Fueling the growth of Self-Driving Cars

A snapshot of opportunities in the autonomous vehicle market

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By 2018, one in five vehicles on the road will be aware of its surroundings, mechanical health or global positioning, and by 2020, more than 150 million cars will be connected to the Internet.

But connectivity is only part of the story: Autonomous vehicles will start to hit the market within the next 10 years. This shift toward connectivity and automation is expected to create sizable opportunities for manufacturers that create the technology fueling the phenomenon.

**Demand drivers**

The number of connected devices—known as the Internet of Things—is on track to grow fivefold by 2020, according to the technology research firm Gartner,¹ and self-driving cars will play a major role in this expansion. Over the course of the next decade, we expect to see:

- **Vehicle-to-vehicle and vehicle-to-infrastructure connections,** fueled in part by legislative initiatives. For example, by 2018, cars in the European Union will be required to have a device that automatically reports a collision to the emergency call system.

- **A boom in driver-assistance systems and autonomous vehicles.** Consider this: More than 90 percent of crashes are caused by human error.² With an estimated 1.55 billion vehicles on the road and 1.2 million traffic deaths globally each year, the potential for this technology to reduce accidents and traffic jams is unprecedented.

- **Increased adoption of car-to-mobile connectivity features,** including infotainment systems and apps that enable in-car purchases (of everything from music to pizza). The demand for such features will increase as customers’ expectations for and comfort with them grow.

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**Self-Driving Cars by the numbers:**

- **$192 billion**
  - The projected value of the global market for connectivity components and services in 2020—five times higher than today’s $32 billion.
  - Source: McKinsey

- **$96 billion**
  - Projected value of the driver-assistance and autonomous vehicle market by 2025. This could jump to $197 billion by 2030.
  - Source: Goldman Sachs Global Investment Research

- **152 million**
  - The number of cars projected to be connected to the Internet by 2020, up from 23 million today.
  - Source: IHS Automotive

- **1:5 cars**
  - By 2018, one in five cars will be aware of its surroundings, mechanical health and/or global positioning.
  - Source: Gartner
Cars that drive themselves

As futuristic as it may sound, autonomous vehicles are no longer the stuff of science fiction. The era of self-driving is five to ten years away, and the opportunity it presents is huge: Goldman Sachs estimates that today’s $3 billion assisted-driving market will grow to a $96 billion assisted-driving/automated vehicle market by 2025.¹

*The technology behind self-driving vehicles falls into two categories:*

- **Advanced Driver Assistance Systems (ADAS):** This technology provides assistance to the driver, such as adaptive cruise control or cars that can parallel park on their own. ADAS is in the Level 1 and Level 2 autonomy category, meaning that the driver maintains primary control of the vehicle. Basic ADAS has existed for nearly a decade and sophistication continues to grow.

- **Autonomous Vehicles (AVs):** These are cars that truly drive on their own with little or no interaction from the driver; these cars require vehicle-to-vehicle and vehicle-to-infrastructure communication and connectivity. Google is rapidly advancing its development of a fully self-driving electric vehicle (Level 4) by 2017. Traditional automakers like Toyota and General Motors are focusing on limited self-driving (Level 3) given the enormous software challenges for complete automation.

### Autonomy Level

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Example</th>
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</thead>
<tbody>
<tr>
<td>00</td>
<td>No automation</td>
<td>Driver is completely in control; vehicle may offer warnings.</td>
</tr>
<tr>
<td>01</td>
<td>Function-specific automation</td>
<td>Driver maintains control overall but can cede limited authority.</td>
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<tr>
<td>02</td>
<td>Combined functional automation</td>
<td>Driver is responsible for monitoring the roadway and available to take control on short notice at all times.</td>
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<tr>
<td>03</td>
<td>Limited self-driving automation</td>
<td>Driver can relinquish full control in certain traffic conditions but will need to take over at times. The vehicle is smart enough to determine when it can no longer support automation, e.g., if there is a construction area ahead.</td>
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<tr>
<td>04</td>
<td>Full self-driving automation</td>
<td>Driver provides navigational input only and is not expected to take control at any time. The vehicle is designed to perform all safety-critical functions and monitor road conditions at all times.</td>
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Source: National Highway Traffic Safety Administration; Goldman Sachs Global Investment Research
Implications

Automotive components
As we shift from ADAS into the AV realm, automotive content companies stand to benefit greatly from increased market penetration and demand for components. These companies include manufacturers of cameras, radars, LIDAR, actuators, etc. For instance, LIDAR technology, which has no significant market in the automotive space today, is projected to grow into a $10 billion industry by 2025.3

- **GPS (Global Positioning System)** combined with readings and tachometers, altimeters and gyroscopes to provide the most accurate positioning  
  **Cost:** $80–$6,000

- **Ultrasonic sensors** to measure the position of objects very close to the vehicle  
  **Cost:** $15–$20

- **Odometry sensors** to complement and improve GPS information  
  **Cost:** $80–$120

- **Central computer** analyzes all sensor input, applies rules of the road and operates the steering, accelerator and brakes  
  **Cost:** 50–200% of sensor cost

  Source: Wired Magazine

- **LIDAR (light detection and ranging)** monitor the vehicle’s surroundings (road, vehicles, pedestrians, etc.)  
  **Cost:** $90–$8,000

- **Video cameras** monitor the vehicle’s surroundings (road, vehicles, pedestrians, etc.) and read traffic lights  
  **Cost:** $125–$200

- **Radar sensors** monitor the vehicle’s surroundings for objects that may not be visible (road, vehicles, pedestrians, etc.)  
  **Cost:** $50–$150

Semiconductors
The move toward automation will also create substantial opportunities for semiconductor companies and those that create the building-block components. Goldman Sachs predicts that the current $1.4 billion ADAS market of communication semiconductors, processors, logic and connectors will expand to $12 billion in five years and $35 billion within a decade.3
Investing in companies that power self-driving cars

Investing in this theme is about investing in the manufacturers of components and technology that enable connectivity and autonomous aspects of the cars—and not in the car manufacturers themselves.

*These companies fall into the following segments:*

**Safety Systems**
Developers of ADAS technologies that automate, adapt and enhance vehicle systems for safety and better driving. This category can also include traditional automotive suppliers.
*Example companies: Delphi, Mobileye*

**Sensors**
Companies that offer image, speed, motion, ultrasonic and other types of sensors for cars.
*Example company: Sensata*

**Connectivity**
Companies that provide telematics such as vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2X) systems and wireless carriers (4G LTE) for cloud- and vehicle-monitoring services.
*Example company: TE Connectivity*

**System on a Chip**
The more diversified semi component equipment manufacturers. For these companies, the automotive industry is just one of many end markets.
*Example companies: Texas Instruments, NXP*

**Infotainment & Display**
Creators of infotainment devices for cars and companies that supply display units for infotainment devices.
*Example companies: Harman, Gentex*

**Software**
Providers of the operating system and interface for the different components to communication and real-time analytics.
*Example company: Luxoft*
Motif Capital: Portfolio Construction

We built our Self-Driving Cars portfolio to provide systematic targeted exposure to the firms across the key industry segments listed above. These stand to benefit from increased demand for the advanced automotive components that will enable continuously connected self-driving cars.

To build our portfolio, we:

- Identified U.S.-listed stocks and ADRs of companies involved in providing self-driving car components.
- Segmented companies by their focus within the self-driving car ecosystem.
- Determined each company’s percentage of total revenue derived from self-driving car component products.
- Applied a pure-play factor to give greater relative weight to companies that derive a higher percentage of their revenue from self-driving car components.
- Weighted each company by its market capitalization adjusted for revenue exposure to self-driving car components.
- Finally, created the portfolio by running the adjusted market cap weighted portfolio through an optimization engine to reduce concentration risk and volatility, and to satisfy investability constraints.

Top Five Holdings:

**Delphi Automotive**
*Segment – Safety Systems*
Delphi develops electronic components, safety systems and other auto related products. The company’s self-driving technology was among the best in show at CES 2015.

**TE Connectivity**
*Segment – Connectivity*
The company develops connectivity chips and sensors for automotive and other industrial applications.

**MobilEye**
*Segment – Safety Systems*
Mobileye develops software and related technologies for camera-based ADAS.

**Sensata Technologies**
*Segment – Sensors*
Sensata Technologies provides circuit breakers, pressure sensors and control devices for automotive and aviation applications.

**Texas Instruments**
*Segment – System on a Chip*
Texas Instruments designs and sells components used in infotainment and ADAS systems.

Conclusion

We believe the connected and automated car industry is poised for considerable growth in the next decade. The key to jumping into this theme is to invest in the companies creating the infrastructure and parts that will support these vehicles—not the carmakers themselves. Motif Capital has applied systematic, objective analysis in selecting the firms we believe stand to gain the most as we move down the road to fully autonomous driving.
Working with Advisors

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References


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