US Autos Outlook Today & Beyond

Center for Automotive Research Management Briefing Seminar

Colin Langan
US Autos, Analyst
Agenda: *US Auto Outlook Today and Beyond*

- Near Term Outlook
- Electric Car Teardown
- Autonomous Cars
- Big Data Revolution
Section 1

Near Term Outlook: The Sky Isn't Falling Yet
Concern #1: Deteriorating Credit

+60 Day Delinquencies Prime

- May 2017: 0.44%
- Historic Average: 0.39%

+60 Day Delinquencies Subprime

- May 2017: 2.95%
- Historic Average: 2.68%

Source: S&P, UBS
Credit Risk More Price Than Volume Historically

ABS Net Loss Rate vs. SAAR

Source: S&P, Wards, UBS
Concern #2: Used Pricing Concerns

Supply: Rising with higher off-lease vehicle returns

Demand: Lenders are pulling back on subprime lending

[Diagram showing historical used prices with two lines representing Manheim Index and NADA Used Vehicle Price Index from January 1996 to January 2017.]

Source: NADA, Manheim, UBS
Used Prices Also Points to Pricing Pressure vs. Volume

NADA Used Index vs. SAAR

Source: NADA, Wards, UBS
## Macro Indicators Are Strong

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Last Update</th>
<th>Current</th>
<th>Prior Year</th>
<th>Y/Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>U of M Conditions for Buying New</td>
<td>Jun-17</td>
<td>141</td>
<td>144</td>
<td>↓</td>
</tr>
<tr>
<td>Used CPI</td>
<td>Jun-17</td>
<td>1.372</td>
<td>1.434</td>
<td>↓</td>
</tr>
<tr>
<td>Incentives (Autodata)</td>
<td>Jun-17</td>
<td>3.616</td>
<td>3.237</td>
<td>↑</td>
</tr>
<tr>
<td>Unemployment</td>
<td>Jun-17</td>
<td>4.4%</td>
<td>4.9%</td>
<td>↓</td>
</tr>
<tr>
<td>Housing Starts</td>
<td>Jun-17</td>
<td>1.215</td>
<td>1.190</td>
<td>↑</td>
</tr>
</tbody>
</table>

Consumer Buying Conditions Remain Strong

U of M Conditions for Buying a New Vehicle

If U of M is in the 135-145 range, how did the average SAAR change over the following 6 months?

Source: U of M Consumer Survey, UBS
## GDP vs. SAAR Growth

<table>
<thead>
<tr>
<th>GDP Range</th>
<th># of Periods</th>
<th>Average SAAR Growth</th>
<th>Median SAAR Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP &gt;5%</td>
<td>8</td>
<td>8.0%</td>
<td>5.9%</td>
</tr>
<tr>
<td>4-5%</td>
<td>10</td>
<td>7.9%</td>
<td>8.5%</td>
</tr>
<tr>
<td>3-4%</td>
<td>10</td>
<td>1.5%</td>
<td>0.9%</td>
</tr>
<tr>
<td>2-3%</td>
<td>10</td>
<td>2.5%</td>
<td>2.4%</td>
</tr>
<tr>
<td>1-2%</td>
<td>6</td>
<td>1.5%</td>
<td>-0.9%</td>
</tr>
<tr>
<td>0-1%</td>
<td>2</td>
<td>-6.8%</td>
<td>-6.8%</td>
</tr>
<tr>
<td>GDP &lt;0%</td>
<td>7</td>
<td>-10.3%</td>
<td>-11.1%</td>
</tr>
</tbody>
</table>

Source: Bureau of Economic Analysis, Wards, UBS
Section 2

What is the impact of Rising EV Demand?
We tore down the world's first mass-market electric car
What’s in a EV?

Cockpit Electrics

12V DC

DC-DC Converter

DC Distribution Module

Power

DC

Battery Pack

On Board Charger

AC

Inverter / Converter

AC

Electric Motor

Power to Run Motor
Regen Power
Home Charging Power

Source: Munro, UBS
Massive powertrain transition

EV Powertrain

- Battery Pack $12,500
- EV Powertrain $3,900

ICE Powertrain

- DC/DC Converter $180
- On Board Charger
- Cabling
- Charging Cord
- Thermal
- Other

Total:
- $16,400
- $3,900
- $6,500

Source: Munro, UBS
We overestimated the Bolt's cost by ~$5k

The Bolt's powertrain is ~$5k cheaper than we thought ...

... and the battery pack, the largest cost item, is likely to decline faster

Therefore, the powertrain cost difference between the Bolt and a traditional engine will shrink from ~$10k today to $3-4k by 2025

Source: UBS estimates
We raise our EV penetration forecasts ~50% to 14% globally

EV sales by region (m units)

<table>
<thead>
<tr>
<th>Year</th>
<th>Europe</th>
<th>US</th>
<th>China</th>
<th>Japan</th>
<th>ROW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017E</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018E</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019E</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020E</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021E</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2022E</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2023E</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024E</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2025E</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

46% CAGR

31% CAGR

EV share by region (% of total car sales)

European, US, China, Japan, ROW

Steep part of the s-curve begins

EV sales penetration set to meaningfully accelerate after 2020

... particularly in Europe, where we now forecast 30% penetration by 2025 (previously 18%)

Sooner TCO parity should spark EV demand and cause faster penetration growth than we previously assumed

Source: UBS estimates

UBS
Evaluating the **Chevy Bolt**'s profitability today

How much money does GM lose with a Bolt today (EBIT/contribution margin in $)...

![Graph showing losses and margins](image)

We estimate GM loses \(-7k\) per vehicle at EBIT level, but the **contribution margin** is in positive territory at \(-3k\)

*Source: UBS estimates*
Evaluating the Tesla Model 3's profitability

What will be the break-even selling price ($) for the Tesla Model 3?

Options required to break-even: $5.7k (assuming 50% gross margin on options)

We estimate Tesla will require an achieved selling price of ~$41k for the upcoming Model 3 to break even at the EBIT level.

Source: UBS estimates
The content share split changes meaningfully in the Bolt

Vehicle content on tier-1 level by sub-sector ($k)

- 11 times increase in battery suppliers
- 38% reduction in powertrain electronics suppliers
- 17% reduction in other parts suppliers

Powertrain components – Bolt vs. Golf ($)

- 87% supplied by LG
- 100% supplied by tier 1 suppliers

- Charging cord
- Onboard charger
- VCIM / EVCC
- High voltage cables
- Power distribution module
- DC/DC Converter
- Thermal management
- BMS

The content share of non-electronic suppliers in the Bolt falls by almost 40%

Powertrain electronics content is $4k higher on tier-1 level, motor included

Some 56% of the vehicle content comes from outside the traditional auto supply chain

Source: UBS estimates
The global **aftermarket** should shrink ~60% long-term

**The Bolt has ~60% lower after-sales costs ($)**

- **Chevy Bolt**
  - Total annual maintenance: $285
- **VW Golf**
  - Total annual maintenance: $510

**Global aftermarket revenue ($bn) to drop by ~60%**

- -0.4% (2021E)
- -1% (2025E)
- -4% (2028E)
- -16% (2033E)
- -59% (???)

The annual maintenance costs for the Bolt are about **$355 lower** than for the Golf.

The global automotive aftermarket should ultimately shrink by c60%, though a material impact should not be felt before ~2030E.

Source: UBS estimates
Some commodities will be heavily impacted by EVs

Weight of key commodities (kg) – Bolt vs. Golf

Incremental commodity demand in a 100% EV world (% of today’s global production)

In the Bolt (compared to the Golf), we found ...

- ~70% more aluminium,
- ~60% more copper
- ~7% less steel,
- ~60% less iron
- 100% less precious metals
- ~140 kg of “active” materials in the battery cells
- ~1 kg of rare earths in the e-motor

Source: UBS estimates
Section 3

What is the impact of the Autonomous Car?
What is our base outlook?

• See **Fully Autonomous** (Level 5) as **Decades Away**
  ▪ **Experts at MIT, Stanford, startups like nuTonomy**

• **Level 4 Coming Soon**
  ▪ Geo-fenced, range bound **niche** applications

• **Challenges**
  ▪ **Almost perfect technology needed**
  ▪ **Precedent in aerospace and space travel**
  ▪ **Ethical, legal, & regulatory risks**
Autonomous Driving **New Sales Impact**

- Concerning Headlines
  - MIT Singapore Study: 60% decline in fleet
- Despite a decline in the size of the fleet, normalized US sales could actually increase new vehicle sales
- Offsets: Vehicle life, Addressable market, & Demand growth

![Bar chart showing sales impact](chart.png)

Source: UBS
Section 4

How will Big Data transform the auto industry?
Value of Big Data

Vehicles Sold with Embedded Modems (m)

What the future car knows about you?

Source: HS (June 2015), UBS estimates (2026E)

Source: UBS
Big Data: **Superior Consumer Experience**

**New Auto Business Model**
- Build & Sell Great Cars
- Use Diagnostic Data
- Lower Marketing
- Cost Savings
- Better Loyalty
- Better Driver Exp.
- Better Profit

**New Dealer Servicing Model**
- Customer Gets Diagnostic Notice
  - Early warning
  - Consumer confident repair is needed
- Schedules Appointment with Dealer
  - Leverages travel history to fit w/ driver schedule
- Dealer Orders Parts
  - Faster repair
- Win-Win
  - Better customer loyalty
  - Dealers/OEMs increase part & service income

Source: UBS
Big Data: Sales & Marketing

Marketing & Advertising Cost Per Unit

Source: UBS
Big Data: **Non-Traditional Revenue Opportunities**

**New Non-Traditional Revenue Opportunities**
- Directed Ads (Push Notices)
- Audio/Video Streaming
- Real Time Traffic/Parking
- OTA Updates
- Directed Dealer Servicing
- Usage Based Insurance
- Fleet Management

**New Global 2016E Revenue Opportunities**

<table>
<thead>
<tr>
<th>Service</th>
<th>Bear</th>
<th>Bull</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced Dealer Servicing</td>
<td>13.6</td>
<td>34.0</td>
</tr>
<tr>
<td>Subscription-based Services</td>
<td>15.2</td>
<td>43.9</td>
</tr>
<tr>
<td>Paid Over-the-Air Updates</td>
<td>1.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Used Based Insurance</td>
<td>0.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Advertising</td>
<td>4.6</td>
<td>22.4</td>
</tr>
<tr>
<td>Streaming Audio</td>
<td>0.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Streaming Video</td>
<td>0.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Real-Time Data</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Fleet Management</td>
<td>2.9</td>
<td>7.0</td>
</tr>
<tr>
<td>Total ($bn)</td>
<td><strong>37.7</strong></td>
<td><strong>117.5</strong></td>
</tr>
</tbody>
</table>

Source: UBS
Big Data: Economic Impact

Global Auto Margin Opportunity

Potential Non-Traditional Revenue Opportunities

Source: UBS
Thank You

If you have any questions, please reach out!

Colin Langan, CFA, CPA
colin.langan@ubs.com
Valuation Method and Risk Statement

Our price targets are based on an EBITDA multiple, relative to the local market.

The global auto industry is highly cyclical, vulnerable to sudden shifts in consumer sentiment, employment, interest rates, available lending, and general economic activity. Parts suppliers are further exposed to customer pricing pressure, shifts in OEM market share, volatile production schedules, and unforeseen changes in technology.

Analyst Certification

Each research analyst primarily responsible for the content of this research report, in whole or in part, certifies that with respect to each security or issuer that the analyst covered in this report: (1) all of the views expressed accurately reflect his or her personal views about those securities or issuers and were prepared in an independent manner, including with respect to UBS, and (2) no part of his or her compensation was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed by that research analyst in the research report.
**Required Disclosures**

This report has been prepared by UBS Securities LLC, an affiliate of UBS AG. UBS AG, its subsidiaries, branches and affiliates are referred to herein as UBS.

For information on the ways in which UBS manages conflicts and maintains independence of its research product, historical performance information, and certain additional disclosures concerning UBS research recommendations, please visit [www.ubs.com/disclaimers](http://www.ubs.com/disclaimers). The figures contained in performance charts refer to the past; past performance is not a reliable indicator of future results. Additional information will be made available upon request. UBS Securities LLC is licensed to conduct securities investment consultancy business by the China Securities Regulatory Commission. UBS acts or may act as principal in the debt securities (or in related derivatives) that may be the subject of this report. This recommendation was finalized on 06/03/AM 31 July 2017.

**UBS Investment Research: Global Equity Rating Definitions**

<table>
<thead>
<tr>
<th>12-Month Rating</th>
<th>Definition</th>
<th>Coverage</th>
<th>IB Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buy</strong></td>
<td>FSRs &gt; 5% above the MRA</td>
<td>45%</td>
<td>28%</td>
</tr>
<tr>
<td><strong>Neutral</strong></td>
<td>FSRs between 0% and 5% of the MRA</td>
<td>38%</td>
<td>27%</td>
</tr>
<tr>
<td><strong>Sell</strong></td>
<td>FSRs &gt; 5% below the MRA</td>
<td>17%</td>
<td>11%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short-Term Rating</th>
<th>Definition</th>
<th>Coverage</th>
<th>IB Services</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buy</strong></td>
<td>Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
<tr>
<td><strong>Sell</strong></td>
<td>Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
</tr>
</tbody>
</table>

**Source:** UBS Rating allocations are as of 30 June 2017.
1. Percentage of companies under coverage globally in the 12-month rating category.
2. Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3. Percentage of companies under coverage globally in the Short-Term rating category.
4. Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

**KEY DEFINITIONS:**
- **Forecast Stock Return (FSR)**: is defined as expected percentage price appreciation plus gross dividend yield over the next 12 months.
- **Market Return Assumption (MRA)**: is defined as the one-year local market interest rate plus 5% (a proxy for, and not a forecast of, the equity risk premium).
- **Under Review (UR)**: Stocks may be flagged as URs by the analyst, indicating that the stock's price target and/or rating are subject to possible change in the near term, usually in response to an event that may affect the investment case or valuation. Short-Term Ratings reflect the expected near-term due to three months performance of the stock and do not reflect any change in the fundamental view or investment case. **Equity Price Targets have an horizon of 12 months.**

**EXCEPTIONS AND SPECIAL CASES:** UK and European Investment Fund ratings and definitions are: **Buy:** Positive on factors such as structure, management, performance record, discount. **Neutral:** Neutral on factors such as structure, management, performance record, discount. **Sell:** Negative on factors such as structure, management, performance record, discount. **Core Bonding Exceptions (CBE):** Exceptions to the standard +/-5% bands may be granted by the Investment Review Committee (IRC). Factors considered by the IRC include the stock's volatility and the credit spread of the respective company's debt. As a result, stocks deemed to be very high or low risk may be subject to higher or lower bands as they relate to market expectations. Conformity with the guidelines may be assessed by the Company Defaults of UBS Investment Bank (Europe) Limited, credit surveillance, and local risk management. Such analysts may not be associated persons of UBS Securities LLC and therefore are not subject to the FINRA restrictions on communications with a subject company, public appearances, and trading securities held by a research analyst account. The name of each affiliate and analyst employed by that affiliate contributing to this report, if any, follows.

UBS Securities LLC Colin Langen, CFA

Unless otherwise indicated, please refer to the Valuation and Risk section within the body of this report. For a complete set of disclosure statements associated with the companies discussed in this report, including information on valuation and risk, please contact UBS Securities LLC, 1295 Avenue of the Americas, New York, NY 10019, USA, Attention: Investment Research.
Company Disclosures

There are no company specific disclosures related to this presentation.
Global Disclaimer (continued)

Strategic Evaluation and Business Consulting

JAPAN

FACON S.A. Germany. Prepared by UBS Limited and distributed by UBS Limited and distributed by UBS Europe SE is regulated by the Bundesanstalt für Finanzmarktüberwachung (BaFin). Spain. Prepared by UBS Limited and distributed by UBS Europe SE(Spain) and UBS Securities España S.A. UK. UBS Securities Limited is regulated by the Financial Conduct Authority (FCA). Document not to be utilized in connection with providing any capital market services to persons within the Republic of Turkey without the prior approval of the Capital Market Board. However, according to article 10 (2) (ii) of the Decree No. 32, there is no restriction of any kind on the purchase or sale of the securities abroad held by the Turkish Financial Administration. Where an analyst of UBS Limited (locally a registered Securities Establishment) UBS Limited has contributed to this document the document is also deemed to have been prepared by UBS Limited (locally a registered Securities Establishment) UBS Limited has contributed to this document the document is also deemed to have been prepared by

ITALY

ITALY

ITALY

ITALY

ITALY

ITALY
Contact Information

UBS Securities LLC
1285 Avenue of the Americas
New York, NY 10019

Tel: +1-212-713-2000

www.ubs.com

UBS Securities LLC is a subsidiary of UBS AG.
The North American Market: Sales and Production Footprint