO2 emission targets on a stand-alone basis without negatively affecting its profitability. We note that the company is planning to offer 12 electrified propulsion systems by 2022 and is planning the roll-out of its BEV Fiat 500e for 2020. However, given untested consumer acceptance, FCA might not be able to pass on the incremental costs to customers. The company has not disclosed contractual terms of the agreement with Tesla, but we assume at a high cost especially in the early 2020s. For 2018, the group reported CO2 emissions of its average European fleet of 125.3 g/km (up from 119.2 g/km), suggesting the company would have to reduce emissions by more than 25% in the coming two years to comply, without any pooling agreements. Since the agreement reduces the risk of material fines in the years after 2021, we expect FCA will not be forced into offering hefty customer incentives to buy EVs. Given that emission targets are becoming more stringent over time, we expect FCA to continue focusing on reducing its fleet's CO2 emissions. We believe this might prove challenging, in light of the company's strategic intention to reduce diesel engines and given its below sector average R&amp;D spending (3.8% of revenues in 2015-2018). Required investments--including a targeted €9.0 billion in the electrification of the powertrain--will also significantly constrain the group's FOCF in the coming years (compared with about €4 billion generated in 2018), but could allow the company to catch up over time. Social risks do not play a significant role for FCA. In 2018, FCA recalled 4.8 million vehicles in the U.S. over a potential software failure. The company offers a free fix and given that no accidents were reported related to the fault, profitability will not be significantly affected. We view the group's management and governance framework as satisfactory. The recent announcement over a final aggregate settlement of \$0.8 billion with the U.S. Department of Justice (and other federal and state agencies and private class actions) compares favorably with the \$2.0 billion we had previously factored into our base case.</p>	<p><b>U.S.</b></p>	<p><b>Anna Stegert</b></p>
<p><b>Ford Motor Co.</b> (BBB/Negative/A-2)</p> <p>Environmental risk factors will have an increasing influence on Ford's credit quality as it faces tough CO2 emissions targets for its passenger and commercial light duty vehicles by 2021, and tightening fuel economy targets in the U.S. by 2025. We expect the company to be in compliance in both regions, based on its current portfolio plans, albeit at high costs. Beyond 2020, a key risk factor will be the company's ability to meet rapidly evolving regulatory standards in China and establish a competitive advantage in the EV segment, which will attract substantial competitors, many of which will benefit from a larger scale than Ford. Ford's overall R&amp;D expenses in 2018 were \$8.2 billion, up 12% from 2016, leading to sizable losses in its autonomous vehicle technology and services segment. We expect these trends to persist, hence limiting improvements in profitability over the next three to five years. From a social risk standpoint, we have very limited visibility on returns linked with Ford's plans for safe and reliable urban transportation systems and development of autonomous vehicles, on which the company aims to build new revenue streams (possibly with fleet operators). We believe Ford's investments and capital outlays (including shared investments) in these areas indicate a cautious approach, given risks surrounding technology, market acceptance, regulatory, safety, and insurance liability. Our assessment of Ford's management and governance takes into account its robust risk management framework and consistent track record of making strategic decisions to achieve its financial and operational goals since the Great Recession. However, we believe that during 2015 and 2016, the company's strong operating performance backed by higher volumes, improved product mix, and low commodity costs masked several operational inefficiencies as well as unperceptive capital allocation decisions. We also view management's extended risk-tolerance for several unprofitable segments may have somewhat limited its position to invest in newer business opportunities (electrification, autonomy, and mobility services) relative to some peers.</p>	<p><b>U.S.</b></p>	<p><b>Nishit K Madlani</b></p>
<p><b>General Motors Co.</b> (BBB/Stable/--)</p> <p>We expect ESG factors to have an increasing influence on GM's credit quality as GM invests heavily toward vehicle and greenhouse gas emissions control, improved fuel economy, electrification, autonomous vehicles, the safety of drivers and passengers, and urban mobility. The company's R&amp;D expenses in 2018 were \$7.8 billion, up over 7% over 2017 levels and up 18% from 2016. We expect this trend to persist, hence limiting improvements in profitability and constraining financial flexibility somewhat over the next three to five years. Despite lack of exposure to the tough emission standards in Europe, GM faces these risks in China and--to a much lesser extent--in the U.S. Strides toward portfolio electrification in China will likely be credit neutral over the next two years. For instance, future improvements in battery technology and costs are unlikely to impact credit quality positively before 2025, as sufficient scale related advantages would be hard to achieve until then. Back in 2014, from a social and governance risk standpoint, GM's high-profile product recalls were a negative factor in our assessment credit quality as they indicated a less effective risk-mitigation culture, in our view. GM was able to manage ongoing cash outflows of over \$3.5 billion to date associated with the recalls and related litigation. In addition, the company paid a settlement fine of \$900 million with the Department of Justice in 2015. Post 2014, we believe GM's management and governance demonstrates a robust risk management framework and consistent track record of making strategic decisions to achieve its EBIT and</p>	<p><b>U.S.</b></p>	<p><b>Nishit K Madlani</b></p>

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automotive cash flow targets, and strong responses to activist pressure under CEO Mary Barra. We also view the management's low risk-tolerance as credit-positive, as demonstrated by the quick decision-making in its exit from unprofitable operations (Europe, South Africa, India, and manufacturing in Australia), effective targeted cost-reduction actions, and reduced emphasis on passenger cars. By avoiding additional costs in loss-making regions, the company is better positioned to invest in newer business opportunities (electrification, autonomy, and mobility services) compared with many automotive peers. GM's aggressive investments in autonomous technology (albeit shared with other players) will remain credit neutral for the foreseeable future. Social risks will intensify into the next decade as accidents and cybersecurity breaches could increase the risk of product liability, government scrutiny, and further regulation.

**Honda Motor Co. Ltd.** (A/Stable/A-1)

Japan

Machiko  
Amano

Environmental and social risks to Honda are relatively high and they may hurt the company's profitability and competitive position in the future, in our view. Honda has less exposure to Europe and China, where more stringent environmental standards have been introduced. However, its profitability could come under downward pressure if R&D costs to meet environmental standards rapidly increase. The ratio of its R&D expenses to sales rose to 6% in fiscal 2018 (ended March 2019), from 5.2% in fiscal 2014. We expect the ratio to remain on an uptrend, albeit at a moderate pace, over the next year or two. However, this is likely to have only limited impact on the company's EBITDA margin, which is underpinned by its highly profitable motorcycle business. Honda has promoted measures to secure staff while pursuing initiatives to establish business alliances with companies in other industries to develop next-generation technologies. For example, it has collaborated with Softbank on Artificial Intelligence and connectivity; and with Sense Time and General Motors on autonomous driving. We also believe the company is likely to maintain its leading position in the motorcycle business with its strong technological advantage, despite tougher environmental regulations in both developed and emerging countries. Honda's management and governance is satisfactory, in our view, which is neutral to our ratings on the company

**Hyundai Mobis Co. Ltd.** (BBB+/Stable/--)

Korea

Minjib Kim

As a captive auto parts company, Mobis will play an important role in supporting the group's plan to expand its green car models to 44 by 2025, from 18 in 2018. Specifically, Mobis is one of the key pillars of the group's investment in hydrogen fuel cell (over US\$7 billion until 2030). R&D spending has increased around 10% every year recently for green car and autonomous driving, which will put negative pressure on cash flow in the near term. Longer term, we will monitor Mobis' ability to secure its position and profitability in the new area. Social factors are less material for Mobis. That said, as new technology accelerates, the risk of reputational damage from unexpected quality issues becomes more critical for the auto industry with respect to customer acceptance and regulatory responses. In addition, Mobis' domestic operation is not free from the negative impact of Korea's highly unionized workforce. Governance factors are a neutral for Mobis, given its management's expertise and comprehensive public disclosures. However, there could be changes in the group's complex ownership structure ("circular shareholding" among HMC, Kia, and Mobis) in the near future, which the Korean government is indirectly pushing to resolve. The impact remains uncertain.

**Hyundai Motor Co. (including subsidiary Kia Motors Corp.)** (BBB+/Stable/--)

Korea

Minjib Kim

HMC-Kia is investing to expand its green car models to 31 by 2020 and 44 by 2025, from 18 in 2018. We believe meeting the requirements without sacrificing margins will be challenging, given the higher manufacturing cost of green cars. HMC-Kia's domestic plants (44% of total production) have experienced labor strikes every year since 2012 with the most significant one in 2016 (annual utilization rate down by nearly 10%). As application of new technology accelerates, the risk of reputational damage from unexpected quality issues becomes more critical to manage with respect to customer acceptance and regulatory responses. For instance, HMC-Kia recognized sizable quality-related expenses in 2017 and 2018, totaling more than US\$1 billion. Governance is a neutral factor for HMC-Kia, given its management's expertise and comprehensive public disclosures. However, there could be changes in the group's complex ownership structure ("circular shareholding" among HMC, Kia, and Mobis) in the near future, which the Korean government is indirectly pushing to resolve. The impact remains uncertain.

**Johnson Electric Holdings Ltd.** (BBB/Stable/--)

China

Yolanda Tan

As a global supplier with balanced exposure to Asia, Europe, and the Americas, JE will experience challenges and opportunities in supporting its customers to meet environmental requirements. We expect JE to keep its high R&D costs and capex to maintain technology advances in order to support EV and hybrid evolution. This is demonstrated by forecast continued R&D spending of over 5% of revenue and capex of 10% in next year ending March 2020, which will continue to negatively impact EBITDA margin by 40-50 bps and FOCF by US\$45 million-US\$55 million. However, the net result won't be sufficient to change our ratings in the near term. JE is exposed to potential reputation damage and credit impact arising from quality deficiency, and also liabilities of safety issues. So far, we have not observed any material recalls or lawsuits concerning the above factors. We see JE's management and governance as satisfactory, mainly based on its long track record of strategic planning and execution process as well as management's expertise and experience.

**Magna International Inc.** (A-/Stable/A-2)

Canada

Alessio Di  
Francesco

Environmental and social factors could become important credit risk factors for the company over the next decade. Given Magna's scale as the world's third-largest supplier and product mix, the company should benefit from the global efforts by virtually all developed markets to improve fuel economy and reduce greenhouse gas emissions. This trend should fuel demand from original equipment manufacturers (OEMs) for products that reduce weight and optimize aerodynamics, which bodes well for Magna's body exteriors and structures segment (about 45% of revenue). We see this as an opportunity for Magna to increase the content per vehicle within its powertrain segment while product demand within the company's other segments remains largely unchanged. At the same time, Magna will have higher level of investments to maintain competitiveness and could face increased pricing pressure from automakers that face migration of value away

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from their traditional products toward electrified products with higher cost of battery systems. We believe Magna will also face increased expenditure on autonomous driving, along with high R&D costs to develop autonomous features wanted by OEMs, which could place pressure on profits. Uncertainty regarding ability to commercialize new technologies, and social risks associated with ultimate customer adoption reduce the visibility of these investments. While a meaningful portion of Magna's workforce is unionized, labor relations have been relatively stable. We believe the company can manage labor-related disruptions, due in part to its global manufacturing footprint. The company is publicly held, with a highly regarded management team and good governance practices.

**Nemak S.A.B. de C.V.** (BB+/Stable/--)

**Brazil**

**Francisco  
Gutierrez**

Environmental factors are relevant for Nemak's credit analysis, primarily as competitors in the auto-part industry are subject to increasingly tougher regulations for emission control, as well as energy and water consumption. Social factors play a major role in our credit analysis for Nemak. As an auto and industrial parts supplier, the company is exposed to potential reputation damage and credit impact arising from warranty and product liability claims of quality deficiency, and potential fines and liabilities relating to environmental, health and social (EHS) issues. So far, we have not observed any material recalls or lawsuits concerning the above. We see Nemak's management and governance as satisfactory, reflecting its constant record of strategic planning and execution process as well as management's expertise and experience. This aligns to the sustainable policies of its parent company, Alfa S.A.B. de C.V. (BBB/Stable/--).

**Nissan Motor Co. Ltd.** (A-/Stable/A-2)

**Japan**

**Katsuyuki  
Nakai**

Governance factors are one of the focal points in our credit analysis of Nissan. We consider Nissan's management and governance as a weakness for our 'A-' rating on the company. In our view, the company's governance system is not sufficient, given its inability to guard against misconducts and conflicts of interests alleged against the former chairman. We also believe that the company's internal risk management is not strong due to the recent cases of its inadequate inspections. Additional risk could emerge from possible accusations against Nissan or potential shareholder litigation. Going forward, we will monitor Nissan's efforts to intensify its governance system and progress in negotiation with Renault about the alliance structure. Overall, we see Nissan's management and governance as fair, lower than most global peers. By 2022, Nissan aims to reduce CO2 emissions by 40%, compared with 2000, in its new car sales in Japan, the U.S., Europe and China. Under this ambitious goal, Nissan aims to increase its sales of EV and e-Power Hybrid Vehicle by up to 1 million units. This strategy will require a rapid increase in R&D spending (4.1% of sales in fiscal year ended March 2018), limiting any significant improvement in Nissan's profitability over the next two to three years. Also, fierce competition in eco-friendly vehicles could weaken Nissan's business position, should it fail to adequately deal with such technological development. Nissan has a good track record of effective control over social risks, in our view.

**Panther BF Aggregator 2 LP** (B+/Stable/--)

**U.S.**

**Lawrence  
Orlowski**

From an environmental standpoint, Power Solutions must comply with local lead-emissions regulations to avoid penalties and shutdowns. At the same time, there are legal and ethical obligations to prevent serious risks to the members of the local community, especially children, who live close to its smelting operations. The recycling of lead-acid batteries can pose serious public health risks through environmental emissions and occupational exposure. Children and young women of childbearing age are especially vulnerable to lead exposure. Lead can have a toxic effect on many parts of the human body, including the heart, kidneys, reproductive organs, and nervous system. A positive for the industry is that 99% of automotive batteries are designed for recyclability and conventional vehicle batteries are the most recycled consumer product in the world. Over the years, the company has made significant investments in its recycling facilities. Because of these investments, Power Solutions' global footprint emits less than half of the amount of lead air emissions as the overall U.S. battery industry and its emission intensity in the U.S. is less than one-eighth that of its competitors. Furthermore, how well a company ensures the safety of its workers has important social ramifications. Power Solutions appears to perform better than its industry peers do in this area. The company's worker incident and illness rates in the U.S. are below industry standards. Furthermore, the average lead blood level among its workers is 20 milligrams per deciliter (mg/dl), which compares with the Occupational Safety and Health Administration's (OSHA) requirement of 50 mg/dl and the industry's target of 30 mg/dl. Our assessment of management and governance is fair since the company has a short track record since its spin off from Johnson Controls. Given the controlling ownership by Brookfield, we will monitor its role in furthering the operational effectiveness of Power Solutions and its treatment of other stakeholders.

**Peugeot S.A.** (BBB-/Stable/--)

**France**

**Vittoria  
Ferraris**

The French automaker PSA, whose business is primarily concentrated in Europe, is mainly focused on securing compliance with 2020 average fleet CO2 emission targets (95-100 g/km). This compares with provisional average CO2 emission of 114 g/km in 2018, up from an estimated 112 g/km with a full year of OPEL Vauxhall in 2017, due to the integration of OPEL as well as the shift from diesel to gasoline, and to a mix effect linked to stronger consumer preference for higher emitting vehicles like SUVs. From 2019, we expect the mix to include new electrified models (mainly hybrids) which we expect would help the group to be compliant by the end of 2020. According to its sustainability report, if the company-specific CO2 target is missed, a penalty will be applied amounting to €95 per g/km of CO2 and per vehicle, e.g. for Groupe PSA approximately €240 million for 1 g/km of CO2 exceeding the target. The execution of the electrification strategy implies consistent efforts from OEMs on R&D and capex. According to our estimates, PSA compares well with peers, since its R&D and capex should hover at approximately 8%-9% of sales, versus an industry average we estimated at 10%-12% for OEMs in EMEA. Our base case factors in some margin dilution due to the transition to electrification and the higher production costs of hybrid and pure battery vehicles, which we think will gradually subside toward 2025 with wider adoption of EVs and increased production scale. Longer term changes in consumer habits and the evolution of the traditional vehicle ownership model, could result in substantially lower volume of



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vehicle sales, resulting in pressure on break-even. However, we believe this development is well beyond our forecast horizon. Governance risks are not a credit concern for our ratings on PSA.

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**Renault S.A.** (BBB/Negative/A-2) **France** **Margaux Pery**

With its Zoe model, Renault ranks among the best-selling brands for electric cars in Europe. In order to meet the 2021 target of 93 g/km for its average fleet in Europe, Renault is stepping up its effort toward the electrification of its portfolio. This will constrain, at least temporarily, its operating profitability and FOCF, due to the associated R&D costs and capex. Renault acknowledges that its electric cars are generating operating margin below the group average, but indicates that its electric cars are profitable on variable costs. By the end of 2022, the company expects to generate an operating margin in Europe at group average level. Thanks to its cooperation with Nissan and Mitsubishi motors, Renault expects benefits in terms of R&D and production costs. The cost benefits will mainly come from the use of a common platform for EVs. This is a key consideration because Renault is a mass market manufacturer positioned on small and entry cars with risk of not being able to pass on extra costs to consumers. Social factors do not play a major role in our credit assessment, but we monitor the risk related to product liability issues linked to road and vehicle safety. Renault has strengthened its governance with the appointment of Jean Dominique Senard as chairman and Thierry Bolloré as CEO while previously both positions were concentrated in the sole person of Carlos Ghosn. Our score on Renault's governance does not constrain our ratings on Renault.

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**Scania AB (publ.)** (BBB+/Stable/A-2) **Sweden** **Per Karlsson**

Scania is focused to support fossil-free commercial transport solutions by 2050, and already has a portfolio of engines which cover all commercially available alternative fuels (biogas, bioethanol, biodiesel, biogas, compressed natural gas, and hydrogenated vegetable oils [HVO]). Scania's biogas engines reduce CO2 emission by 90% compared with traditional diesel combustion engines. The company actively supports infrastructure development through a variety of partnerships. We view Scania as in a good position to manage tightening environmental regulation, but this will continue to require substantial investments, and we expect R&D of about 6.0%-8.0% of sales with a focus on strategic automation, connectivity, and electrification. The company will be exposed to tightening environmental regulation in Europe mainly, albeit over a longer timescale than our rating horizon. As Scania is a relatively small manufacturer of heavy trucks, the required investment may somewhat constrain profitability in the near to medium term. However, given Scania's position as a premium truck manufacturer, we believe its high awareness and focus on lower emissions will continue to strengthen its competitive position over time. Social factors do not play a major role in our credit assessment. Although we are monitoring an ongoing investigation by the European Commission concerning inappropriate cooperation, we currently do not have any credit concern with regards to governance factors.

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**Schaeffler AG** (BBB-/Stable/--) **Germany** **Anna Stegert**

With its roots in mechanical engineering and significant powertrain operations, Schaeffler has a relatively significant dependency on internal combustion engine technology. Core traditional products in its Automotive OEM segment include transmissions, engine systems, and chassis systems through which the company still generates the vast majority of its earnings, while it attempts to grow its e-mobility operations (5% of OEM sales in 2018) to align its product offering to customers' attempts to reduce CO2 emissions through electrification and increased fuel efficiency. While Schaeffler's product portfolio is well positioned to offer increased fuel efficiency for internal combustion engine technology, we expect Schaeffler will need to balance carefully necessary investments to enhance its competitive advantage in e-mobility and autonomous driving competencies. We expect the shift to electrified products will dilute margins, while additional investments in that field will reduce financial flexibility. The company earmarks about €100 million-€500 million for acquisitions per year (€163 million payout in 2018, and €150 million payout assumed under our base case in 2019 and 2020). In addition, the company is planning to incur R&D of about 8.0%-8.5% of sales in its Automotive OEM business, with a particular focus on strategic growth areas, which is largely consistent with peers' efforts. While this will constrain profitability in the near-term, it should support the company's transition in an evolving industry environment longer term. We see Schaeffler's management and governance as fair, reflecting management's depth and breadth of expertise.

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**Sensata Technologies B.V.** (BB+/Stable/--) **U.S.** **David Binns**

Sensata will play an important role in supporting its customers through its technological innovation to reduce CO2 and NOx emission targets. The company produces sensors that can play a key role in monitoring the pressure and temperature of powertrains and exhausts, to help OEMs increase fuel efficiency. While we believe the overall trend of lower emissions should help Sensata grow faster than the market, we believe there are risks to the company's profitability if electrification happens faster than expected. While Sensata will continue to innovate and find sensing solutions for EVs, the certainty of platform wins and ultimate volume of demand for these products is lower than for its existing products where Sensata has a strong legacy of success. We therefore consider the near-term impact on the group's credit profile as somewhat positive, but the longer term impact as introducing greater risk. Social factors do not play a major role for our credit assessment on Sensata. Product liability issues are inherent risks for the automotive industry, but the company has a good track record and issues with its sensors are quite rare. We see Sensata's management and governance as fair, reflecting management's depth and breadth of expertise.

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**Tesla, Inc.** (B-/Negative/--) **U.S.** **Nishit K Madhani**

We expect governance and social risk factors to remain high and have an increasing influence on Tesla's credit quality. The company's environmental risks are minimal relative to other automakers, given its focus on fully electric vehicles and its ambitions to expand aggressively into heavy-duty trucks and energy storage markets. Governance risks will remain a bigger negative for credit quality than environment and social risks, given the increasing risk that the conduct of CEO Elon Musk violates securities laws on fair disclosure, and the recent high rate of senior executive turnover. We view the effectiveness of the committee that oversees Mr. Musk's communications as

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poor, given the rising risks from current and future litigation (as demonstrated by the recent subpoenas from the Securities Exchange Commission and related investigations from the U.S. Department of Justice). We view key-man risk as very high for Tesla, given Mr. Musk's dominant role in the company. In late 2018, the settlement with the SEC, under which Mr. Musk resigned as chairman of the board of directors but remained CEO, averted a significant disruption to Tesla's operations. Social risks will intensify into the next decade as potential accidents, fires, and cybersecurity breaches could increase the risk of product liability, government scrutiny, and further regulation. Until those risks abate, in our view, Tesla's progress toward improving safety through the successful deployment of its autopilot technology will at best remain credit neutral for the foreseeable future. From an environmental risk perspective, we think Tesla has an advantage over competitors given its battery and powertrain technology, the superior range per kWh (as rated by the U.S. Environmental Protection Agency) of its vehicles compared with upcoming launches, and Tesla's ability to improve vehicle performance through over-the-air software updates. However, Tesla's sales growth could be hurt by reduced U.S. tax incentives, which began to phase out for Tesla after production of 200,000 vehicles in July 2018. The company will face intense global competition, as most major automakers plan to launch a range of electric vehicles after 2019. Tesla's cash flows remain weak, given its need to fund R&D (which totaled 7% of 2018 sales), and the need to make investments in tooling and manufacturing for its new vehicles, services, and infrastructure, energy storage products, and solar products. Given its high reliance on battery and other customized components, Tesla's limited and often single-source supply chain exposes it to multiple potential sources of delivery failure or component shortages. We saw this happen in 2012 and 2016 in connection with production delays for the Model S and Model X.

**Toyota Motor Corp.** (AA-/Stable/A-1+)

**Japan**

**Machiko  
Amano**

We view environmental and social risks as important to Toyota Motor's credit quality, as the company is investing heavily in EVs, greenhouse gas emissions control, autonomous driving, and safety issues, all of which have potential impacts on market competitiveness and profitability. However, these factors currently do not have any negative credit implications for Toyota Motor, given its readiness for several scenarios for future electrification, ample cash position, and its strong commitment to prioritize safety issues and fair supplier selection. Toyota aims to achieve global sales of at least 5.5 million EVs, including at least 1 million zero-emission battery EVs and fuel cell EVs by 2030, versus 1.5 million in total in 2017. It also set a target to cut CO2 emissions from new vehicles by 35% compared with 2010. Toyota's R&D expenses in fiscal 2018 (12 months ended March 31, 2019) were ¥1.05 trillion, or around 4% of sales; and capex for auto business was over ¥1.5 trillion in fiscal 2018, up 10% from the previous year. Starting in 2020, Toyota will accelerate the introduction of battery EVs, initially in China, and will expand these models to at least 10 in the first half of the decade worldwide. It will also expand the line-up of fuel cell EVs and plug-in hybrid EVs throughout the 2020s. We expect this trend to persist, limiting marked improvement in profitability. However, we view Toyota will be able to manage R&D and capex effectively, as it is making effective use of joint ventures within the group and business tie-ups besides its own R&D resources.

**Valeo S.A.** (BBB/Negative/A-2)

**France**

**Margaux Pery**

Valeo's product portfolio in its powertrain business aims at helping customers reduce CO2 and NOx emissions, to a large extent through electrification. We see Valeo as well placed to address this trend by serving its customers with 48V technology, for which it holds a significant market share. In addition, Valeo should see growth opportunities through its joint-venture with Siemens on high voltage components. Valeo's product portfolio serves three types of electrified cars (mild hybrids, plug-in hybrids and electric cars). The ongoing electrification of cars' powertrains offers growth opportunities to Valeo because the content per car for a low-voltage electric car can exceed the content per car for a standard internal combustion engine powered car by 2x while it can go as high as 7x-9x for plug-in hybrids (including high-voltage products from its joint-venture with Siemens). However, at the same time, gross R&D investments remain high (at around 10.8% of 2018 sales) constraining the company's EBITDA margin and free cash flow generation in the near term before sales will reach a critical mass and R&D costs will have peaked. Social factors do not play a major role for our credit assessment on Valeo. We score Valeo's management and governance as satisfactory, supported by management expertise and experience.

**Volkswagen AG** (BBB+/Stable/A-2)

**Germany**

**Vittoria  
Ferraris**

We continue to regard VW's management and governance as a weakness for the rating because the consequences of diesel emissions testing scandal continue to weigh on cash flows (more than €3 billion in 2018), albeit to a lesser extent than in the past. We view VW's ownership structure as negatively influencing its corporate decision-making, with limited consideration given to minority shareholders. In particular, this reflects the continued disproportionate voting rights of Porsche Automobile Holding SE (Porsche SE). Porsche SE has a 52.2% share in VW, held through only 30.8% of VW's subscribed capital, which gives it control of VW (except on matters linked to factory and headquarters location). Porsche SE is itself 100% owned and controlled by members of the Porsche and Piech families. Without improvements in VW's management and governance framework, a rating in the 'A' category is unlikely. In Europe, VW still needs to manage a reduction of more than 25g/km to secure compliance with 2020 average fleet CO2 emission targets (95g/km-100g/km). To achieve this, VW, unlike some of its global peers, is accelerating the deployment of pure battery vehicles, which has been translating into R&D and capex at the very top of the industry range, above 12% of sales in recent years and will likely result in more pronounced margin dilution. While we monitor this, we do not think it represents downside risk to the rating at this stage, considering the double-digit adjusted EBITDA margin of VW, now less severely burdened by dieselgate-linked provisions than in the past.

**AB Volvo** (A-/Stable/A-2)

**Sweden**

**Per Karlsson**

We view Volvo to be in a good position to manage its exposure to tightening environmental regulation, thanks to its advanced technology. Volvo has invested large amounts already in alternative fuels that substantially lower emissions. For example, methane-, HVO-, and LNG-powered trucks are offered in Europe, with 20%-100% lower CO2 emissions compared with diesel. In North America, Volvo was the first OEM to approve the use of advanced HVO in all of its products. In addition, electric trucks will be offered in Europe during 2019. Given

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the company's innovative strength and sizable investments, we see longer-term growth opportunities that could allow Volvo to strengthen its competitive position over the medium term through strong technological developments. We expect that Volvo will at least keep up its already high R&D costs and capex, likely in the higher range of the SEK20 billion-SEK25 billion spent annually since 2015. We don't expect this will lead to any significant further pressure on profitability, which instead will be more dependent on the industry cycle. Product liability risk is more of an issue for the industry but we don't think this is a specific concern for Volvo as no recalls have occurred to date.

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**Yanfeng Global Automotive Interior Systems Co. Ltd.** (BBB-/Stable/--)

**China**

**Stephen Chan**

We believe YFAI is actively seeking solutions that help its auto OEM customers to meet environmental regulation and reduce auto carbon emissions. The company has spent around RMB10 million per year to develop lightweight products by leveraging its current manufacturing expertise and customer resources. Our base case further incorporates relevant capacity investments of around RMB100 million annually. Such expenditure is unlikely to pressurize the company's profitability and cash flows materially given its limited scale. Meanwhile, we expect product innovation to somewhat enhance YFAI's brand reputation and competitiveness, strengthening its market standing. In terms of social factors, inherent risks relating to skilled labor shortages could lead to unexpected declines in profitability. In 2018, a labor shortage occurred in some of YFAI's Eastern European plants that lasted for a number of months. The disruption led to a delay on product deliveries and a margin loss of 2%-3% on YFAI's affected European operations for the year. The company has taken steps to manage its labor issues. In 2019, the company transferred workers from other regions and rebalanced its workforce. Still, labor issues remain a potential social risk for YFAI given their impact on operational stability.

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**ZF Friedrichshafen AG** (BBB-/Negative/--)

**Germany**

**Anna Stegert**

We expect ZF will need to keep up its high R&D costs to reposition its product offering toward EVs as demonstrated by the €12 billion R&D and capex investment plan for the coming five years in the areas of electrification and autonomous driving. This will continue to pressure profitability (the company's adjusted EBITDA margin was 10.2% in the 12 months to June 30, 2018) and constrain reported free cash flow generation over coming years (forecast at about €0.8 billion per year, compared with €1.3 billion in 2017). We therefore consider the near-term impact on the group's credit profile as somewhat negative. However, given the company's innovative strength and sizable investments that are targeted toward the company's Vision Zero (roadmap to a world of zero accidents and zero emissions), we see longer-term growth opportunities that could allow ZF to strengthen its competitive position by leading technological developments in those areas. Social factors are not a credit concern at the moment. However, we monitor the current air bag investigation of 12.3 million vehicles manufactured by its U.S. subsidiary TRW. So far the magnitude of recalls has not significantly affected operating results. We see ZF's management and governance as fair, reflecting management's depth and breadth of expertise.

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**Zhejiang Geely Holding Group Co. Ltd. / Geely Auto Holding Ltd.** (BBB-/Stable/--)

**China**

**Chloe Wang**

Though NEV only accounted for about 5% of Geely Auto's total sales in 2018, the company is quickly ramping up its NEV offerings by launching a stand-alone NEV brand platform in 2019. Volvo Car is also aiming for fully electric cars to comprise 50% of its sales by 2025. In addition, Zhejiang Geely Holding is cooperating with battery technology leaders, such as CATL, to further improve its competence in the NEV powertrain space. In our view, Zhejiang Geely Holding will have to invest substantially in NEV R&D and new model launches in the next few years. We assume that Zhejiang Geely Holding's R&D and capex will account for about 10%-15% of its total revenue in the next two to three years. Social and governance factors do not play a major role in our assessment for Zhejiang Geely Holding, but product liability issues are inherent risks. Recalls at major subsidiaries include 40,068 vehicles at Geely Auto in 2018 and 89,657 in January 2019; and 166,977 vehicles by Volvo Car in January 2019. However, the magnitude of these recalls do not have significant impact on the current credit profile, by our assessment.

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## Appendix: Components In The Sector ES Risk Atlas

Here is a list of examples of factors we consider in evaluating sector-specific environmental exposure. For example, we examine to what extent each sector is relatively exposed to:

**Greenhouse gas emissions (GHG):** actual or potential regulations such as carbon taxes, emissions trading schemes, and other direct or indirect costs. The GHG emissions under the Kyoto climate change agreement are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>).

**Sensitivity to extreme weather events:** incremental costs or the potential physical impact on assets associated with recurring (for example, hurricanes) or infrequent (droughts) severe weather events.

**Sensitivity to water scarcity:** potential costs related to the need for extracting or sourcing large quantities of water, or requiring on-site water treatment, in comparison to other water users of the same water basins or utilities.

**Waste, pollution, and toxicity:** potential fines or rising costs associated with prevention and treatment of waste and pollution, including hazardous waste and air pollution.

**Land use and biodiversity:** asset retirement obligations, developing natural land or potential operating constraints, or increased costs associated with protecting plant and animal life.

The following is a list of examples of factors we consider in evaluating sector-specific social exposure. For example, we analyze to what extent each sector is relatively exposed to:

**Human capital management:** a sector's capacity to develop a long-lasting productive workforce while reducing potential operational disruptions from workforce mismanagement; diversity and inclusion attributes; exposure to strikes and the sector's general exposure to dealing with emerging skills scarcity or surplus labor.

**Changing consumer or user preferences:** We recognize that changes in consumer behavior are often the result of complex dynamics, such as changes in technology or fashion or other disruptive business trends. Therefore, we treat a change in consumer preferences as a social factor related to sustainability, health, safety, the environment, privacy, financial mis-selling, or community and human rights, particularly when an entity has triggered the change.

**Demographic changes:** potential costs or opportunities related to population growth and composition, such as an aging population, urbanization, changing living standards, or a growing middle class

**Safety management:** potential direct or indirect costs resulting from problems related to the safety of a sector's production processes and final customer products.

**Social cohesion:** potential or actual costs in direct operations or in the supply chain resulting from geopolitical or community-related events such as conflicts, community unrest, and terror attacks.

This report does not constitute a rating action.

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