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Strategy | Potential impacts of automated driver assistance systems (ADAS) and autonomous car technologies on the insurance industry

The insurance industry in 2015

pwc

Potential impacts of automated driver assistance systems (ADAS) and autonomous car technologies on the insurance industry

Although it may take a couple of decades for the market to feel the full impact of automated driver assistance systems (ADAS) and autonomous car technologies, the implications to the auto insurance sector – which include potentially lower premiums – are significant. Forward-thinking insurance carriers and auto manufacturers will create new opportunities to thrive in this automated environment, while others are likely to see a significant erosion of revenues.

The US National Highway Traffic Safety Administration (NHTSA) recently came up with five levels of maturity for automated driver assistance.[1] The five levels provide a useful framework for examining the different types of technologies:

- **Level 0**: No automation
- **Level 1**: Function-specific automation (e.g., cruise control, automatic braking, and lane keeping)
- **Level 2**: Combined function automation (e.g., adaptive cruise control and lane centering)
- **Level 3**: Limited self-driving automation where the driver cedes control of all safety critical functions under certain traffic or environmental conditions
- **Level 4**: Full self-driving automation where the car performs all safety critical functions under all conditions

Most current vehicles are at Level 1, though some manufactures are introducing Level 2 vehicles and even a few experimental Level 3 vehicles. Level 4 vehicles are operational on test tracks and cannot legally operate on normal roads.

Vehicle manufacturers and traffic authorities are currently using three main types of technology that will eventually lead to more widespread Level 3 and 4 vehicles:

1. **Vehicle automation** – Several auto manufacturers are deploying various in-car technologies, such as forward collision warning, drowsy driver detection, adaptive headlights, lane departure sensing, blind spot assistance, parking assistance, and adaptive cruise control. When motorists use some of these automated driver assistance technologies in tandem, self-driving automation can reach Level 2 or even Level 3.
2. **Vehicle to infrastructure communications** – This includes both vehicle automation and automating the road infrastructure through road monitoring, smart traffic signals that communicate with cars, and sensors that can detect rain and snow. Such combined automation could lead to more Level 3 automation.
3. **Vehicle to vehicle communications** – Considering the number of cars that are already on the road and the time it will take to replace them and newer non-automated vehicles, automated or partially automated cars will have to coexist with human drivers. Vehicle-to-vehicle communications using either in-car technologies or smartphone technologies can help facilitate this transition.

For the purposes of this report, we focus below on the first of these three.

The impact of automated driver assistance technologies on the frequency and severity of accidents

Automated driver assistance technologies' impact on auto claims and premiums will depend on a number of factors:

- **Technology impact** –Auto manufacturers implement technologies such as forward collision warning, drowsy driver detection, and adaptive headlights in different ways. As a result, collision damage reduction could vary depending on the effectiveness of respective implementations.

There is typically a fifteen-year span between the initial introduction of a new technology and 95 percent new vehicle availability. It takes an additional 15 years (or 30 years total) to reach 95 percent of all vehicle availability.

1 *Preliminary statement of policy concerning automated vehicles*. National Highway Traffic Safety Administration, 2013.

- **Availability** – Depending on manufacturer cost, regulatory requirements, and customer adoption, automated technologies may be standard or optional features. In addition, auto manufacturers may deploy these technologies on higher end models or on all of their vehicles.
- **Usage** – At least for the foreseeable future, human drivers will have to activate some or most of these technologies (e.g., adaptive cruise control and parking assistance). Accordingly, even if vehicles feature them, drivers may not necessarily use the technologies at their disposal.
- **Regulatory intervention** – Given these technologies' potential to increase safety and reduce congestion and greenhouse gas emissions, the government is likely to mandate their eventual usage. However, it almost certainly will want to rigorously test them under all conditions before they approve their widespread deployment. This could either speed up or slow down adoption of automated technologies, depending on if adoption has an urgent mandate or takes an inordinately long time.
- **Penetration** – The availability and use of automated technologies will change as they mature and drivers become more comfortable using them. The number of new cars with these technologies also will be a critical factor in their overall impact.

We have modelled the overall impact of these technologies over a 20-year time horizon in three steps:

- **Step 1: Technology impact analysis** – In this step, we use the Highway Loss Data Institute's research[2] to estimate the impact of the automated driver assistance technologies we list below on the frequency and severity of five types of claims: 1) bodily injury liability, 2) collision, 3) personal injury protection, 4) comprehensive claims and 5) property damage liability.
  - » Forward collision warning
  - » Drowsy driver detection and warning
  - » Adaptive headlight
  - » Lane departure
  - » Blind spot assist
  - » Voice activated systems
  - » Adaptive cruise control
  - » Parking assistance
  - » Back-up protection
  - » Curve assist
  - » Night vision
- **Step 2: Adoption projection** – Having determined the impact of the specific technologies on the five types of claims, we estimate their adoption (which includes availability and usage) over the next 20 years.
- **Step 3: Loss reduction estimation** – In order to determine the net reduction of losses in the five major categories of claims, we use the assumptions of the adoption of automated technologies and how long it will take to replace older vehicles.

The potential for ADAS to significantly reduce risk is gaining increasing acceptance; in fact, the auto industry and auto insurers are discussing not if such a scenario will occur, but when.

2 *Highway Loss Data Institute Bulletins* on initial results of vehicle manufacturer collision avoidance features, December 2011 to April 2014. The bulletins are available at http://www.iihs.org/iihs/iihs-website-search?q=HLDI%20Bulletins.

Risk shifting and sharing are increasingly common, and we also expect to see risk slicing becoming more prevalent in the near future.

The model is sensitive to the assumptions we make in these three steps. In particular, the key assumptions that drive the overall results are:

1. **Technology impact** – Based on our analysis of all the technologies we describe above, the reduction in losses include bodily injury (-15%), collision (-6%), comprehensive (0%), property damage and protection (-14%), and personal injury protection (-10%). This is an average we base on technologies that auto manufacturers deploy. As technologies improve and manufacturers learn from their own and other manufacturers' experiences, these declines could be even larger.
2. **Availability and adoption** – Historical analysis shows a fifteen-year span between the initial introduction of a new technology and 95 percent ***new vehicle*** availability. In addition, we assume that it takes an additional 15 years (or 30 years total) to reach 95 percent of ***all vehicle*** availability.[3] If some of these technologies prove to contribute to passenger safety, then regulators could mandate them, thereby accelerating their widespread availability. Moreover, adoption is likely to come in multiple waves as different technologies are piloted, tested, deployed as optional and finally standard equipment. Frost & Sullivan estimates there will be around 3.2 million semi-automated, highly-automated, and fully-automated new vehicles in North America and around 3 million in Europe as part of the third wave of shipments.[4]
3. **Baseline** – We assume a linear projection of losses for the baseline, based on projecting vehicle miles driven and loss experience from 2009-2013. This projection suggests that total losses would grow to $83 billion by 2025 and $101 billion by 2035 if new technologies have no impact.

Based on the overall assumptions and the analysis, we estimate a reduction of losses of around ten percent for the US auto market by 2025 and 20 percent by 2035. We estimate the net baseline projected losses without driver assistance technologies will be $83 billion by 2025, and $76 billion with driver assistance technologies. By 2035 we project losses without driver assistance at $101 billion, and $80 billion with driver assist technologies. Figure 1 shows the total projected losses for US auto insurance by 2025, with and without automated driver assistance technologies.

We believe these estimates are conservative, and if we relax some of our assumptions about the rate of availability, pace of adoption, and impact of technology on losses, then there should be even greater loss reductions. For example, Thatcham Research estimates that 80 percent of all crashes in the UK occur at a speed of less than 25 Km/hr.[5] ADAS that focuses on safety systems at lower speeds (e.g., forward collision with automatic breaking, emergency brake assistance) can result in 208,000 fewer crashes, 158,000 fewer injuries, and 52, 000 mitigated injuries. This would reduce repaid and whiplash compensation to Euro 1.8 billion.

Changes to regulations are already underway. The 1968 Vienna Convention on Road Traffic, which requires a human driver to be present in a moving vehicle and to have control over the vehicle at all times, is being amended.[6] The Working Party on Road Traffic Safety of the UN Economic Commission for Europe is working on draft amendments to the Vienna Convention that all nations are likely to pass and adopt over the next couple of years. That would remove some of regulatory barriers and hasten ADAS adoption.

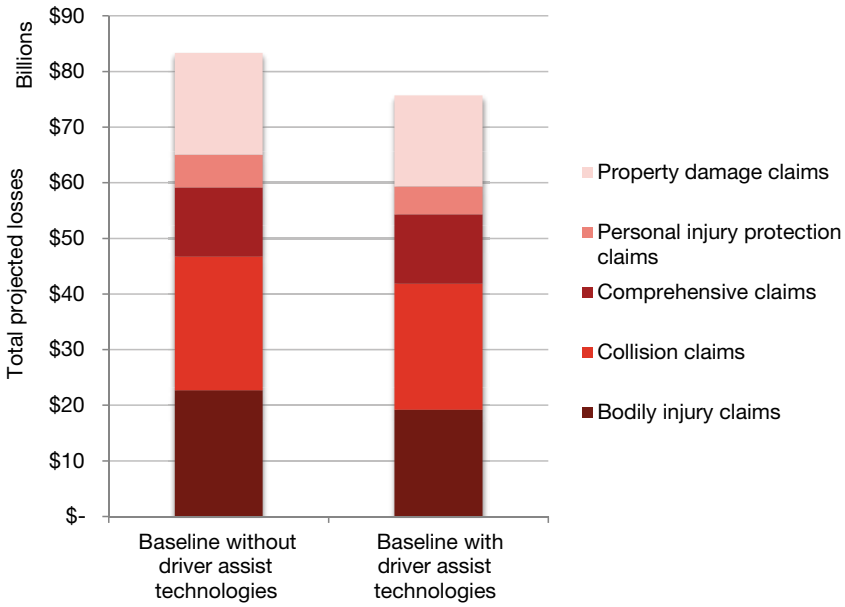
3 *Estimated time of arrival: New safety features take 3 decades to spread through vehicle fleet.* Insurance Institute for Highway Safety Loss Data Institute Bulletin. Vol. 47, No. 1: January 2012.

4 *From Vehicle Automation to Autonomous Driving: The Big Leap*. Prana Natarajan, Frost & Sullivan. Proceedings of the *The Autonomous Car: Risks and Opportunities for the Re/Insurance Industry.* September 2014.

5 *Understanding Technological Advances in Vehicle Safety to Reduce Claims Costs in the Future.* Matthew Avery. Thatcham Research. 2014.

6 *Regulatory Challenges for the Introduction of Automated Driving: Road Traffic Law*. Miodrag Pesut. UN Economic Commission for Europe. Proceedings of the *The Autonomous Car: Risks and Opportunities for the Re/Insurance Industry*. September 2014.

Figure 1: US projected losses – Auto insurance (2025)



Future scenarios

In our earlier work on the future of auto insurance[7], we outlined four possible risk scenarios, including risk shifting, risk sharing, risk slicing, and risk reduction. While risk shifting and sharing are increasingly common, we also see risk slicing becoming more prevalent in the near future, particularly in the following ways:

- **Car sharing** – Car sharing and associated risk sharing is in line with what we predicted in 2013. Car sharing continues to grow, and is especially popular with urban millennials. Over 80 percent of the US and more than 50 percent of the global population is considered urban; city living and the increasing availability of automotive time-sharing suggests a future in which more and more premiums move from 24-hour asset coverage to a pay-per-use model.[8] According to a Frost & Sullivan research estimate that Forbes reported in March 2012, the global car sharing market could exceed $10 billion by 2020, and the North American car sharing market alone could surpass 4.4 million members and $3 billion by 2016.[9] In Europe, the number of members will rise to 15 million by 2020.[10] As a result, an increasing number of low-frequency drivers is likely to mean at least some reduction in individual premiums. However, this scenario does not necessarily represent only lost premiums. Most of the people who do not choose to own cars will need to rent them at least occasionally; accordingly, car sharing can expand the market for alternative buyers of insurance.
- **Self-driving mode** – In the next five to ten years we also are likely to see more cars with a self-driving mode. Drivers will be shifting between hands-on and hands-off-driving depending on road conditions and personal preference. This will result in different risk profiles for a single trip and also different liabilities – driver liability in the hands-on mode and product liability in the self-driving or hands-off mode. This type of risk slicing offers a number of interesting pricing options for auto insurers. Similar to usage-based or mileage-based insurance that telematics-driven auto insurers offer, we could see insurance premiums priced differently based on the mode of driving.

7 http://www.pwc.com/us/en/insurance/publications/assets/pwc-top-insurance-issues-2013-auto-insurance.pdf

8 *How the Autonomous Car will Change the World and Upend Auto Insurance.* Brad Templeton, Singularity University. Proceedings of the *The Autonomous Car: Risks and Opportunities for the Re/Insurance Industry.* September 2014.

9 *Zipcar fuelled up for $22 Run as Business Model Matures*. Forbes. March 20, 2012.

10 *Growing Awareness of Peer-to-Peer Carsharing will Boost Carsharing Rentals in Less Populated Areas in Europe*. Frost & Sullivan. August 22, 2012.

Moreover, the scenario of risk reduction (and potentially even elimination) has been gaining increasing acceptance. The auto industry and auto insurers are discussing not *if* such a scenario will occur, but *when*. Almost every major auto manufacturer has announced an autonomous car initiative with expected public release ranging from as early as 2017 to the middle of the next decade. Driverless or autonomous cars (Level 4) equipped with the latest awareness technologies could completely change the industry as we know it. Google, Inc.'s auto research investments are hastening the eventual, widespread availability of driverless cars. Google's driverless, laser-equipped vehicles have logged over 700,000 miles without an accident; moreover, the company has begun investing in the research and development that initially sets and then drives down the costs of new technologies.[11] Driverless cars are now legal in California, Nevada, Michigan and Florida. Google estimates that the technology can reduce traffic accidents by 90 percent, reduce number of cars by 90 percent, and reduce wasted commute time and energy by 90 percent resulting in savings of $2 trillion per year to the US economy.[12]

Implications

The widespread adoption of ADAS is already happening and autonomous cars will be on public roads in the not-so-distant future. These developments present insurers with a number of risks and opportunities. Ignoring them or not taking decisive action could prove fatal. Some of the ways to turn ADAS adoption into an opportunity include:

- **Product innovation** – Usage-based, driving mode-based, and trip-based insurance using telematic devices and ADAS offers insurers new product innovation opportunities, including unbundling current auto insurance offerings and re-bundling them in new ways to target urban, casual, and self-driving car drivers.
- **Distribution innovation** – The rise of affinity groups, car sharing groups, and vehicle manufacturers who want to package auto insurance with autonomous vehicles can open up new distribution channels for auto insurers. Disruptive players who focus on these segments can adopt a B2B distribution channel directly with auto manufacturers or their dealers. These players would have a fundamentally different business model and could progressively capture market share as the number of autonomous cars increase.
- **Service innovation** – As the need for protection decreases, insurers can play the central role of aggregating information and entertainment needs. Auto manufacturers, online/mobile service providers, telecommunication providers, and information providers all are vying for leadership in in-car infotainment services. Insurers with trusted brands can re-orient themselves as service providers.
- **Claims innovation** – The biggest impact of ADAS and autonomous cars will be on safety and the prevention or reduction of accidents. Insurers who approach insureds who drive these types of cars as a separate segment and handle claims based on on-board diagnostics and analytics will use fundamentally different economics for claims handling and the legal expenses associated with claims. Such auto claims settlement has promise to increase claims satisfaction and reduce litigation costs.

Regardless of the extent to which insurers want to innovate in any of the above areas, they should continue to monitor and prepare for the following:

- **Driving demographics and patterns**: The move towards the "shared economy," especially as it relates to younger (especially urban) generations' driving behaviors is still nascent, but could be very disruptive to existing business models when and if it becomes more commonplace.
- **Automotive and artificial intelligence (AI) technology acceleration**: The pace of change in AI technology (e.g., machine learning, video/image analytics), its incorporation within auto manufacturing, and the move towards an "open auto platform" can result in faster adoption and reduce (or even eliminate) risk.
- **Regulatory approvals**: Technologies that increase driver, passenger and road safety could gain quick regulatory approval. Accordingly, keeping abreast of regulatory activity is vital to facilitate timely entry or expansion in this market.

11 *How the Autonomous Car will Change the World and Upend Auto Insurance.* Brad Templeton, Singularity University. Proceedings of the *The Autonomous Car: Risks and Opportunities for the Re/Insurance Industry*. September 2014.

12 *Fasten your Seatbelts: Google's Driverless Car is Worth Trillions (Part 1)*. Chunka Mui. January 22, 2013.

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