Automotive Semiconductors

Can semis grow in the face of a further auto production decline in 2020? Yes - but just +3%.

Equities

Global
Semiconductors

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After a tough 2019, 2020's shaping up to be another year of production decline

2019 was a challenging year for auto semis with sales declining c4% against auto production down 6% (content gain offset by inventory reduction). With further supply-chain and demand disruption our autos colleagues now forecast -3% autos production decline in 2020E before then recovering +3% in 2021E. Positively for the semi sector as we head into 2020E, downstream inventories are reasonably clean such that we believe auto semis can return to out-performing production by c6% and still see semis grow c3% in 2020E. With auto production then recovering in 2021E and EV penetration accelerating rapidly, we forecast auto semis sales accelerate to +13% in 2021E. The challenge is that despite the recent sell-off the sector is still not cheap and we believe with potential auto production declines this year - earnings could be at risk. We expect growth heavily biased towards EV/ADAS - we prefer Infineon (Buy) and Rohm (Buy) with least prefer Melexis (Sell) and Texas Instruments (Sell).

Divergence in performance in 2019 - inventory better in check

2019 saw a significant divergence in autos sales performance. We estimate the auto semis market was down 4% in US$ terms. Outperformers not surprisingly were those with a strong EV/ADAS mix including STMicro (+5%), NVIDIA (+1%), Infineon (-2%) and ON Semi (-2%) while ADI, Renesas, NXP and TXM all saw mid to high-single digit declines y-o-y. The most notable underperformer was Melexis, declining 18% y-o-y. When we look at inventory levels through the supply chain - this has now normalised at OEMs but there are still some heightened inventory positions in semis.

Revisiting the structural growth trends in the sector

Whilst we now see some challenges to the sector in 2020E that might limit growth, our confidence in the mid-term opportunity in auto semis is undiminished. With ADAS and EV penetration rates likely to rise rapidly in the next 2-3 years we forecast autos semis growth CAGR of 10% from '20E - '25E with 75% of the growth coming from EV and ADAS. We have written many reports at length on both topics in recent years.

Valuation: Sector not cheap but some of the biggest beneficiaries are

Whilst the overall sector is still not cheap (18x '21E P/E vs historical avg forward 17x) we see good opportunities in both Infineon (15x '21E proforma P/E) and Rohm (15x).

Can auto semis still grow in 2020E?

2019 was a challenge year for the auto semis industry with autos production down 6% and we estimate auto semis sales down 4% as inventory work-down in the supply-chain offset underlying content growth. In January, most corporates were looking forward to a strong recovery in demand through 2020E as production stabilised and inventory levels had normalised. While some of this is still the case (we believe inventory levels downstream are much leaner than entering 2019), the coronavirus outbreak and its associated demand and supply-chain disruption is likely to make 2020 another challenging year for auto semis. Our autos colleagues have just downgraded their production estimate for 2020E to -3% y-o-y from +1% and depending on how long it takes for supply chains and depending on the demand recovery, there could yet be further downside risk.

Figure 1: UBS global vehicle production forecast (m units)

(Production, m units)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020E	2021E	2022E	2023E	2024E
Western Europe	16.5	16.6	16.5	16.3	16.3	15.9	15.6	16.0	14.4	11.8	13.2	13.7	12.6	12.7	13.3	14.2	14.7	14.9	14.3	13.4	12.7	12.7	12.7	12.7	12.7
% growth	*0%*	*1%*	*-1%*	*-1%*	*0%*	*-2%*	*-2%*	*2%*	*-10%*	*-18%*	*12%*	*4%*	*-8%*	*0%*	*5%*	*7%*	*4%*	*1%*	*-4%*	*-6%*	*-5.0%*	*0.0%*	*0.0%*	*0.0%*	*0.0%*
Eastern Europe	2.9	2.7	2.7	3.1	3.9	4.3	5.1	6.0	6.4	4.7	5.8	6.5	6.7	6.8	6.9	6.7	6.8	7.4	7.7	7.7	7.7	7.8	7.9	8.0	8.2
% growth	*-5%*	*-6%*	*-1%*	*18%*	*24%*	*10%*	*20%*	*18%*	*5%*	*-26%*	*24%*	*11%*	*3%*	*3%*	*0%*	*-2%*	*1%*	*9%*	*4%*	*0%*	*0.0%*	*1.5%*	*1.5%*	*1.5%*	*1.5%*
Europe	**19.4**	**19.3**	**19.1**	**19.4**	**20.2**	**20.2**	**20.7**	**22.0**	**20.8**	**16.5**	**19.0**	**20.2**	**19.3**	**19.5**	**20.1**	**21.0**	**21.5**	**22.3**	**22.0**	**21.1**	**20.4**	**20.5**	**20.6**	**20.7**	**20.9**
% growth	*-1%*	*0%*	*-1%*	*1%*	*4%*	*0%*	*3%*	*6%*	*-6%*	*-21%*	*15%*	*6%*	*-4%*	*1%*	*3%*	*4%*	*3%*	*4%*	*-2%*	*-4%*	*-3.2%*	*0.6%*	*0.6%*	*0.6%*	*0.6%*
North America	**17.2**	**15.5**	**16.4**	**15.9**	**15.8**	**15.8**	**15.3**	**15.1**	**12.6**	**8.6**	**11.9**	**13.1**	**15.4**	**16.2**	**17.0**	**17.5**	**17.8**	**17.1**	**17.0**	**16.3**	**16.0**	**15.9**	**15.9**	**15.9**	**15.9**
% growth	*1%*	*-10%*	*5%*	*-3%*	*-1%*	*0%*	*-3%*	*-1%*	*-16%*	*-32%*	*39%*	*10%*	*18%*	*5%*	*5%*	*3%*	*2%*	*-4%*	*-1%*	*-4%*	*-1.5%*	*-1.0%*	*0.0%*	*0.0%*	*0.0%*
South America	**2.0**	**2.1**	**1.9**	**1.9**	**2.5**	**2.8**	**3.1**	**3.6**	**3.8**	**3.7**	**4.2**	**4.3**	**4.3**	**4.5**	**3.8**	**3.1**	**2.7**	**3.3**	**3.4**	**3.3**	**3.3**	**3.4**	**3.5**	**3.7**	**3.8**
% growth	*22%*	*2%*	*-8%*	*0%*	*31%*	*14%*	*8%*	*17%*	*5%*	*-2%*	*13%*	*3%*	*-1%*	*6%*	*-15%*	*-19%*	*-12%*	*20%*	*4%*	*-4%*	*2.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*
of which: Brazil	1.5	1.6	1.6	1.6	2.0	2.2	2.3	2.7	2.9	2.9	3.2	3.2	3.2	3.5	3.0	2.4	2.1	2.6	2.8	2.8	2.9	3.0	3.1	3.2	3.3
% growth		*4%*	*-2%*	*2%*	*26%*	*11%*	*3%*	*16%*	*8%*	*2%*	*8%*	*0%*	*1%*	*9%*	*-13%*	*-21%*	*-11%*	*26%*	*5%*	*1%*	*5.0%*	*3.0%*	*3.0%*	*3.0%*	*3.0%*
Asia	**17.1**	**16.9**	**18.8**	**20.3**	**21.8**	**23.9**	**26.0**	**28.1**	**28.6**	**28.9**	**37.1**	**37.0**	**40.8**	**43.0**	**44.4**	**45.3**	**48.7**	**50.0**	**49.2**	**46.1**	**44.7**	**47.1**	**48.0**	**48.9**	**49.9**
% growth	*5%*	*-1%*	*11%*	*8%*	*7%*	*9%*	*9%*	*8%*	*2%*	*1%*	*28%*	*0%*	*10%*	*5%*	*3%*	*2%*	*8%*	*3%*	*-1%*	*-6%*	*-3.0%*	*5.3%*	*1.9%*	*1.9%*	*2.1%*
of which: Japan	10.1	9.8	10.3	10.3	10.5	10.8	11.5	11.6	11.6	7.9	9.6	8.4	9.9	9.6	9.8	9.3	8.8	9.2	9.2	9.2	8.7	8.8	8.8	8.8	8.8
% growth	*5%*	*-4%*	*5%*	*0%*	*2%*	*3%*	*6%*	*1%*	*0%*	*-31%*	*21%*	*-13%*	*18%*	*-3%*	*2%*	*-5%*	*-6%*	*5%*	*0%*	*0%*	*-5.1%*	*0.8%*	*-0.2%*	*-0.3%*	*0.5%*
of which: China	1.9	2.0	3.0	4.0	4.5	5.2	6.7	8.1	8.6	12.8	16.8	17.3	18.2	20.9	22.6	23.7	27.1	27.6	26.6	24.3	23.6	25.3	25.8	26.3	26.9
% growth	*19%*	*10%*	*45%*	*35%*	*12%*	*17%*	*28%*	*21%*	*6%*	*49%*	*31%*	*3%*	*6%*	*15%*	*8%*	*5%*	*14%*	*2%*	*-4%*	*-9%*	*-3.0%*	*7.0%*	*2.1%*	*2.1%*	*2.1%*
of which: South Korea	3.1	2.9	3.1	3.1	3.4	3.7	3.8	4.0	3.8	3.5	4.2	4.6	4.5	4.4	4.4	4.5	4.2	4.2	4.0	3.9	3.8	3.8	3.8	3.8	3.8
% growth	*9%*	*-5%*	*6%*	*2%*	*10%*	*6%*	*4%*	*6%*	*-6%*	*-8%*	*22%*	*9%*	*-2%*	*-2%*	*0%*	*1%*	*-7%*	*0%*	*-5%*	*-2%*	*-1.5%*	*-0.5%*	*-0.5%*	*-0.5%*	*-0.5%*
of which: India	0.8	0.8	0.9	1.1	1.4	1.6	1.9	2.2	2.2	2.6	3.4	3.8	3.9	3.7	3.6	3.8	4.2	4.4	4.7	4.2	4.2	4.6	4.9	5.1	5.3
% growth	*12%*	*-3%*	*8%*	*26%*	*26%*	*14%*	*18%*	*15%*	*3%*	*14%*	*32%*	*11%*	*5%*	*-7%*	*-2%*	*6%*	*10%*	*6%*	*7%*	*-11%*	*0.0%*	*10.0%*	*5.0%*	*5.0%*	*5.0%*
of which: ASEAN	1.1	1.2	1.4	1.6	1.8	2.2	2.0	2.1	2.5	2.0	3.0	2.9	4.1	4.2	3.9	3.8	3.9	3.9	4.2	4.0	3.9	4.2	4.3	4.5	4.7
% growth		*10%*	*17%*	*13%*	*15%*	*24%*	*-8%*	*4%*	*20%*	*-20%*	*48%*	*-4%*	*43%*	*2%*	*-8%*	*-2%*	*3%*	*0%*	*8%*	*-4%*	*-2.7%*	*6.1%*	*3.2%*	*3.9%*	*4.3%*
Other	0.2	0.2	0.2	0.2	0.2	0.3	0.0	0.1	-0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.7	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.5
% growth	*-89%*	*8%*	*16%*	*-2%*	*-10%*	*83%*	*-90%*	*46%*	*-469%*	*-159%*	*-92%*	*336%*	*13%*	*157%*	*29%*	*65%*	*181%*	*-6%*	*-19%*	*-16%*	*-6.0%*	*0.0%*	*5.0%*	*5.0%*	*5.0%*
ROW	**0.7**	**0.8**	**0.9**	**1.1**	**1.3**	**1.5**	**1.7**	**1.8**	**1.8**	**1.8**	**2.2**	**2.3**	**1.7**	**1.6**	**2.0**	**2.0**	**2.3**	**2.6**	**2.6**	**2.0**	**1.8**	**1.9**	**1.9**	**2.0**	**2.0**
% growth	*4%*	*12%*	*15%*	*28%*	*18%*	*15%*	*15%*	*3%*	*0%*	*2%*	*19%*	*4%*	*-25%*	*-8%*	*25%*	*0%*	*16%*	*12%*	*0%*	*-22%*	*-8.0%*	*1.0%*	*3.0%*	*3.0%*	*3.0%*
Total	**56.4**	**54.6**	**57.1**	**58.6**	**61.6**	**64.2**	**66.8**	**70.6**	**67.6**	**59.5**	**74.4**	**76.9**	**81.5**	**84.7**	**87.4**	**88.8**	**93.1**	**95.3**	**94.2**	**88.7**	**86.3**	**88.8**	**89.9**	**91.1**	**92.5**
% growth	*2.3%*	*-3.3%*	*4.6%*	*2.7%*	*5.0%*	*4.2%*	*4.1%*	*5.6%*	*-4.3%*	*-11.9%*	*25.0%*	*3.3%*	*6.0%*	*4.0%*	*3.2%*	*1.6%*	*4.9%*	*2.3%*	*-1.2%*	*-5.8%*	*-2.7%*	*2.8%*	*1.3%*	*1.3%*	*1.5%*

Source: IHS Global Insight, UBS estimates

Given the significant changes to our autos production estimates, we also update our autos semis market model and forecast 3% growth in 2020E. We go into detail on some of the assumptions we make in this model later in this report when we start to look forward to the mid-term structural opportunities for the sector.

Figure 2: UBS auto semis industry model (US$m)

Semi sales (US$bn)	2015	2016	2017	2018	2019E	2020E	2021E	2022E	2023E	2024E	2025E	% CAGR ('18-'23)
ADAS	1.7	3.0	4.1	5.1	5.5	6.8	8.9	10.3	12.3	15.1	19.9	19%
Aftermarket	2.2	2.2	2.3	2.5	2.3	2.2	2.1	2.2	2.2	2.2	2.3	-3%
Body	4.6	5.5	6.6	7.4	6.8	6.7	7.1	7.6	8.0	8.5	9.0	2%
Chassis	4.6	4.5	5.1	5.5	5.1	5.0	5.3	5.7	5.9	6.0	6.1	1%
Infotainment	7.2	7.7	8.4	9.0	8.3	8.2	8.9	9.4	10.0	10.4	10.8	2%
Powertrain	5.4	6.8	7.4	8.1	8.1	8.8	10.4	11.6	13.0	15.0	17.4	10%
Safety	4.4	4.3	4.6	4.8	4.3	4.2	4.4	4.5	4.6	4.6	4.7	-1%
Total	**30.1**	**34.1**	**38.5**	**42.4**	**40.5**	**41.9**	**47.2**	**51.2**	**56.1**	**61.8**	**70.2**	**5.3%**
% y-o-y		**13.3%**	**13.1%**	**10.0%**	**-4.4%**	**3.4%**	**12.7%**	**8.4%**	**9.6%**	**10.2%**	**13.5%**	
Autos production(m)	**88.8**	**93.1**	**95.3**	**94.2**	**88.7**	**86.3**	**88.8**	**89.9**	**91.1**	**92.5**	**93.9**	
% y-o-y		**4.9%**	**2.3%**	**-1.2%**	**-5.8%**	**-2.7%**	**2.8%**	**1.3%**	**1.3%**	**1.5%**	**1.5%**	

Source: UBS estimates, Gartner data for historicals ('15-'18)

Lead Indicator update

At this point, lead indicators appear balanced in our view. Consensus forecasts assume that growth rates will steadily reaccelerate through 2020E but with the coronavirus outbreak likely to cause at least some disruption to demand, there is likely downside in our view to H1 estimates (indeed we cut our own forecasts). It is also notable that consensus forecasts are assuming significant outperformance of semis vs. their customers in 2020E which given there was only a measured inventory reduction in 2019 appears overly optimistic in our view and highlights downside risk to estimates. There is one support in the form of inventory levels which at this stage appear to be much better managed within OEMs, although do appear at slightly elevated levels in our view compared to history at semis.

Figure 3: Autos / Industrial Semis Leading Indicators

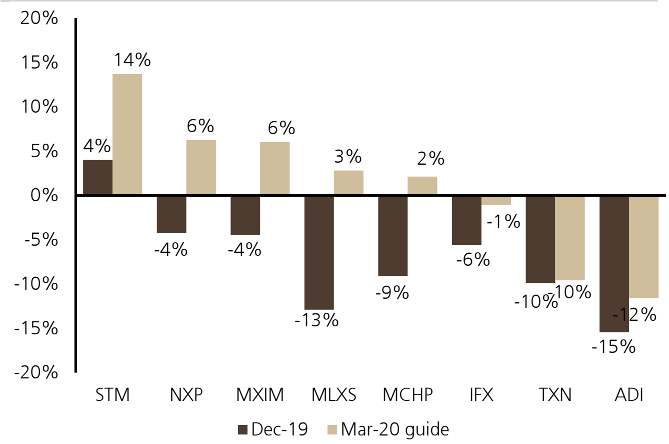
	Trend								
Indicator	Q1'19	Q2'19	Q3'19	Q4'19	Q1'20E	Q2'20E	Q3'20E	Q4'20E	Commentary
1) Semis y-o-y rev growth	-6%	-6%	-8%	-7%	0%	3%	8%	11%	Positive - if semis cam meet expectations it would be positive but we see downside risks to cons
2) Semis vs OEM revgap	-2%	-4%	-8%	-2%	4%	5%	9%	8%	Negative - Semis forecasts appear too high and out of line with fundamentals
3) Inventory days - Semis	126	126	117	118					Neutral - Pressure from inventory levels eased but still somewhat high compared to history
4) Inventory days - OEMs	64	66	60	62					Neutral - Inventories have come down to more normalised levels and are less of a risk - particularly autos
5) Autos production y-o-y	-5%	-8%	-2%	-1%					Negative - we now forecast -3% y-o-y autos production in 2020E (UBSe).

Source: UBS, Company Data

#1 y-o-y semis growth

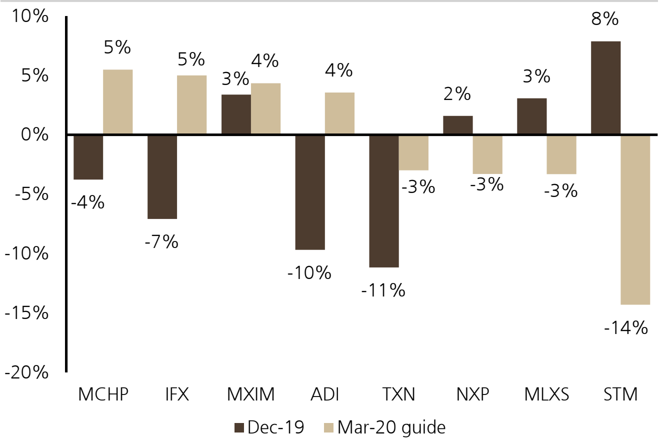
The first leading indicator we focus on, and often the most important one, is the trend in y-o-y growth for the sector. Looking across the auto and industrial exposed Semis, the revenue growth guidance for Q1 20 - drawn from the sample of 8 stocks that were equally weighted - averaged -1% q/q and +1% y/y. We saw continuation of downtrend in Q4 19 for Semis, driven primarily by a weak demand in Automotive. Management of 5 out of 8 Semi companies guides for a recovery in Q1'20 vs the previous year.

Figure 4: y-o-y revenue trend comparison (in US$)



Source: Company data

Figure 5: q-o-q revenue trend comparison (in US$)

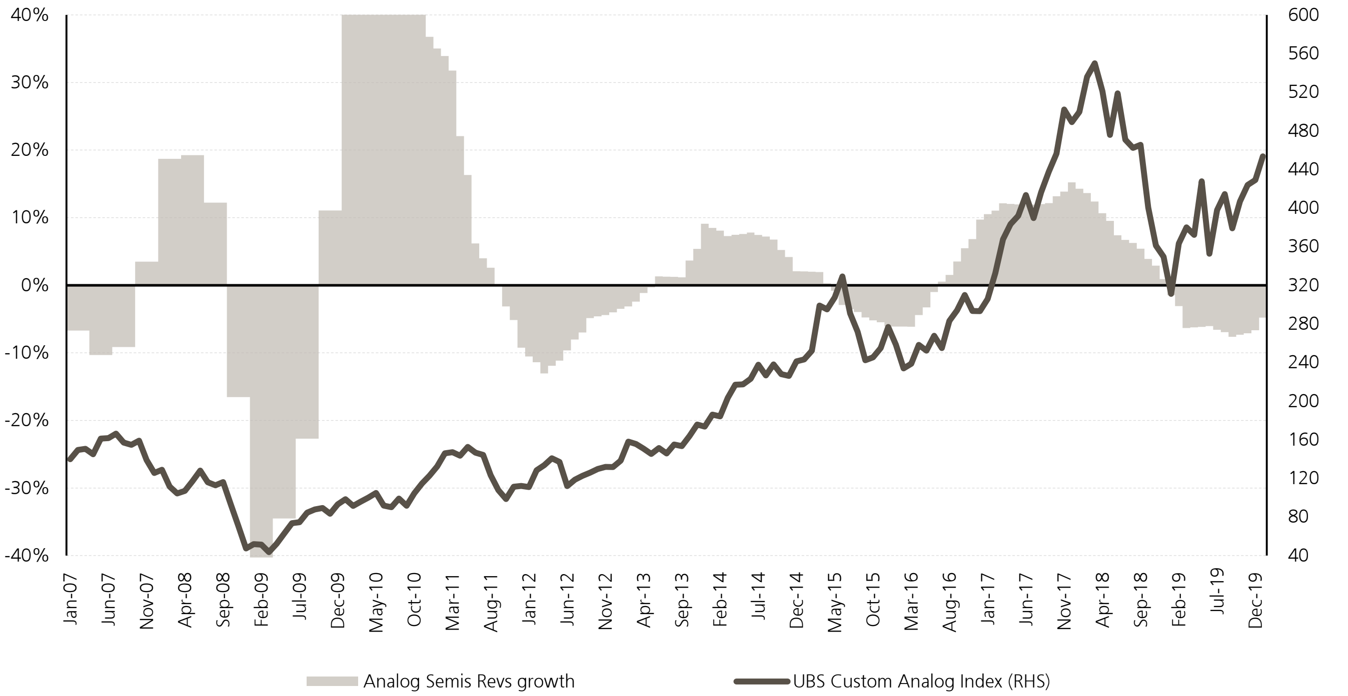


Source: Company data

In terms of the relative performance between companies, STMicroelectronics has continued to outperform in terms of y-o-y growth through this down-cycle. On the contrary, the weakest performer has been Analog Devices, followed by Melexis and Texas Instruments (all +10% to +15% y-o-y growth).

Historically, it has proven right to turn more cautious/positive on the sector a few months ahead of the peak/trough in y-o-y growth trends. However, in more recent cycles the stocks – driven by fiscal easing in particular – have continued to see multiple expansions even after the lead indicators have turned. At this point – markets expect topline growth rates to rebound from the through, what is consistent to what we saw year-to-date. We believe the sector will need to see a recovery in demand of the downstream end markets in order for stocks to support a sustained recovery in topline growth rates. We do not anticipate any strong recovery in 2020E but there are some bright spots from Auto (i.e. global car production of c+1% y/y in 2020, UBSe) and the Industrial sector (still strong order books and healthy inventory levels).

Figure 6: UBS Custom Analog Index performance and its y/y growth dynamics

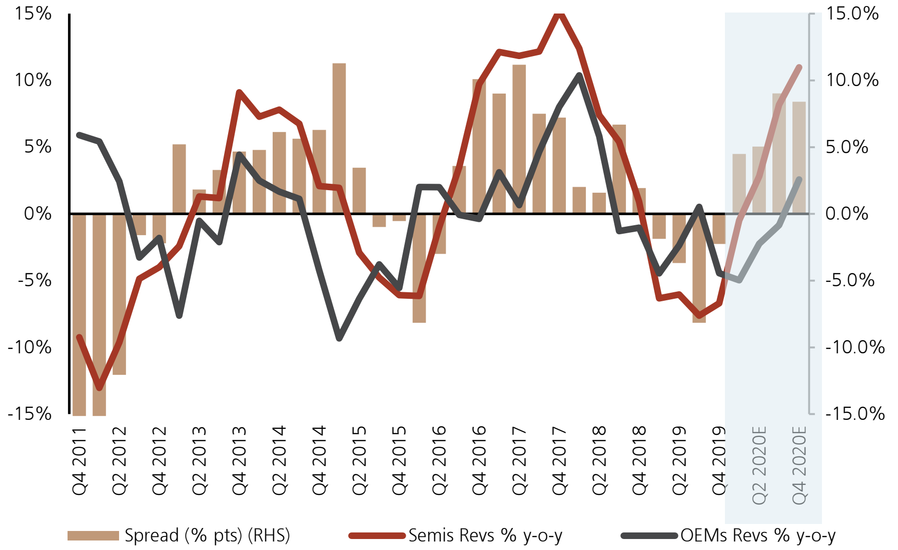


Source: UBS estimates, Company data, IBES consensus NOTE: Analog semis index calculated as a simple average of the performance of the share prices of Analog Devices, ams AG, Texas Instruments, STMicroelectronics, Infineon, ON Semi, Microchip, Maxim, Melexis and NXP

#2 – Semis expected to outperform their end market OEMs throughout 2020E

Another factor we watch closely is the relative performance of the Semi space and their underlying OEM customers. While in the medium term content growth means that we should expect Semis to outperform their OEM/Tier 1 supplier customers, short term it also provides a representation of whether inventory is likely being built of reduced downstream. Positively, estimates suggest necessary inventory destocking in Q1 20 and onwards but our concern is the pace of recovery as the one assumed for Semis ought not necessarily be reflected in their downstream customers, adding risk to 2020E estimates for the sector. Overall, we expect a recovery at Semis to be more robust than for their downstream OEMs.

Figure 7: Autos/ Industrial Semis vs OEM Revs (y-o-y)

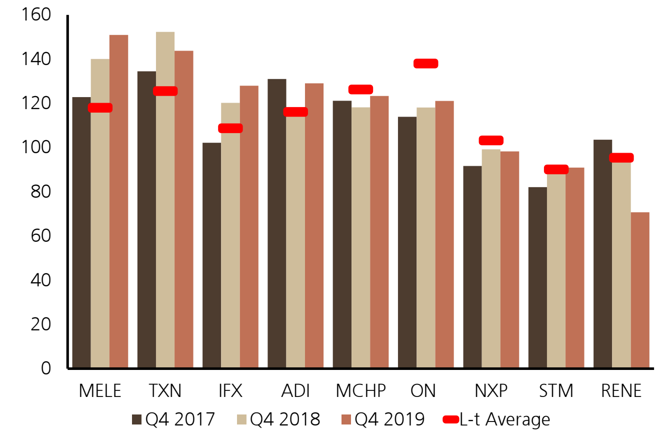


Source: Company data, IBES consensus data, UBS estimates, (9 semis, 26 OEMs)

#3 – Semi Inventory still somewhat elevated

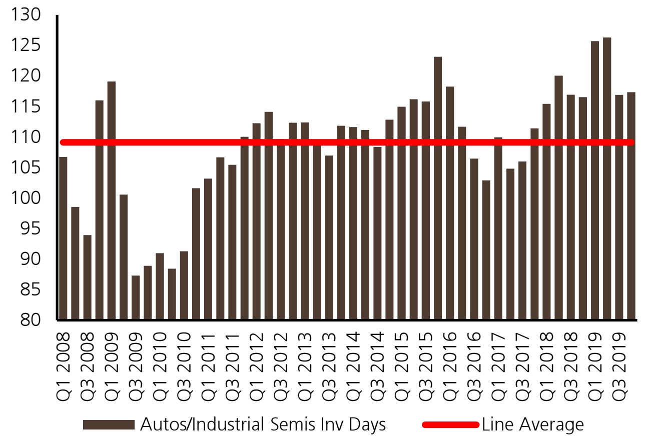
Looking at the inventories, at Semis, we noticed that they remain high given many companies were slow to start lowering utilisation rates as demand slowed and many claimed to be intentionally increasing inventory after a period of short supply. However, we saw two consecutive quarters of falling Inventory days. Positively, Q4 was accompanied by lower utilisation rates to better deal with the excess inventory and we would hope to start seeing inventories falling as we head into 2020 and a stricter oversight of stock supply.

Figure 8: Autos / Industrial Semi inventory days



Source: UBS, Company data, Note: used 360 days as a proxy for year

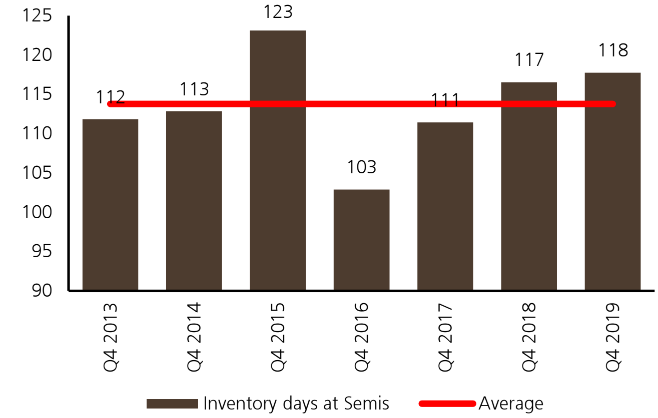
Figure 9: Autos / Industrial Semi inventory days



Source: UBS, Company data, Note: used 360 days as a proxy for year

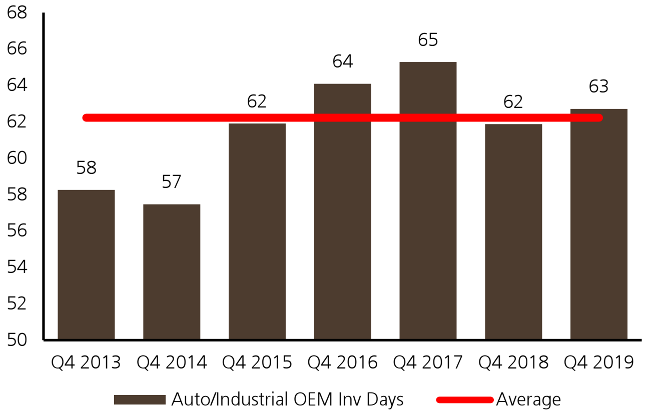
When we look at the OEMs, inventories appear to now be more aligned with historical Q4 levels. The same is the case in both the autos and industrial OEMs that we track.

Figure 10: Semis inventory days - seasonally adjusted



Source: UBS, Company data; Note: used 360 days as a proxy for year

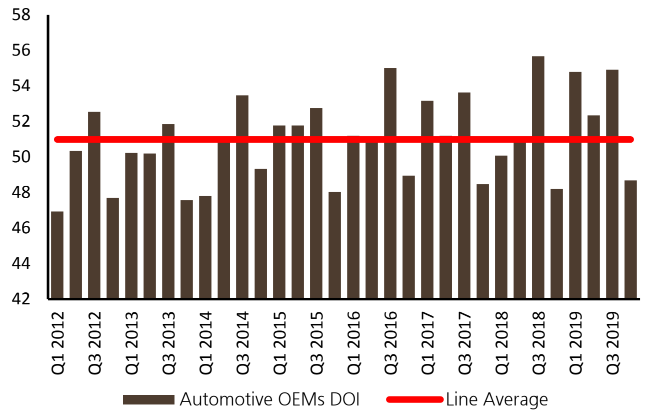
Figure 11: Auto / Industrial downstream OEMs – seasonally adj.



Source: UBS, Company data; Note: used 360 days as a proxy for year

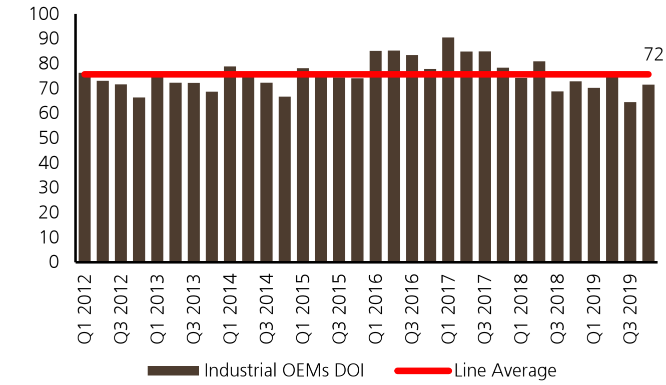
Comparison of normalised Days of Inventories for both Auto and Industrial OEMs revealed that inventories at Auto OEMs have corrected sequentially and are now back at the normal seasonal levels we would expect in Q4, while industrial OEMs have managed their inventory levels well.

Figure 12: Downstream Auto OEMs Inventory Days



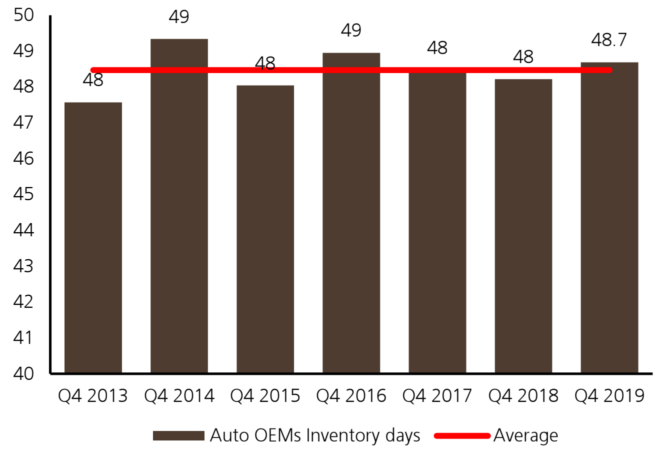
Source: UBS, Company data

Figure 13: Downstream Ind. OEMs Inventory Days



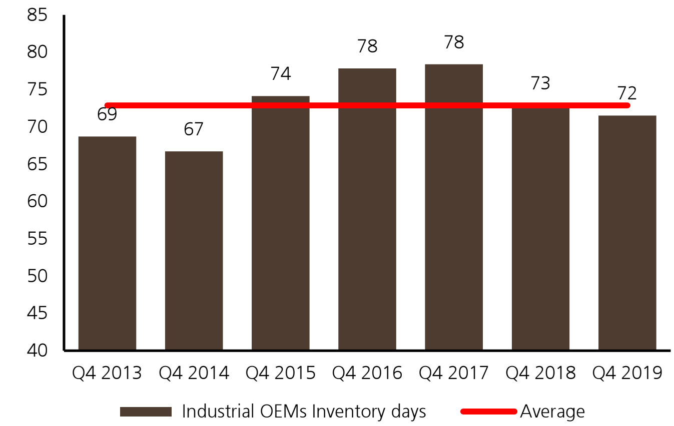
Source: UBS, Company data

Figure 14: Auto OEM Inventory days, Q4 19 vs hist.



Source: UBS, Company data, Note: used 360 days as a proxy for year

Figure 15: Industrial OEM Inventory Days, Q4 19 vs hist.

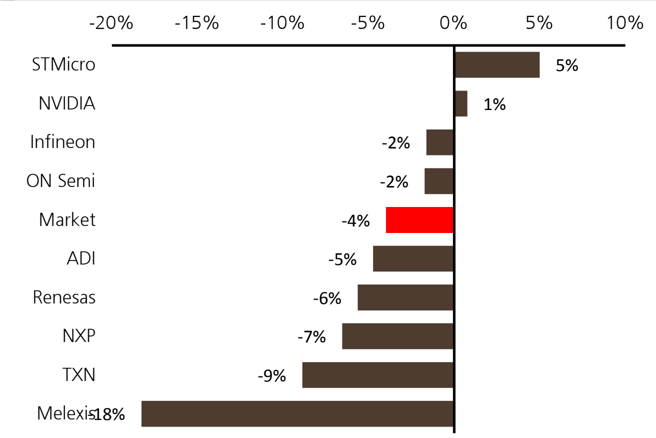


Source: UBS, Company data; Note: Philips excluded as does not disclose quarterly data on inventories; used 360 days as a proxy for year

A word on autos semis market share

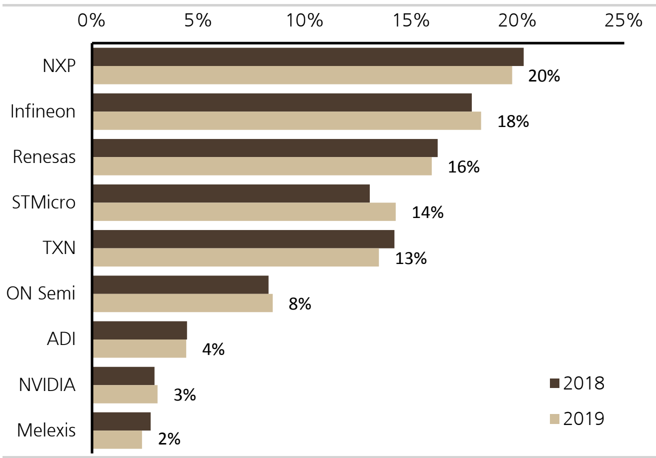
Within our industry models, we track the auto semis revenue reported by each company. We recognise that this in many cases will not be on a like-for-like basis but we still believe it provides a relevant comparison between the companies. It shows that those with a strong power semis exposure (STMicro, Infineon an ON Semi) outperformed, while those with more traditional business underperformed. We estimate that all-in the auto semis market declined by c4% in 2019. Please note that in Figure 17 below we are only tracking around half the industry so the market shares should only be considered relative and not in absolute.

Figure 16: % y-o-y growth in auto semis (2019)



Source: UBS, Company data

Figure 17: Tracked Auto semis market share (2019)



Source: UBS, Company data

Revisiting the structural growth drivers

We have written at length in recent years on the structural growth opportunities in the auto semis space as content grows with rising EV and ADAS penetration. For a more in depth review of some of this please revisit the following research reports:

Semiconductors for Autonomous Vehicles "ADAS Is Coming To A Car Near…"

Semis: Who's powering Tesla's Model 3? "Lap 2: Electronics - Driving with ..."

Semis: Who's powering Tesla's Model 3? "Lap 1: Powertrain - Some SiC(k)..."

Q-Series "UBS Evidence Lab Electric Car Teardown: Will EV and ADAS add ..."

Below we update our forecasts for the auto semis industry out to 2025E. Having seen a significant slowdown in growth in H2'18 that continued and stimulated an inventory correction through the supply chain in 2019 we estimate that auto semis revenue only barely outperformed autos production in 2019. We expect that the coronavirus outbreak will pose a headwind in H1'20 before we start to see a strong re-acceleration in H2'20 and into 2021E for the industry.

Figure 18: UBS Auto semis industry model

Semi sales (US$bn)	2017	2018	2019E	2020E	2021E	2022E	2023E	2024E	2025E	% CAGR ('18-'23)
ADAS	4.1	5.1	5.5	6.8	8.9	10.1	11.8	14.0	18.1	18%
Aftermarket	2.3	2.5	2.3	2.2	2.1	2.2	2.2	2.2	2.3	-3%
Body	6.6	7.4	6.8	6.7	7.1	7.6	8.0	8.5	9.0	2%
Chassis	5.1	5.5	5.1	5.0	5.3	5.7	5.9	6.0	6.1	1%
Infotainment	8.4	9.0	8.3	8.2	8.9	9.4	10.0	10.4	10.8	2%
Powertrain	7.4	8.1	8.1	8.8	10.4	11.6	13.0	15.0	17.4	10%
Safety	4.6	4.8	4.3	4.2	4.4	4.5	4.6	4.6	4.7	-1%
Total	**38.5**	**42.4**	**40.5**	**41.9**	**47.2**	**51.0**	**55.5**	**60.7**	**68.4**	**5.3%**
% y-o-y	**13.1%**	**10.0%**	**-4.4%**	**3.4%**	**12.7%**	**7.9%**	**8.9%**	**9.4%**	**12.5%**	
Autos production(m)	**95.3**	**94.2**	**88.7**	**86.3**	**88.8**	**89.9**	**91.1**	**92.5**	**93.9**	
% y-o-y	**2.3%**	**-1.2%**	**-5.8%**	**-2.7%**	**2.8%**	**1.3%**	**1.3%**	**1.5%**	**1.5%**	
$ content / car	**2017**	**2018**	**2019E**	**2020E**	**2021E**	**2022E**	**2023E**	**2024E**	**2025E**	**% CAGR ('18-'23)**
ADAS	44	55	63	79	101	112	129	152	193	19%
Aftermarket	24	27	26	25	24	24	24	24	24	-2%
Body	69	78	77	78	80	84	88	92	96	2%
Chassis	53	58	57	58	60	63	65	65	65	2%
Infotainment	88	95	94	95	100	105	110	112	115	3%
Powertrain	78	86	91	102	117	129	143	162	185	11%
Safety	48	50	49	49	50	50	50	50	50	0%
$ Content per car	**404**	**450**	**457**	**485**	**532**	**567**	**609**	**657**	**728**	**7.3%**
% y-o-y	**10.5%**	**11.3%**	**1.5%**	**6.3%**	**9.6%**	**6.5%**	**7.5%**	**7.8%**	**10.9%**	

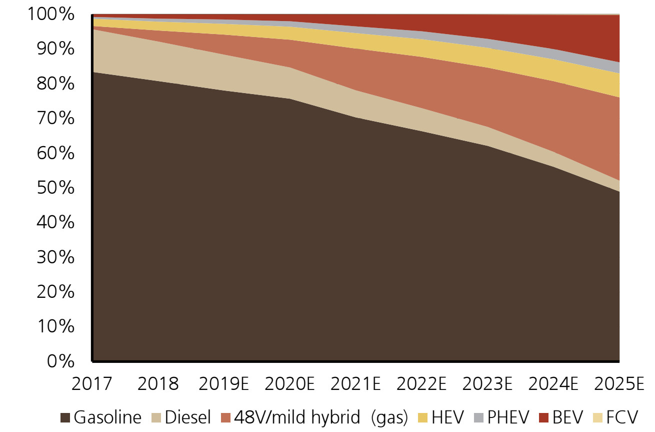
Source: UBS estimates, Gartner actuals for 2017/2018

Over the next 5 years we expect to see significant growth in auto semis as we see the two megatrends in the industry - rising PHEV/EV vehicles in the mix and also rising penetration rates of ADAS functionality and higher levels of ADAS. We expect these two megatrends will drive 75% of the growth in the industry from 2020E to 2025E as you can see in our forecasts below.

Rising EV penetration still a significant tailwind to come

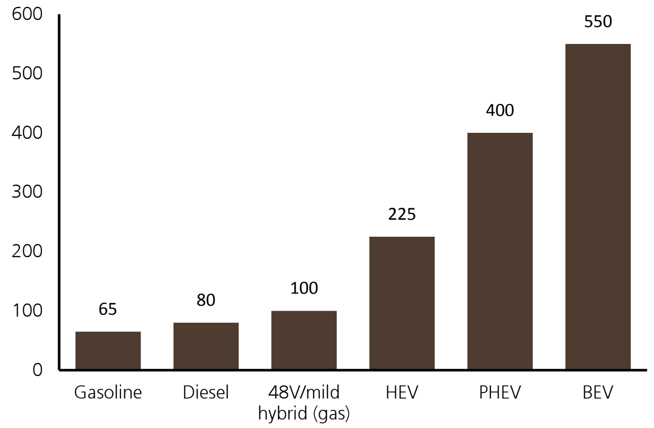
We forecast that EV (combined plug-in hybrid and full battery electric) will rise to 17% of auto sales by 2025E with a strong acceleration happening through the end of 2020 and into 2021 as OEMs deal with emissions requirements in Europe. These two tailwinds along with the significant content increase that we see as we shift towards full battery-electric vehicles we believe will drive significant growth ($9bn between 2020 and 2025E) for the industry benefiting primarily those that supply power switching semis (IGBT / SiC MOSFETS) and semis that are used in battery management solutions. We wrote at length on the break-down of the content increase in our tear-downs of both the Tesla Model 3 and Chevrolet Bolt and would refer investors back to those for more details.

Figure 19: A rapidly shifting powertrain mix



Source: UBS estimates

Figure 20: Beneficial to semis given content ($, 2025)



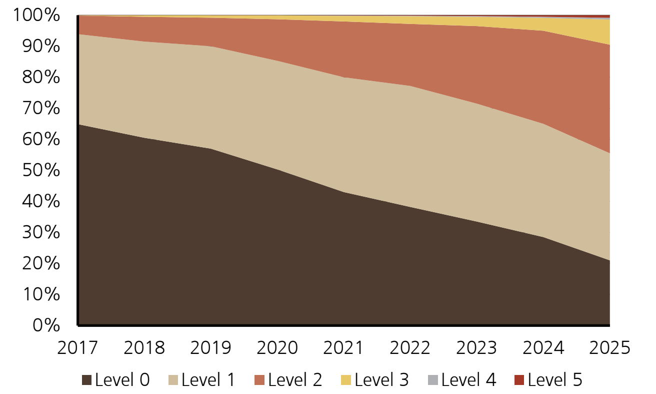
Source: UBS estimates

One thing to note is that within our forecasts, we assume that the content within a full battery-electric powertrain doesn't erode much over the next 5 years which is based on our assumption that on a like-for-like vehicle content would probably decline 2-3% per year but we will then start seeing SiC penetrate more widely into the vehicle mix and bringing with it 20-30% inflation in the semi content. At this point we assume these two trends balance each other out but in time we will look to be more granular on the two trends.

ADAS penetration the other mega-trend

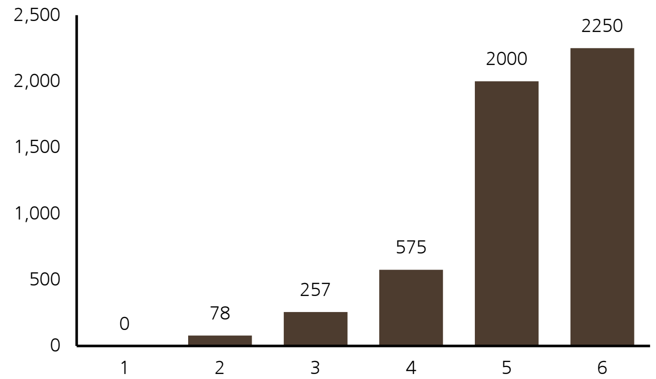
The second mega-trend driving the content growth in the industry is the rising penetration of advanced driver assistance systems or ADAS into the vehicle mix. We remain relatively cautious on how quickly we will reach Level 4/5 within our forecasts which are the levels that drive the most significant content inflation (potentially >$2000 of compute, sensor and memory content added to the car). In the meantime however, we forecasts Levels 1-3 to see penetration rates rise and will still create a significant additional content opportunity in the next 5 years of $11bn (mostly for sensor and compute providers). We continue to see RADAR sensors and camera based sensors being the most significant opportunities in the near term as the key components required in Levels 1-3. We wrote at length on the different content required in the different levels of automation in this report: Semiconductors for Autonomous Vehicles "ADAS Is Coming To A Car Near…".

Figure 21: Bottom-up ADAS penetration levels



Source: UBS estimates

Figure 22: Semi content by ADAS level ($, 2025)

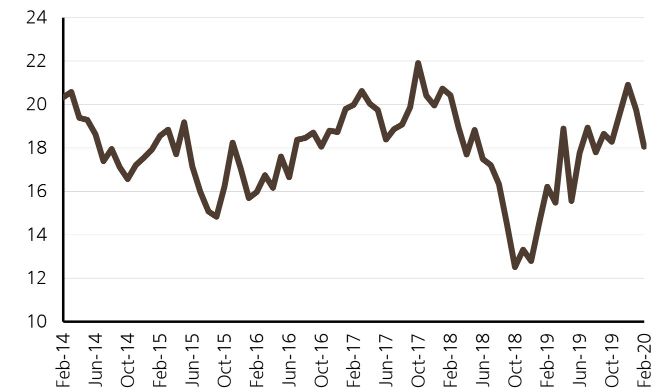


Source: UBS estimates

A word on valuation

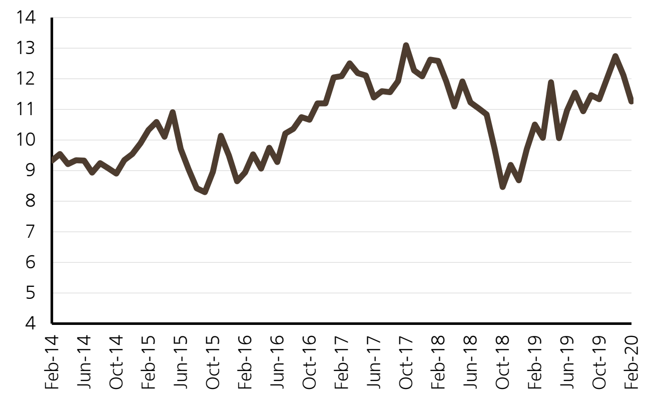
The sector sold off significantly last week, however it is worth noting that it is now only back to the levels we were at in December so whilst the sell-off has been rapid (in 5 days), year-to-date many stocks are only down marginally. We raise this point because from a valuation perspective, the sector is still not cheap in terms of its history. Particularly given if we are right there are likely still risks to estimates through the rest of the year.

Figure 23: Autos / industrial semis 12-month forward P/E



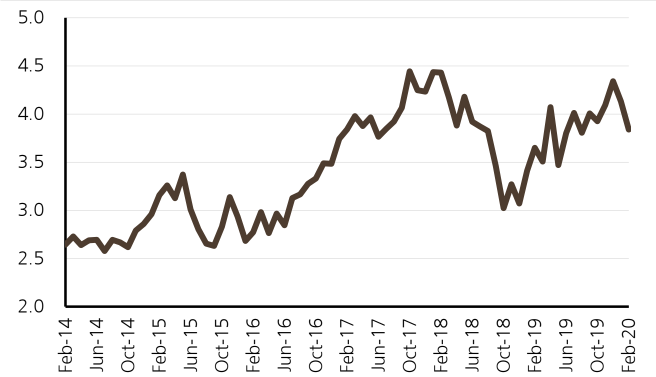
Source: UBS, Datastream

Figure 24: Autos / industrial semis forward EV/EBITDA



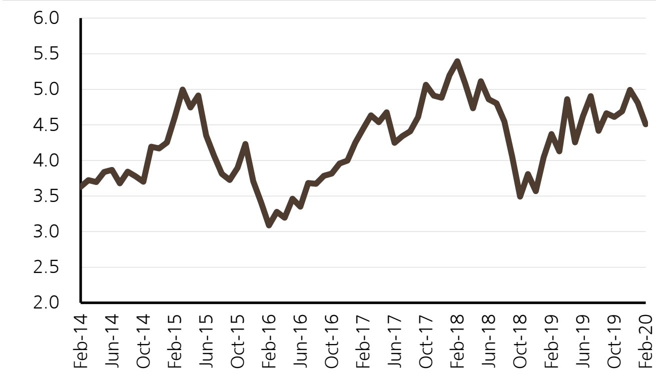
Source: UBS, Datastream

Figure 25: Autos / industrial semis forward EV/Sales



Source: UBS, Datastream

Figure 26: Autos / industrial semis forward P/Book



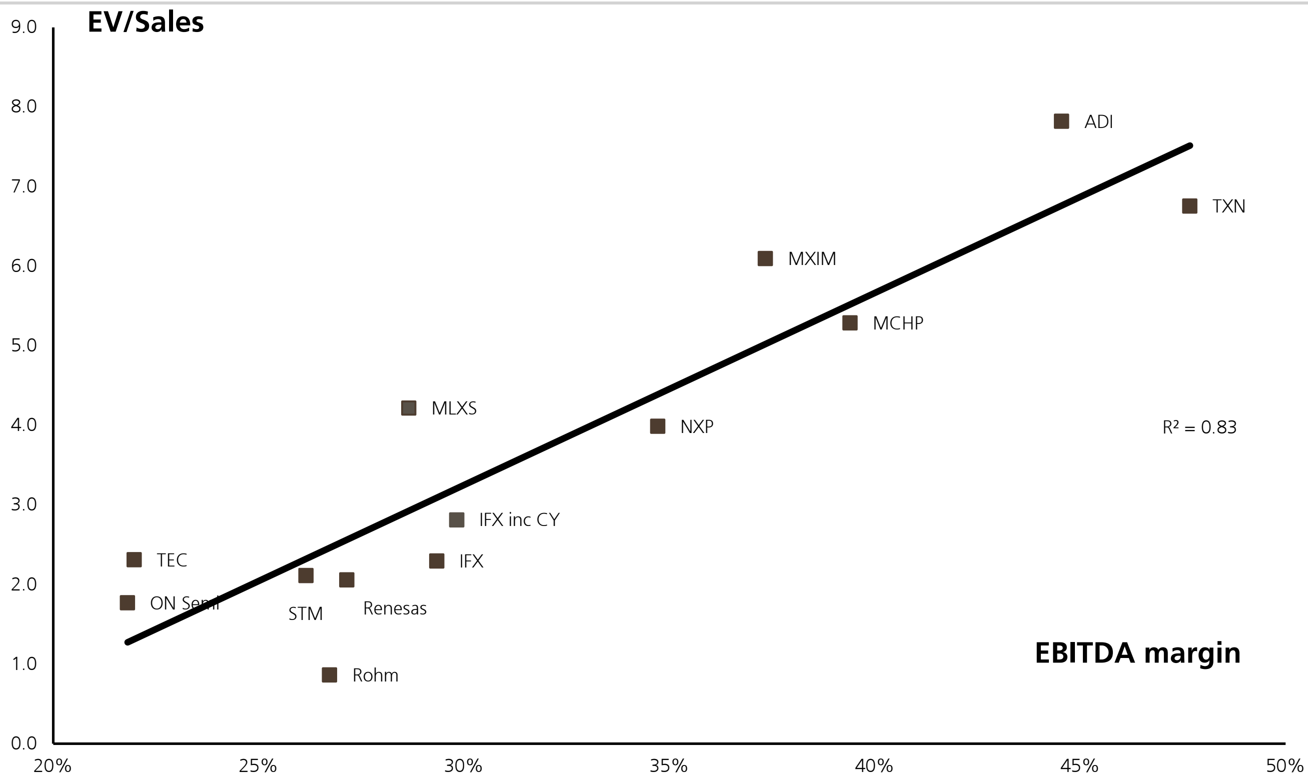
Source: UBS, Datastream

Figure 27: Autos / industrial semis valuation sheet

Company	Rating	Price (lc)	Price Target (lc)	Market Cap ($m)	EV/Sales 2020E	EV/Sales 2021E	EV/EBITDA 2020E	EV/EBITDA 2021E	Price/Earnings 2020E	Price/Earnings 2021E	FCF Yield 2020E	FCF Yield 2021E
Analog Devices	Not Covered	109.05	-	40,154	7.6	7.8	15.4	17.6	21.3	22.2	4.9%	5.0%
Infineon	Buy	18.79	24.50	25,776	2.6	2.3	9.3	7.8	21.4	18.4	3.0%	4.2%
Infineon (pro forma incl. Cypress)	Buy	18.79	24.50	26,640	2.8	2.5	10.3	8.5	18.3	14.8	3.3%	7.5%
Maxim Integrated	Not Covered	55.62	-	14,984	6.1	6.1	16.1	16.3	23.3	22.2	5.1%	5.2%
Microchip Technology	Not Covered	90.71	-	21,728	5.6	5.3	14.1	13.4	15.6	14.4	6.2%	6.5%
Melexis	Sell	62.30	56.00	2,765	4.7	4.2	18.5	14.7	34.7	24.5	3.6%	3.9%
NXP	Not Covered	113.69	-	31,805	4.2	4.0	12.3	11.5	14.9	13.6	5.3%	6.3%
ON Semi	Not Covered	18.66	-	7,670	1.8	1.8	7.9	8.1	12.4	13.6	4.3%	7.7%
Renesas Electronics	Neutral	651	800	10,242	2.2	2.1	7.5	7.6	30.2	25.4	11.6%	12.8%
Rohm	Buy	7,100	11,000	6,703	0.9	0.9	3.8	3.2	19.6	15.2	6.5%	3.2%
STMicroelectronics	Neutral	24.41	24.00	23,922	2.3	2.1	9.4	8.1	19.6	16.4	3.1%	4.7%
TE Connectivity	Not Covered	82.87	-	27,690	2.3	2.3	10.4	10.5	15.2	15.4	6.0%	6.0%
Texas Instruments	Sell	114.14	117.00	113,003	7.5	6.8	16.2	14.2	21.5	18.1	4.2%	5.1%
Analog Semis				*Mean*	**4.0**	**3.8**	**11.7**	**11.1**	**20.8**	**18.3**	**5.3%**	**5.9%**
				Median	**3.4**	**3.1**	**11.3**	**11.0**	**20.5**	**17.3**	**5.0%**	**5.2%**

Source: UBS estimates, IBES consensus for non-covered companies

Figure 28: EV/Sales vs. EBITDA margin (2021E)



Source: UBS estimates, IBES consensus used for non-covered companies

Valuation Method and Risk Statement

The upside risks to the semiconductor sector include stronger end demand from OEMs and tightness of supply due to the financial distress of competitors. Downside risks include macro-economic factors, over-capacity in times of peaking demand and poor yields. The semiconductor sector is high cyclical and vulnerable to sudden shifts in customer sentiment while many companies also have high cost bases meaning they can go loss-making in the downturn.

Infineon is a top 10 global semiconductor company with exposure to auto, industrial and chipcard semiconductors and hence, in spite of its broad portfolio, the company is exposed to fluctuations of the semiconductor cycle. The company is also exposed to overall autos production volumes and the mix towards hybrid and electric vehicles (which have higher semiconductor content). There are also risks of disruptions with new forthcoming technologies such as silicon carbide. Infineon also has ongoing litigation related to the Qimonda bankruptcy that could be a negative. The company is also exposed to fluctuations in the USD:EUR exchange rate with a strong USD positive for the business. We value Infineon using a DCF methodology with a WACC of 9% and a terminal growth rate of 2%.

There are a number of company specific risks facing Melexis including 1) Customer concentration with its largest customer being 16% of sales, 2) Significant dependence on a single product family with magnetic sensor accounting for 56% of Group revenues, 3) Risk of disruption if OEMs were to change to a different magnetic sensor technology. More generally the business is exposed to fluctuations in both the semiconductor inventory cycle and underlying demand for automotive vehicles in particular. The company is also exposed to the pricing and competitive risk in key markets given it operates in attractive growth markets. We value Melexis using a DCF based on a WACC of 9% and g of 2%.

Our Rohm price target is based on a PER methodology. Risk factors include a sales slowdown due to weakness in semiconductor demand alongside a slowdown in the macro economy, a loss of share or price declines as a result of stiffer competition, profit erosion from the strong yen, and deterioration in competitiveness. Also production declines for autos, smartphones, game equipment and PCs.

Texas Instruments: Our valuation is based on an EV/FCF multiple methodology.
Texas Instruments faces a variety of risks, including rapidly changing technology, intense competition, high required capital investments, pricing pressure, and cyclical end-market demand. Other risks include company's ability to grow revenue to increase utilization of its newly acquired capacity and ability to successfully integrate National Semiconductor operations.

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Buy	FSR is > 6% above the MRA.	44%	32%
Neutral	FSR is between -6% and 6% of the MRA.	41%	29%
Sell	FSR is > 6% below the MRA.	15%	20%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 31 December 2019.
1:Percentage of companies under coverage globally within 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.
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4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

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Company Disclosures

Company Name	Reuters	12-month rating	Short-term rating	Price	Price date
Infineon Technologies AG[18]	IFXGn.DE	Buy	N/A	€18.79	28 Feb 2020
Melexis NV	MLXS.BR	Sell	N/A	€62.30	28 Feb 2020
NVIDIA Corp[16, 22]	NVDA.O	Buy	N/A	US$270.07	28 Feb 2020
Renesas Electronics	6723.T	Neutral	N/A	¥651	28 Feb 2020
Rohm	6963.T	Buy	N/A	¥7,100	28 Feb 2020
STMicroelectronics[5, 16, 18]	STM.PA	Neutral	N/A	€24.41	28 Feb 2020
Texas Instruments Inc[16]	TXN.O	Sell	N/A	US$114.14	28 Feb 2020

Source: UBS. All prices as of local market close.
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