HSBC Global Research

23 April 2024

Autonomous Vehicles

Assessing safety and governance risks

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- Advances in autonomous driving are evident globally; extensive adoption of full autonomy in the near future is yet debatable
- In addition to cost and tech challenges, regulatory scrutiny and public backlash over safety issues present major hurdles
- We highlight key liability and governance areas to consider as accident mismanagement by leadership brings additional risks

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Cars are now moving, slowly, to the next level of autonomous driving, opening new opportunities; but the timeline for full autonomy as a commercial reality is not clear. L2 driver assist features (see figure 1 for a classification) are now commonplace on new models; in our view, this is the most tangible near-term market for all carmakers, while transition to L3 will be restricted to premium brands and/or top-end models due to cost and regulatory issues. The US and China lead the way on L4 / robotaxis, and localised trials are evident worldwide. However, we think widespread adoption of L5, in the near future, is challenging, as technical, economic, market and legal liability hurdles have a meaningful impact on AVs commercial viability and investment position.

Regulatory and social obstacles increase as safety issues keep on rearing their heads. Regulations are key to determine penetration of the technology; but with new rules, regulatory scrutiny has intensified. A lack of acceptance by the public challenges AVs commercial viability too. We expect the improvements to safety protocols to be an ongoing effort by firms, which will help meet stakeholder expectations.

Inadequate management of safety issues and poor leadership brings additional risks; these risks stem from ineffective governance and may lead to increased reputational damage as well as weakened relationships with regulators, media and local communities. Looking at the October 2023 Cruise incident, inappropriate response by leadership resulted in additional regulatory investigations and media scrutiny. This poor response, among other things, was largely due to a lack of accountability and coordination in relation to safety processes (e.g. no chief safety officer) and failure to appreciate the importance of transparency in communication with regulators and media. We think robust board oversight, healthy culture and clear accountability for safety matters will facilitate widerspread adoption of the technology.

As vehicles gain more autonomy and move to L3-L5, we expect the liability landscape to shift from a driver towards a manufacturer/developer/service provider; this will bring new challenges associated with the income stream. Legislation and case law on liability are still evolving; we think this legal uncertainty may intensify financial and litigation risks for AV companies.

Issuer of report: HSBC Bank plc

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Autonomous driving: opportunities and risks

- Vehicles are transitioning to the next level of autonomous driving, bringing new revenue streams; robotaxis is an area to watch
- But many regulatory and social obstacles still need to be overcome; the timeline for full autonomy as a commercial reality is not clear
- Also liability rules and accident mismanagement due to weak governance are of concern; we offer five engagement questions

Vehicles globally are increasingly sold on their software – it is no longer all about the style and design of the hardware; this opens the possibility of new revenue streams for original equipment manufacturers (OEMs), but also brings new challenges to address.[1]

The levels of autonomy

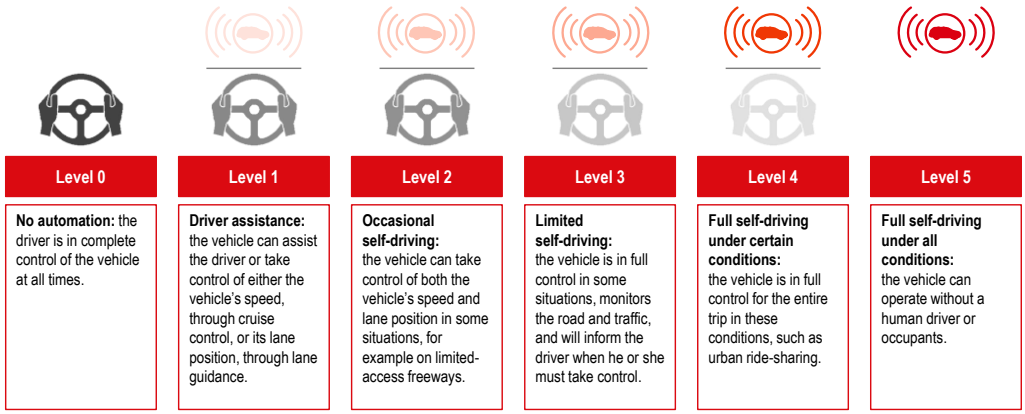
Levels of autonomy are split into five levels

Advanced driving assistance systems (ADAS) have been commonplace for several years; and now the varied levels of assisted driving move toward making the vehicle more autonomous. The Society of American Engineers (SAE), a leading professional association of experts in aerospace and automotive industries, splits **levels of autonomy into five levels** (L0-L5, as figure 1 suggests), where level zero (L0) represents no presence of assisted driving functions at all. The key difference between autonomy levels lies between L2/L2+ and L3, because this marks the transition to partial autonomous driving (mainly for privately owned vehicles). L4 and L5 autonomous vehicles (AVs) are currently and will likely remain most suitable for mobility as a service, such as robotaxis.

L2 driver assist features are now commonplace on new models; we think this is the most tangible near-term market for all OEMs. Many OEMs offer ADAS features in their cars up to L 2/ L2+ automated driving at a one-time cost at the point of purchase or on a monthly subscription basis (e.g. Tesla). While some of the features allow a driver to be hands-free, especially on highways, the driver is still expected to pay attention at all times and be ready to take over when prompted by the car. Thus, whatever the name is (e.g. Full Self-Driving (FSD) package as in Tesla's case) the car is still in the driver-assist realm rather than 'autonomous' in the true sense.

1 We would like to acknowledge the contribution of Mick Cameron, Equity Research Autos Sector Consultant, to this report. Mick Cameron is employed by a non-US affiliate of HSBC Securities (USA) Inc., and is not registered/qualified pursuant to FINRA regulations.

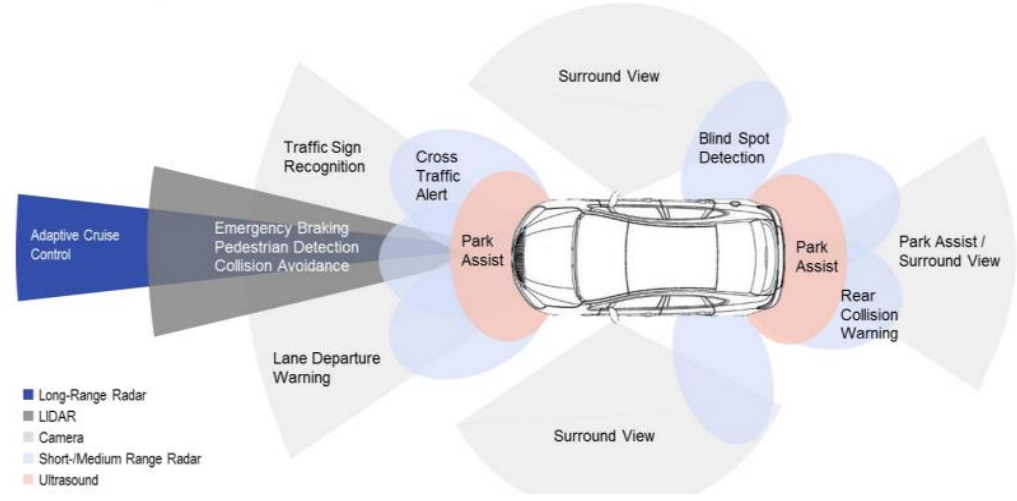
Figure 1. Five levels of vehicle autonomy



Source: SAE & NHTSA, HSBC

Transition to L3 will be restricted to premium brands and/or top-end models, in our view, due to regulatory limitations and liability issues. While the existing technology (cameras, sensors etc., as figure 2 illustrates on recently launched cars already supports autonomous driving beyond Level 2, carmakers don't yet offer that as a package to customers. Limited application is a factor: since 2021, L3 driving has been allowed only up to 70km/h and only on highways, where markets permit. This was revised in 2023, when UN Regulation No. 157 allowed highly automated cars to reach speeds of up to 130 km/h. Manufacturers must obtain local approval for this before activating the function after careful technical and product liability testing; however, to date no carmaker has adopted this higher speed limit for L3 driving. Also currently the liability question of L3 driving is open to interpretation in many markets increasing the legal risk for companies. As we move to higher levels of autonomy, in our view, this will develop / evolve on a case by case basis, and more liability will shift from the driver to the carmaker.

Figure 2. Typical functions of different sensors



Source: HSBC Research

Also technology costs make L3 features expensive and suited, currently, only for premium OEMs. L3 driving features are not cheap. We, therefore, expect this technology to be restricted to the premium carmakers, who at their price points can monetise it; while mass-market brands would rather focus on monetising L2 technology.

The US and China lead the way on robotaxi deployment

Developments in autonomous driving and taxi services (L4-L5) are evident worldwide, but **currently they are allowed to operate in a few major city-based locations** in the **US** (e.g. San Francisco, Phoenix, Los Angeles) and China, with other markets mainly running smaller localised trials. **China** is at the forefront of the global autonomous driving industry, aided by better connectivity, well developed 5G infrastructure and a consumer base more open to autonomous driving. Robotaxis are fast approaching an everyday reality, albeit within strictly controlled parameters (L4), for now – in Wuhan as well as other Tier-1 cities. In Europe, **France** and **Germany** lead the way in terms of the robotaxi pilots and testing projects; and in the **UK**, Transport Secretary Mark Harper expects self-driving cars to appear on roads 'by as early as 2026'.[2] We expect more rollouts of **L4 robotaxi services** globally.

Fully autonomous – an opportunity, but at what risk

The timeline for full autonomy as a commercial reality remains unclear

The case for **widespread adoption of fully autonomous cars (L5), especially in the near future, is debatable;** we think **four key hurdles** have a meaningful impact on their commercial viability and the value of AVs as an investment proposition:

- length of time required to technically define, develop and validate an autonomous system to truly deliver L5 autonomy;
- implied market size erosion that self-driving vehicles represent;
- economics of owning an AV as an income earning asset: whether it will justify the cost of the feature; and
- higher capital risk AVs represent given accident liability will theoretically sit with the OEMs

The full report looks at opportunities and risks for fully autonomous vehicles and whether they will become a commercial reality – and the implications for all OEMs now and into the future. Please contact your HSBC representative for more details.

The regulators and the public – many obstacles still to overcome

High levels of safety are key for regulatory approval and public acceptance

We think for **widespread rollouts of AV fleets**, OEMs / operators will need to satisfy two main stakeholders that these vehicles are safe: the **regulators** (policymakers) and **the general public**.

Regulations are key to determine penetration of the technology, in our view. We have seen important developments in some markets, such as in Germany, the United States and China.

Even where rules exist, regulatory scrutiny is a challenge. General Motors/Cruise's[3] licence to run driverless vehicles in San Francisco was suspended because the regulator determined Cruise vehicles were 'not safe for the public's operation' after its robotaxi dragged a person in San Francisco. On a different issue, Tesla's naming of its autonomous features – AutoPilot & Full Self-Driving – has drawn criticism from some regulators, partially because of what it implies and also what it doesn't deliver. We think this casts further doubt on the ease of route to approval for the autonomous systems.

Lack of acceptance of AVs by the general public is growing too, with the public voicing concerns around self-driving cars and/or robotaxis, bringing another challenge to AVs commercial viability.

Achieving a high level of safety, in our view, is key for regulatory approval and public acceptance, as we discuss below.

The full report gives examples of different regulations and public actions against AVs. Please contact your HSBC representative for more details.

2 Road Safety GB, Transport secretary outlines 2026 ambition for driverless cars, 29 December 2023
3"DMV Statement on Cruise LLC Suspension", California DMV, 24 October 2023

Addressing AV safety issues

Improvements of safety protocols will be an ongoing effort by AV firms

We think AVs will significantly reduce the number of accidents in the future – but it is hard to find a controlled study to have more clarity on the progress and timeline. We would suggest human error accounts for most of the accidents on our roads. In theory, autonomous systems should be able to eliminate almost all road traffic accidents, resulting in fewer human casualties, but this is a very high benchmark for the AVs to achieve.

There are **three major challenges regarding the safety of AVs**:

- Errors in the perception system, e.g. due to radar interference, road, weather or traffic conditions or issues with machine learning models (MLM);
- Cybersecurity vulnerabilities: errors due to cyberattacks when cybercriminals deliberately introduce erroneous data into MLM, resulting in faulty outputs; for example, this can cause the MLM in an AV to misinterpret a stop sign; and
- Technology malfunctions: self-driving cars are not immune to technology glitches or system malfunctions.

The full report reviews errors in perception by various different AV systems and their decision-making capabilities – including instances where ethical decisions must be made – as well as cybersecurity interpretations. Please contact your HSBC representative for more details.

Poor governance practices lead to additional regulatory risks

Inefficient governance may intensify adverse outcomes of safety incidents

While safety issues bring negative consequences for AV firms, including regulatory suspensions from operating and negative reaction from the public, in our view, **ineffective leadership response to safety incidents may bring additional risks**; these risks stem from **poor governance practices** and may lead to increased reputational damage as well as weakened relationships with regulators, media and local communities. For example, according to the report by the law firm Quinn Emanuel commissioned by Cruise[4], leadership failings in their response to the October crash by the Cruise AV worsened the situation – 'ultimately to the detriment of Cruise.' This included sharing incomplete facts and video about the accident with the media and some of the regulators (not explaining the pullover manoeuvre and pedestrian dragging), resulting in an additional regulatory investigation (and potential fines), public scrutiny and backlash against the technology from local residents.

Looking at this Cruise crash and other recent accidents, we identify key governance areas for investors to consider. We offer **five questions** with related considerations for investors to ask AV companies during their engagement; these questions may seem fairly obvious, but in our view, these areas are sometimes overlooked, especially in 'new tech' subsidiaries of 'old tech' legacy firms. We think **robust governance practices** will facilitate improved management of safety issues and increase regulator and other stakeholder trust in the sector.

The full report discusses management accountability, oversight, legislation and safety issues as well as board expertise needed to tackle this new frontier. Please contact your HSBC representative for more details.

4 Quinn Emanuel Urquhart & Sullivan, Report to the Boards of Directors of Cruise LLC, GM Cruise Holdings LLC, and General Motors Holdings LLC Regarding the October 2, 2023 Accident in San Francisco, 24 January 2024

AV accidents: who is liable?

If we fast forward through all the technical, regulatory, safety and governance challenges and concerns above and assume AVs become a reality, then the final question is associated with the income stream due to evolving case law and legislation on liability.

Lastly, in the full report, we also take a look at the issue of liability – and what different regulators and policymakers are proposing. Please contact your HSBC representative for more details.

Conclusion

We see a commercial potential for AVs, including robotaxis, but we are no closer to knowing when. We do not agree that the scale of this opportunity is as vast as some suggest as we still find little supporting data to say when the feature will be delivered. Technical, financial and legal issues are among the key challenges.

Also to gain commercial traction worldwide, AV firms need to build trust across different stakeholders, especially local communities and regulators, by delivering on the promise of improved safety; this is challenging as autonomous tech is held to a much higher standard of safety than human drivers. In our view, robust governance arrangements will help minimise safety, legal and regulatory risks as well as support enhanced performance outcomes, contributing to the AVs potential to far exceed human levels of safety in the future.

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