

SMARTKARMA RESEARCH

Editor's Picks 2018 Edition





Welcome!

What a year 2018 was for investment research. In a post-MiFID II world, the power of independent research lies in its ability to be differentiated, unshackled by corporate interests, and free from opaque practices.

Despite the challenges in monetisation and growth, independent analysts have the freedom to pick the ideas and companies worth covering. And 2018 hasn't been short of interesting topics of coverage - from the impact of MiFID II to the world's second-most valuable IPO, to the struggling semiconductor market, to widespread mismanagement in India's banking sector.

Independent Insight Providers publishing on Smartkarma were able to train their critical eye and analytical expertise on all these areas and more. They generated deep analysis, shared actionable Insights, and kicked off debate and conversation.

As we start our journey into the new year, we compiled 10 of those Insights that were either overwhelmingly appreciated, generated robust discussion, or were particularly discerning and differentiated. We present them here in their entirety, to paint a picture of the research available on the platform. The selection is not meant to be exhaustive, but rather indicative of the depth and breadth of knowledge and information you can find on Smartkarma - the global investment research network!

Smartkarma is a global investment research network, made up of independent Insight Providers who produce, curate, and publish unbiased intelligence for institutional investors.

Smartkarma Research |
Editor's Picks 2018 Edition
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Nathan Ramler

More than 20 years of experience in investment banking and equity research. He has been covering Japanese tech and telecommunications stocks from Tokyo since 2002.

SoftBank Corp's IPO Promised a Blockbuster but Didn't Quite Get There

November 2018

SoftBank had an eventful 2018, what with its milestone Vision Fund that financed companies from Uber to Boston Dynamics jeopardised by the storm of controversy around the Saudi government, its biggest limited partner. The timing for SoftBank was especially critical ahead of the US\$23b listing of its telco arm - the second largest ever after Alibaba's US\$25b IPO - which faced a massive 15 percent drop in stock price just after the listing, before recovering in a rollercoaster ride. In November, Nathan Ramler looked at the IPO against other Japanese telco valuations and through a sum-of-the-parts analysis of SoftBank Group in this bearish view.



"The SoftBank Corp. IPO price looks expensive when comparing it to the domestic peers' valuation multiples, but we expect the focus will be very much all about the dividend yield, selling it to the domestic retail investor who is typically hungry for steady cash flows from good, fixed returns and may be less concerned about corporate governance issues."

SoftBank (9984 JP) - A Fresh Look at the Valuation Framework in Light of the Latest IPO Information

By Nathan Ramler | 16 November 2018

EXECUTIVE SUMMARY

At long last, [Softbank Group \(9984 JP\)](#) published data for its planned listing of SoftBank Corp., the domestic Japanese telecom business, including preliminary pricing and detailed financials. We use this new information in our sum-of-the-parts (SOTP) analysis.

In this Insight, we recalculate the [Softbank Group \(9984 JP\)](#) SOTP, especially focusing on new data for the domestic mobile business and updates from the SoftBank Vision Fund. We also conduct scenario analyses, providing sensitivity tables to help assess the SoftBank Corp. IPO.

Based on the latest data, the current SoftBank Group share price implies that the market is factoring in close to a 45 percent discount to the SOTP valuation (after applying a 20 percent holding company discount). This seems big. Perhaps the valuation assumptions we use are overly generous and/or perhaps the market has significant concerns about SoftBank Group's ability to create value with a reasonable degree of risk. Whatever the root cause(s) of the gap, this situation appears to present opportunities.

DETAIL

Since 11 October 2018, when we published the [Insight SoftBank \(9984 JP\) - A Valuation Framework And Preparation for the Domestic Telco IPO in December](#), we have seen a great deal of market volatility both in Japan and globally, and SoftBank Group's share price is about 11 percent lower than it was in early October.

For reference, over the same time period [NTT Docomo's \(9437 JP\)](#) share price has fallen 13 percent and [KDDI's \(9433 JP\)](#) 17 percent, largely due to concerns about upcoming fee changes

for mobile telecom services in Japan, which [NTT Docomo](#) communicated poorly, in our opinion.

In light of the stock moves and newly available information, we recalculated our SoftBank Group SOTP framework. Specifically, we updated for:

- The latest stock prices (especially for [Sprint \(S US\)](#), [Yahoo Japan \(4689 JP\)](#), and [Alibaba \(BABA US\)](#))
- 2Q FY3/19 new P&L and balance sheet information
- New disclosures from the SoftBank Vision Fund
- The latest foreign exchange rates
- Most importantly, the preliminary pricing and data for the SoftBank Corp. (domestic mobile) IPO, which is on track for a 19 December 2018 listing date. (For an excellent discussion on the technical factors and merits of the IPO itself, please also see our colleague [Travis Lundy's](#) insight: [Softbank Corp IPO - Dividends, Index Buying, and Offer Structure](#))

In the table below, we show our latest calculation and compare it with the previous SOTP framework:

¥ billions	Value to SoftBank Group:			Previous	
	Stake	US\$bn	¥ bn	¥ bn	Change
SoftBank Corp. (IPO entity)	100%	90.7	10,249	7,200	42.3%
Sprint	84.7%	53.1	6,005	6,113	-1.8%
Yahoo Japan	48.2%	3.5	401	399	0.4%
Arm	100%	32.8	3,708	3,741	-0.9%
Vision Fund and Delta Fund	38%	12.5	1,417	1,321	7.2%
Brightstar	100%	2.2	251	251	0.0%
Others	100%	3.3	376	376	0.0%
Alibaba stake	29%	113.1	12,779	12,494	2.3%
Other investments	na	18.3	2,072	2,205	-6.0%
TOTAL EV			37,258	34,100	9.3%
Net Debt			14,826	14,621	1.4%
Total equity value			22,432	19,479	15.2%
Value per share, ¥			20,380	17,698	15.2%
Discount applied			20.0%	20.0%	
Adjusted value per share, ¥			16,304	14,158	15.2%
Current SoftBank Group share price, ¥			9,020	10,125	-10.9%
% gap			-44.7%	-28.5%	

Source: Company data, SoftBank, Bloomberg, Kheiron; (current prices as of 15 November 2018)

Domestic Mobile - the SoftBank Corp. IPO is coming

By far the biggest change in the SOTP comes from the domestic mobile operations with a 42 percent increase from the previous calculation.

In the earlier calculation, we used a 6x EV/EBITDA multiple and an 10x EV/OP multiple for SoftBank Corp., based on the trading multiples at the peers NTT Docomo and KDDI, and applied them to the SoftBank domestic telecom operation's results over the previous 12 months, deriving a valuation range of ¥7.1-7.3 trillion. We then used the mid-point of that range for the purposes of the SOTP analysis.

In the updated calculation, we are using the preliminary pricing data from the planned SoftBank Corp. IPO.

With a planned IPO price of ¥1,500 per share implying an equity value of ¥7.18 trillion plus the latest net debt figure of ¥3.07 trillion, the segment is now worth an estimated enterprise value of ¥10.25 trillion (US\$90.7 billion at an FX rate of 113). This is significantly higher than the ¥7.2 trillion enterprise value we calculated before, based on comparable multiples. See the table below for our valuation and net debt computations:

Calculation of SoftBank Corp.'s net debt and enterprise value

	US\$ equiv.	
Price per share, ¥	1,500	13.3
Total shares, bn	4.79	
Equity value, ¥bn (EqV)	7,180	63.5
Net debt, ¥bn	3,069	27.2
Enterprise Value, ¥bn (EV)	10,249	90.7
Balance sheet as of 30-Sep-18		
	¥bn	
Cash & equivalents	312	2.8
Short-term debt	951	8.4
Long-term debt	2,429	21.5
Net debt	3,069	27.2

Source: SoftBank company data (Edinet electronic filings)

We note that in US\$ terms, SoftBank is aiming to achieve the previously discussed (in the media) valuation of US\$90 billion, albeit for Enterprise value not Equity value. The final price for the IPO is expected to be set on Monday, 10 December 2018.

So how does this fit into the domestic peer group? In the table below we show the current trading multiples for all three companies (in bold), based on last-12-month (LTM) financials as of the 2Q FY3/19 results announcements. For reference, we also show the previous multiples (as of 11 October 2018) from our earlier SOTP calculation insight.

	NTT Docomo previous	NTT Docomo current	KDDI previous	KDD current	SoftBank Corp. current (¥1,500)
EV/sales, x	2.3	2.0	1.7	1.4	2.8
EV/EBITDA, x	7.2	6.1	5.5	4.6	8.5
EV/OP, x	11.0	9.2	8.8	7.4	14.5
PER, x	14.1	12.1	13.1	10.7	15.5
PBR, x	2.0	1.7	1.7	1.4	1.4
EqV per sub, ¥	146,667	126,674	143,616	117,814	165,638

Source: Company data, Bloomberg, Kheiron; (current prices as of 15 November 2018)

As expected, the SoftBank Corp. IPO is being positioned at a hefty premium to the domestic peers, based on these comparable multiples. On an EV/EBITDA basis, it's 39-84 percent above the peers, and on a PER basis, it's on a 28-44 percent premium.

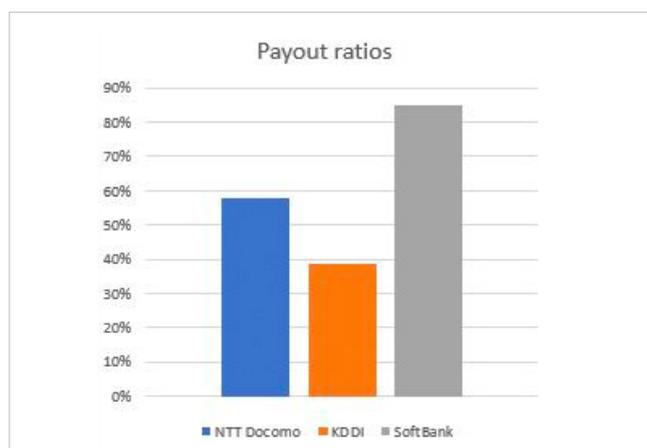
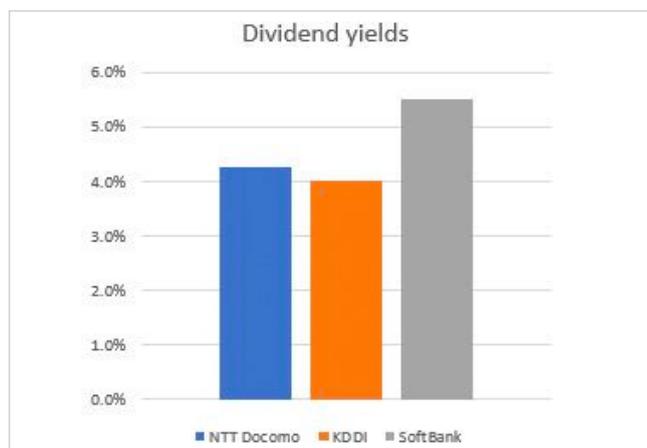
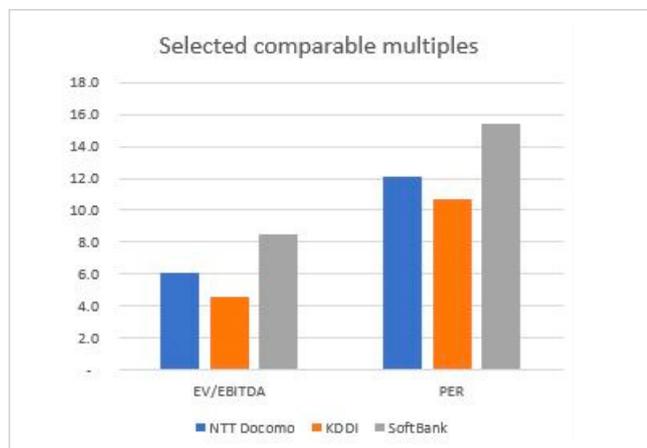
But with close to 90 percent of the IPO allocation aimed at the domestic Japanese retail investors, we expect dividend yield will be a more important consideration and a focal point for sales discussions.

Again using LTM financial data, the preliminary price of ¥1,500 per share, and the expectation that SoftBank Corp. may pay a dividend of 85 percent of its profits, we calculate that SoftBank Corp.'s dividend yield could be close to 5.5 percent, significantly higher than its peers'.

	Expected payout ratio	DPS, ¥	Dividend yield
NTT Docomo	58%	110	4.3%
KDDI	39%	100	4.0%
SoftBank Corp.	85% (est.)	83 (est.)	5.5%

Source: Company data, Kheiron; (prices as of 15 November 2018)

The graphs below show the same data for visual reference. SoftBank Corp. clearly stands out above its peers on all of these measurements.



Source: Company data, Kheiron

As a crude proxy for cash flow that the companies can use for various purposes, including shareholder returns, we look at OpFCF, defined here as EBITDA minus capex. In the table below, we show how the three domestic Japanese telcos compare. All three of them appear to have sufficient headroom to pay their dividends.

LTM, ¥bn	EBITDA	Capex	OpFCF (EBITDA-capex)	Total dividend as a % of OpFCF
NTT Docomo	1,559	564	995	42%
KDDI	1,573	621	952	27%
SoftBank Corp.	1,205	431	774	51%

Source: Company data, Kheiron

This does not take into account the financing structures of the companies, which are very different. That said, as of the 2Q FY3/10 results all three companies still appear to be financially healthy. It is worth noting, however, that SoftBank Corp.'s net debt to EBITDA ratio is nearly five times higher than KDDI's, while NTT Docomo continues to sit on a large net cash position.

¥bn	Cash	Short-term debt	Long-term debt	Net debt/(cash)	Net debt/(cash) to market cap.	Net debt/(cash) to LTM EBITDA
NTT Docomo	768	1	50	-717	-7%	-0.5x
KDDI	187	240	839	892	14%	0.6x
SoftBank Corp.	312	951	2,429	3,069	43%	2.5x

Source: Company data, Kheiron

Below is a sensitivity table with various scenarios based on different prices for SoftBank Corp.'s stock. For each potential stock price, the table shows the implied market capitalisation, dividend yield, and LTM PER and LTM EV/EBITDA multiples. This table allows us to see what different share prices for SoftBank Corp. would mean in terms of yields and valuation multiples. For example, the preliminary price of ¥1,500 per share implies a 5.5 percent dividend yield and a 15.5x P/E ratio. If we were to put SoftBank Corp. closer to NTT Docomo's 12.1x PER, it would imply a SoftBank Corp. share price of around ¥1,200. If we were to put SoftBank Corp. closer to NTT Docomo's 4.3 percent dividend yield, it would imply a SoftBank Corp. share price of around ¥1,900.

Sensitivity to SoftBank Corp. share price:

Price, ¥	Mkt cap, ¥bn	Div Yld	PER, x	EV/EBITDA, x
800	3,830	10.3%	8.2	5.7
900	4,308	9.2%	9.3	6.1
1,000	4,787	8.3%	10.3	6.5
1,100	5,266	7.5%	11.3	6.9
1,200	5,745	6.9%	12.4	7.3
1,300	6,223	6.3%	13.4	7.7
1,400	6,702	5.9%	14.4	8.1
1,500	7,180	5.5%	15.5	8.5
1,600	7,659	5.2%	16.5	8.9
1,700	8,138	4.9%	17.5	9.3
1,800	8,617	4.6%	18.5	9.7
1,900	9,096	4.3%	19.6	10.1
2,000	9,574	4.1%	20.6	10.5
2,100	10,053	3.9%	21.6	10.9
2,200	10,532	3.8%	22.7	11.3

Source: Company data, Kheiron

Before we move on, we also want to flag that we still have some corporate governance-related concerns. Since the SoftBank Group will hold about 63 percent of SoftBank Corp. stock after the IPO, it will naturally retain control of the business. There is a concern that the limited free float and minority status of equity investors could entail risk, and we have seen these concerns raised in the past. For example, the mooted plan in 2014 to sell eAccess to controlled subsidiary Yahoo Japan, which was - fortunately, in our view - subsequently cancelled (see a synopsis of that news event from *Reuters* [here](#)). That said, we get some relief from the fact that SoftBank Corp. will remain one of the largest cashflow generators for the SoftBank Group, and dividend-hungry minority investors should benefit from the large dividend payouts that will facilitate getting the cash to the SoftBank Group level.

So in a nutshell, to us the SoftBank Corp. IPO price looks expensive when comparing it to domestic peers' valuation multiples, but we expect the focus will be very much on the dividend yield, selling it to the domestic retail investor who is typically hungry for steady cash flows from good, fixed returns and may be less concerned about corporate governance issues.

SoftBank Group has precedent for focusing fundraising efforts on the Japanese retail investor community. A large portion of the domestic Japanese debt-based fundraising has been done via "Fukuoka SoftBank HAWKS Bond", leveraging the brand and baseball team that SoftBank owns. The Hawks are based in the city of Fukuoka, Japan, and have a very strong following among local fans.

For details on the SoftBank Group bonds, including the Fukuoka SoftBank HAWKS Bonds, the company provides a detailed list of outstanding instruments on their website (see link [here](#)).

SoftBank Vision Fund and Delta Fund

The second biggest change in the calculated SOTP is from the SoftBank Vision Fund and Delta Fund, which is up by 7 percent from the previous note. The SoftBank Vision Fund and Delta Fund are the primary vehicles the SoftBank Group is using for its venture capital investments, and during the period some assets were sold from elsewhere in the Group to the Vision Fund (note the "other investments" value is down by 6 percent), most notably Coupang and Oyo.

The SoftBank Group has disclosed an updated list (as of 30 September 2018) of the companies these Funds have invested in as well as the aggregate acquisition cost of US\$25.3 billion and the current fair value of US\$33 billion (up from US\$30.5 billion in the previous filing). Note that these numbers are net of the consolidated subsidiary Arm.

US\$bn	Acquisition cost	Fair value
Vision Fund	28.1	35.8
Delta Fund	5.0	5.0
Transferred investments	0.2	0.2
Total	33.3	41.0
Excl. Arm	8.0	8.0
Net total	25.3	33.0

Source: SoftBank company data

Below is the comprehensive list of investments that SoftBank Group has disclosed to date:

Updated SoftBank Vision Fund and Delta Fund investments

(* indicates new to the Vision Fund during 2Q FY3/19)

Investment vehicle	Company	Description
Vision Fund	Arm (a consolidated subsidiary)	Semiconductor technology designer
Vision Fund	Auto1.com	Used car wholesale marketplace
Vision Fund	Brain Corp	AI-based autonomous driving system
Vision Fund	Brandless *	Ecommerce
Vision Fund	ByteDance *	News and video-sharing apps (e.g. TikTok)
Vision Fund	Cohesity	Hyper-converged data platform
Vision Fund	Coupang *	Ecommerce
Vision Fund	Fanatics	Online retailer of licensed sports
Vision Fund	Full Truck Alliance	Cargo truck matching platform
Vision Fund	Guardant Health (+1 affiliate)	Cancer diagnosis through genomic analysis
Vision Fund	HealthKconnect (Ping An Medical)	Managed care platform
Vision Fund	Improbable Worlds	VR/AR development tools
Vision Fund	Katerra	End-to-end design & architecture technology
Vision Fund	Light Labs *	Imaging technology
Vision Fund	Loggi *	On-demand services
Vision Fund	MapBox	Geographical information platform
Vision Fund	Nauto	AI-based safe-driving support services
Vision Fund	NVIDIA	GPU developer
Vision Fund	OneConnect	FinTech solutions
Vision Fund	OpenDoor Labs *	On-demand services
Vision Fund	Oravel Stays (OYO Rooms)	Hotel booking site
Vision Fund	OSIsoft	Industrial IoT solutions
Vision Fund	PayTM (One97 Communications)	Online payment services
Vision Fund	Ping An Healthcare and Technology	Online healthcare portal
Vision Fund	Plenty United	Indoor farm plant
Vision Fund	Policy Bazaar	Digital insurance marketplace
Vision Fund	Roivant Sciences	Biopharmaceutical drug developer
Vision Fund	Slack Technologies	Business chat tool
Vision Fund	Urban Compass	US Real estate big data platform
Vision Fund	Vir Biotechnology	Pharmaceutical drug development using AI
Vision Fund	Wag! Labs	On-demand dog walking & dog care app
Vision Fund	WeWork (+3 affiliates)	Co-working space services
Vision Fund	Zhongan Online P&C Insurance	Online insurance
Vision Fund	+ Two other investments	
Delta Fund	Xiaoju Kuaizhi Inc. (DiDi)	Ridesharing services

Source: SoftBank company data

SoftBank Group manages the Vision Fund and the Delta Fund and has contributed a total of US\$10.9 billion, or about 38 percent of the total, so far. For reference, the total commitments are for US\$97.7 billion, of which SoftBank Group is committed for US\$32.5 billion, or 33 percent of the total. We take a simplistic approach for the SOTP and include the current value of these investments to SoftBank Group as 38 percent of the current fair value of the funds holdings (excluding Arm), or approximately US\$12.5 billion.

Summary

Based on the assumptions above and the updated data, the current SoftBank Group share price implies that the market is factoring in close to a 45 percent discount to the SOTP valuation (after applying a 20 percent holding company discount). This seems big. Perhaps the valuation assumptions above have been overly generous, or perhaps the market has very large concerns about SoftBank Group's ability to create value with a reasonable degree of risk.

Agree? Disagree? Want to change the assumptions? Happy to provide you with an interactive version in Excel, where the inputs and assumptions can be tweaked however you like, upon request. Thank you for reading.

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— Nathan Ramler, CFA (16 November 2018)



Travis Lundy

Over 20 years of alternative strategy experience in Asia that includes multi-strat portfolios at hedge funds, investment banking at Citibank in Japan, and fixed income macro.

Takeda Acquires Shire: A Record-setting M&A From Japan

May 2018

Japan-headquartered Takeda is the largest pharmaceutical company in Asia. The firm, which has a rich history of mergers and acquisitions, announced its latest target in May, with the intention of acquiring Irish pharma company Shire. The US\$62 billion deal is the largest acquisition of a foreign entity by a Japanese company. Travis Lundy and other Insight Providers have been following the deal throughout the year and going in-depth on several key aspects leading up to the final approval in December 2018.



"The shareholder register will change significantly. It is this reshuffling, and its timing, which promises to be the most interesting aspect for global investors, arbitrageurs, and catalyst-driven/event investors."

Takeda/Shire I : On Drug Deals and Deckchairs

By Travis Lundy | 9 May 2018

EXECUTIVE SUMMARY

What was rumored, approached, rejected, re-offered and rejected twice more, then agreed... is now official.

[Takeda Pharmaceutical Co Ltd \(4502 JP\)](#) and [Shire PLC \(SHP LN\)](#) have reached a board-level deal for Takeda today (on the deadline established by UK regulators for Takeda to make a firm offer) to acquire the Dublin-headquartered, US and UK-listed drugmaker specialising in rare disease treatments.

The first deal reportedly agreed in principle last month was for Takeda to offer ~£49 per share (in a split of about £27.26 of stock and £21.75 of cash), which was a premium of 64 percent to the 'undisturbed' 23 March close. Moody's had [said](#) on 25 April that such a deal would involve a serious increase in debt and could result in a multiple notch downgrade. Negotiations have been ongoing since then as to structure and non-financial terms. Last week, the Nikkei reported that Japan's three megabanks would provide up to ¥3 trillion in loans to support the deal.

This first crack at the situation looks at the Drug Deal and the Deckchairs.

The Drug Deal

- The deal agreed is that Takeda will acquire Shire, with Shire shareholders to receive US\$30.33 cash AND either 0.839 new shares of Takeda or 1.678 US-listed Takeda ADSs. The deal is said to represent a value of £46 billion or £49 per share based on the closing price of Takeda and then-current FX rates as of 23 April 2018, which was a 64.4 percent premium to Shire's price prior to "rumors of a possible transaction" (23 March 2018).
- It was presented as offering a "compelling strategic rationale", with "strong strategic fit", "complementary pipelines", an "attractive footprint", and "significant financial benefits", including it being significantly accretive to underlying EPS from the first full year after completion, with pre-tax cost synergies of >US\$1.4 billion annually.
- The companies will get this done through a fully-underwritten US\$30.85 billion bridge facility, a commitment to keep their IG credit rating, and a medium-term goal to de-lever "quickly" after completion of the transaction to get to a medium-term target of net debt/EBITDA of less than 2.0x (not counting any potential disposals). The first conference call Q&A defined that "quickly" to be "within three to five years."
- The initial projection in the first call was that the deal would close in 2019H1 (Long Stop Date is 8 May 2019) but the second conference call stated clearly: "So, we are on the safe side by saying that it will be in the next – beginning of next calendar year, but it could be earlier", and later: "We hope that it could be done actually by year-end." (*Bloomberg* call transcript).
- Takeda is strongly committed to maintaining its ¥180 per share annual dividend payout.
- Both companies' shareholders will have to vote to approve (Shire's approval exceeding 75 percent, Takeda's exceeding two-thirds). *This is quite clearly against what was expected by many, but it makes complete sense that SHP's board would want to ensure good governance at the acquirer in a case where there is significant dilution in a transformational transaction.*

The Announcements and Document List	
Announcement of the Offer on the Takeda website	
Shire's announcement of the Recommended Offer	
Takeda's Rule 2.7 Announcement	
Shire's Rule 2.9 Announcement (regarding shares out)	
Takeda Call Presentation	
Link to the Takeda Audio replay	
The Shire Website with regard to the Takeda Offer (with all relevant documentation linked)	

Source: Bloomberg

The deal as announced is pretty straightforward. There is a cash component and an equity component. The acquirer will become relatively heavily-indebted, will swing its bridge loan into longer-term funding as soon as is practicable, and will reduce debt aggressively through cost-savings, possible disposals, and allocation of excess capital to pay-down of debt (there were questions on the first call about the possibility of equity issuance post-transaction close, but the tone was quite clearly to avoiding that). Approvals do not, at first glance, look that hard.

Conditions to the Scheme

Conditions Precedent are in Appendix I of the deal doc (p50). The big ones are:

- Approval by both companies' shareholders.
- Antitrust clearances by the EU, US, China, Japan, and Brazil.
- Admission of the Takeda ADSs and the new Japanese shares approved for listing (Takeda already

reports by IFRS, which is allowed by SEC Form F-4, and the suggestion is that the Shire ADSs will simply be replaced by the Takeda ADSs, which should not take longer than the last large-precedent transaction requiring ADS listing (which took six months).

- Break fees (US\$1.224 billion from Takeda to Shire if Takeda's Board does not approve, US\$612 million if the Takeda shareholders do not approve, and US\$918 million if Takeda does not get past the regulatory hurdles or waive them.

The Offer History and the Spread

It has been quite clear that Takeda is super serious about this. Takeda made the first bid at £44, then lifted to £45.5, to £46.5, and finally to £49 ([history here](#)). If one looks at 8 May Recommended Offer terms based on undisturbed pricing, the deal looks more like £52+.

And it is also quite clear that Shire shareholders and arbitrageurs have been less optimistic. The stock has traded at a significant discount to agreed terms since the announcement. They have consistently maintained the spread at a level indicating 17-20 percent discount to the pro-forma merger proceeds, and even after today's move, the spread is quite wide.

There are a lot of moving parts to thinking about both the risks of the deal and what happens. There is some interesting reflexivity on Takeda's price based on whether the deal is seen as more or less likely to go through.



The Deckchairs

There is also some significant reshuffling of deckchair usage to come.

The shareholder register will change *significantly*. It is this reshuffling, and its timing, which promises to be the most interesting aspect for global investors, arbitrageurs, and catalyst-driven/event investors.



Source: *pinterest*

That's a pretty picture. But those deckchairs are empty.

A deck full of interested and “active” participants is far more desirable for shareholders.



Source: Sourced from Google Images, maybe from Getty Images (no claim to copyright)

This will likely become one of the very big risk arb situations this year. Arbs will buy on spread and risk, and may not think quite as much about the timing.

What are the risks from such a reshuffling?

Much more discussion below.

DETAIL

My Conclusions First

- This deal is likely to get done in my opinion. There are two main factors:
 - The deal is at a nice premium compared to where it was pre-announcement. +64 percent is not to be sniffed at.
 - The deal price of ~£48 per share of Shire is still 20 percent short of where the consideration package (0.839 shares of Takeda and US\$30.33 per share) was trading at end-December. That means even more possibility.
 - If Shire shareholders reject this, the shares go back down. There was ample room for this bid to be competitive, and it wasn't.
- **The FLOWFRONT aspect is not to be ignored.**

There is a risk that a fair bit of stock comes out on the Shire UK line as active holders denominated in GBP or euros decide that owning a US-listed USD-denominated

Japanese company is a step too far. If that FLOWFRONT occurs, it could be worth tens of billions of USD.

- The arbs might buy the FLOWFRONT outflow from Shire, but then they'd have to short Takeda. Either way, there is outflow.
- Arbs long Shire and short Takeda could be taking a big risk if both stocks fall relative to the global pharma industry because of FLOWFRONT. At 10-15 percent lower, I would look at the prospect of lifting the Takeda hedge more or less completely and going long the pair vs the sector (i.e. more of a long-short trade).
- The lack of GDR for UK line shareholders is unfortunate. One might imagine there could be some 'activism' by shareholders to see if they can arrange to get a GDR line established.
- I think Shire represents good value at the current price, assuming a relatively high probability of the deal getting done, and if not, a relatively significant cash flow supporting the shares in the next few years. For that, I

label this insight Bullish. As confidence in the likelihood the deal gets done builds, there will be attention on the future Takeda-Shire dividend.

- The dividend really, really matters. This will be discussed in Part II.

Musical Deckchairs

On ocean liners of old, cabins were small and cramped and there was little fresh air (especially in steerage) so passengers spent time on deck. Deckchairs were available on the higher class decks and in nice weather, there was strong demand. After a few hours in the bracing wind a passenger might retire to his cabin, or the lounge, and someone else might take his place. In more inclement conditions, there was less demand [note: I have had the pleasure and privilege to conduct two ocean crossings by liner and I would highly recommend the experience].

Currently, if one looks at available holder data from common data providers (who scrape the data from various filings), some 20 percent or so of Shire's shareholder base holds the US-listed ADSs. Another roughly 60 percent hold the Shire shares listed in the UK. There is obviously another 20 percent or so out there, and that may be in the hands of individuals, or those who do not report through the methods which would be caught by the data providers. It is not clear to me (yet) where (US or UK) those shares are likely to be held.

US-listed ADS Holders:

- A very small portion of the US ADSs are held by passive/index funds. Some of those could hold Takeda ADSs (in greater quantity because of greater float), but some would likely get excluded. That aspect is a wash, but there would be little impact because it is small to start with.
- A much larger portion of the ADSs are held by active generalist or healthcare funds, value funds, and income funds.

UK Line Holders

There is a possibly frustrating aspect for UK line holders. The deal involves Takeda listing ADSs in the US to replace the Shire ADS. It does not, as far as I can tell, involve listing a replacement for the UK line of shares. Those shareholders who hold the UK line because of what it represents, and who could not hold the US line as part of their mandate may end up having to exclude themselves from the shareholder register. That would include some UK and European pension funds' domestic equity allocations. It would include FTSE 100 and MSCI Europe index funds.

The next section here is a highly preliminary calculation. More work needs to be done.

- A look through the list of what shows up on *Bloomberg* indicates that perhaps as much as 20-30 percent of the total (not just the UK line) is held in largely passive funds via the UK line (i.e. 30-40+ percent of what is visible). The majority of those index funds appear to be FTSE100 or other UK equity tracker funds, MSCI Europe, or Europe specialist funds. There is also a significant contingent of MSCI EAFE and MSCI World, but my preliminary calculations (and they are still preliminary) attempting to weed out each fund by category/benchmark suggest it is probably 4:1 UK/Europe vs EAFE/World.
- To me this suggests 5-7 percent of the total shares out (UK and US lines) would be likely to roll their exposure (in MSCI EAFE, MSCI World, MSCI AWCI, etc) when they receive Takeda shares.
 - **The other 15-20 percent would appear to be tied to benchmark universes which would NOT hold Takeda shares post-acquisition** because Takeda shares would be categorised as having their main jurisdiction be in Japan. *This is effectively the reverse of the case of Tokyo Electron in their ill-fated joining with AMAT (to form Eteris BV) in 2015.*
 - *In the case of MSCI indices (as explained in the [MSCI Corporate Events Methodology](#) (page 24 is a*

good example)), the stock would get deleted from those indices as of the close of the day before the effective date.

- That would mean a large sell at the close for Shire as of the day before the merger goes through.
- There is also a significant active management portion of the shareholder base. If they are funds which use a “Europe” or “UK” benchmark rather than a “Global”, “ACWI”, or “EAFE” benchmark, this would go a fair bit outside their benchmark so they would sell and not come back. If they are globally-minded, they may, or may not decide to stay in.
- Because of the nature of cross-border ownership and taxation issues, I would expect it is less likely that UK-based individuals and entities without a global presence would want to receive the US-listed ADSs. For that, I expect they would be sellers too.

Takeda Shares (Japan)

- **MSCI** and other indices treat the ADRs and ADSs of Japanese stocks as being part of the float of the parent (i.e. domestic) listing. TOPIX Index ([methodology](#)) appears to do the same (I have the question out to the TSE to confirm and will update at a later stage).
- **MSCI Japan and FTSE Japan** would see the float shares increase by the new Takeda shares, and my estimate is that they would purchase about 8-10 percent of the shares of Shire into the close of the day before the event’s effective date, though occasionally MSCI puts it on the effective date itself.
- **TOPIX** would see a sharp rise in shares outstanding, and would also see a change in free float weight. TOPIX would need to buy roughly 15 percent of the float of the new shares issued (i.e. 14 percent of the shares out - I believe Susan Kilsby’s shares might not be considered float). Because these are “new shares” without something coming out of TOPIX and these shares replacing them, it is likely that these shares fall under the TOPIX Inclusion category of “a foreign stock (not listed exclusively on the TSE) which becomes delisted from the other exchange and becomes exclusively listed

on the TSE”. In that case, the inclusion is on the close of the second-to-last business day of the month AFTER delisting from the foreign exchange (see [TOPIX Index Methodology](#) p38).

- The FFW change from 0.75 to perhaps 0.85 would happen (assuming the merger completed in Q2 2019 or before) in October according to TOPIX FFW review methodology. That would suggest an increase in the “TSE-calculated float” of perhaps 150 million shares, so 22.5 million shares would need to be bought at the end of October.
- **JPX Nikkei 400** (see [methodology](#) p17) would see the change in share count occur on the effective date (i.e. the first day of trading). That would be worth 1-2 percent of float.
 - However, it would get a downweight in the next FFW calculation because the increase in share count would see it through the cap weight.
- There are a bunch more indices (MSCI ESG, S&P Global 1200, etc) which would see slight weight increases, but very few people benchmark off those indices. I assume no effect.
- **Nikkei 225** would see no change.

So What Do The Flows Look Like?

Who knows? Parts of this are pretty easy (the index exclusions and inclusions). Parts of this are tougher (what will UK and US individual investors do? What will European private banks do for their customers? What will Europe-based “global healthcare active” funds do? (They might sell too)

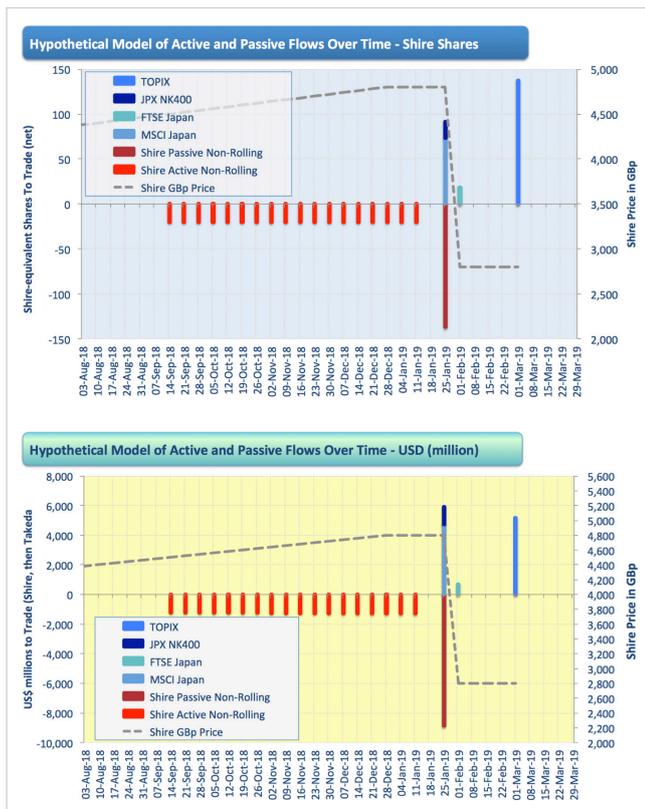
But below I outline a thought experiment. The red bars are outflows. The blue bars are inflows. The deemed date of the transaction is 25 January 2019. The gray dotted line is the Shire price which is expected in this model to converge to fair value over time. The assumption is that GBP 4800 per share is fair (i.e. the non-arbitrageable Takeda equivalent price).

- Shire passive holdings tracking MSCI Europe, FTSE 100, UK 350, etc estimated at 15 percent of Shire shares

outstanding would have to sell ~137 million shares into the close the day before (benchmarked to the London close).

- MSCI Japan and JPX Nikkei 400 would buy at the same time (but importantly, these would be benchmarked to the TSE close).
- Shire “active” funds who desired to no longer take Shire risk might wait until the spread narrows somewhat would be expected to want to reallocate, as the tracking risk will resemble an arb to Takeda (and vice versa) and look less like “traditional Shire”. Individuals might fit this profile as well. I have deemed, for the sake of hypothesis, that half the active holders might want to sell rather than hold a “Japanese” pharmaceutical company. I do not believe that to be an outlandish assumption. They might sell 1/16th of their collective position each week for 16 weeks. That would be ~20 million shares a week.

The second chart shows the USD value of those bars using the same assumed price.



Source: Travis Lundy

End Result?

- A net need to sell ~US\$20 billion of stock BEFORE the deal closes. This is FLOWFRONT, not Flowback.
- Index selling at deal close on a net basis.
- US\$5 billion to buy in TOPIX a month or so after the deal closes.

The “obvious” answer is *Oh, of course... arbs will buy the Shire stock*. But for all the arbs buying at £40, they need to short 0.839 shares of Takeda at the same time. For every US\$1 billion of Shire which gets bought for the arb, arbitrageurs need to short sell about US\$620 million of Takeda.

There is likely to be FLOWFRONT - sell so that one does not receive US shares one cannot own, sell before year-end, sell because the active component aspect does not suit your portfolio, etc. That pressure comes on the combined basket of Shire AND Takeda.

How Much Arb is Possible?

Takeda has ~600 million shares of float. Perhaps 300 million of that is borrowable at a reasonable maximum. If so, that would be the equivalent of ~357 million shares of Shire which could be owned by arbitrageurs. That is US\$20 billion worth of Shire.

This will likely become one of the very big global risk arb situations this year.

HOWEVER, there is a timing risk here too on the Takeda short.

Arbs cannot overly short Takeda shares because holders may recall the shares in order to vote the deal. For every 100 shares outstanding, if arbs borrow 30 and short-sell them, that means an additional 30 people get long. There are 130 long shares and 30 short shares. If all 130 want to vote their shares or sell at a higher price, the shorts will have to buy back higher.

Risks To The Deal

- *Takeda shareholders might not approve.* But if this is so good, accretive, etc, and the dividend is maintained at ¥180 per share, I expect that Takeda shareholders will support. I see no reason for them not to approve, assuming the independent opinion and explanations really will show that 2+2=5.
- Shire shareholders might not approve. But if the actives sell out to arbs beforehand in a FLOWFRONT manoeuvre, presumably it is the arbs who dominate a certain portion of the Shire register when the vote comes. And if there is still a spread, even the non-arbs are going to want it. I expect this deal is not quite as difficult as the risks appear.
- The one slightly unfortunate aspect here is that Shire UK line holders have not been offered a UK-listed GDR to continue to hold. This could upset some people, but presumably that is why Shire asked for more money three times.
- However, if global pharmas go down in price significantly, leading Takeda shares to fall sharply as well, it is possible that Shire holders will want to vote against because of their sunk cost.
- IF the deal breaks, arbitrageurs will feel some pain. Shire will fall, Takeda will go up (it was beaten down sharply as rumours of this deal started to surface in the last week of March). This will keep the spread relatively wide until there is much confidence the deal will get done, much as it did for Tokyo Electron/AMAT. Scrip consideration cross-border mergers are relatively rare.
- From a skew risk perspective, if Takeda goes up between now and the Shire vote, the likelihood of Shire shareholder approval gets better. If Takeda goes down, the likelihood of approval goes down. For that, one would think that a slightly heavy Takeda hedge against a Shire position would be good, BUT that just increases the gross exposure risk of the deal NOT going through (i.e. if voted down). The normal way to deal with that is with a collar, but I expect that was a step too far for Takeda.

- The way I would trade this as an “Arb” expecting the deal to go through is to be hedged here, and if Shire and Takeda were to fall 15-20 percent where the rest of the sector did not fall, I might lift my hedge on Takeda at that time and be net long Shire. Into the time when the price is higher and the spread is tighter, I would expect FLOWFRONT to pick up.

But Takeda has room to fall. Below is a chart of the Takeda terms as if they had been in existence all this time. If Takeda shares rise back to ¥6000, there is 50 percent upside to Shire from here. At the end of December, the package of 0.839 shares of Takeda plus US\$30.33 per share (the blue line in the chart below is the GBP equivalent to the package) was worth GBP 5961. That is a fair bit north of where the red line (Shire’s share price) is and was trading.



Source: Bloomberg data, company filings, Travis Lundy

Disclosure & Certification

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— Travis Lundy (9 May 2018)



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Post-MiFID II, Independent Research Still Faces an Uphill Battle

June 2018

Even past 2018, the impact of MiFID II has been mainly a lot of sound and fury, but not signifying a whole lot yet. Douglas Kim observed this last June - a full six months after the sweeping legislation came into force, things didn't seem to be going as the legislators had planned. As independent research providers storm the beaches of the entrenched, large-scale sell-side, many of them are falling under the fusillade of rock-bottom prices from behemoths like JP Morgan. In this Insight, Kim outlined how independent research can gain more ground.



"The current environment in the post MiFID II era has turned out to be a lot more difficult for many independent research firms, especially due to the extreme pricing competition from the likes of JP Morgan and other global investment banks. In the end, the competition is not just from the pricing but the access."

Independent Research in 2018 - Surviving the Brutal Post-Mifid II Environment

By Douglas Kim | 25 June 2018

Nearly six months have passed since the start of Mifid II in Europe. Mifid II was supposed to be one of the breakthrough events in independent research. Instead, the reality has been different. **Not daunted by any means by the smaller independent outfits to take away any meaningful market shares in the institutional investment research sector, the tier-one global banks, headed by JP Morgan, have gone on a complete market share protection mode in the form of ultra-low research fees.** The overall result has been a difficult operating environment for many independent research firms in 2018, especially in Europe and Asia.

To put this in perspective, JP Morgan has been charging only US\$10,000 per year for its basic equity research since early 2018 for many of the European investment management firms that need to abide by Mifid II. This amount is lower than what many other competitors are charging. *Why is JP Morgan charging US\$10,000 per year for its basic equity research services? Why not US\$100 or US\$1,000 per year?* JP Morgan generated US\$100 billion in revenue and US\$24 billion in net profit in 2017. For JP Morgan, US\$10,000 figure is just pennies. **The US\$10,000 per year figure was probably the minimum amount that JP Morgan was allowed to quote by the regulators that govern Mifid II in Europe.**

Investment research is a tough business. The current environment in the post-Mifid II era has turned out to be a lot more difficult for many independent research firms, especially due to the extreme pricing competition from the likes of JP Morgan and other global investment banks. In the end, competition comes not just from the pricing but the access. Getting customers to give them access is tough for independent research providers.

Independent Research in 2018 - Surviving the Brutal Post-Mifid II Environment

As I was writing this note, the image that kept coming to my mind was the Battle of Normandy and Steven Spielberg's movie, *Saving Private Ryan*. In the early parts of the Battle of Normandy, many of the Allied Forces trying to reach the land through the Omaha Beach never did. This is basically what's happening in the investment research sector post-Mifid II. JP Morgan (and other leading global investment banks) are basically trying to destroy their smaller competitors with extremely low pricing. For JP Morgan, pricing its research at US\$10,000 is almost like pricing it for free (pre-Mifid II environment). This has resulted in loss of revenue for many independent research operators so far in 2018.

One of the interesting ideas that have developed in this difficult environment for independent research has been the launch of the **Boost IRP program** in the UK, backed by **Smartkarma**. For further details on the Boost IRP program, the website is here - www.boostirp.com). This is one of the first **accelerator programs** for independent research globally. Accelerator programs are best known in the technology sector and have become really popular in the past decade. There are some famous tech-focused accelerator programs such as Y Combinator, Seedcamp, Angel Pad, and Techstars.

There are other sector-focused accelerator programs in the education and consumer sectors. However, Boost IRP is focused on accelerating independent research-focused analysts/firms.

In the midst of this difficult operating environment for independent research outfits, the Boost IRP program will try to provide some financial and operational assistance, initially for European-based independent research analysts/firms. In short, the Boost IRP program will help them to reach land.

How long will JP Morgan maintain its ultra low fees of US\$10,000 per year for research?

The answer is simple. JP Morgan will probably try to maintain its ultra-low fees of US\$10,000 per year as long as possible and as long as the regulators allow them. The most likely scenario appears to be that there could be some lengthy discussions among Mifid II regulators, investment banks, major asset management firms, and independent research platform and content providers regarding what the appropriate minimum fees are that can be charged by the leading global investment banks for their investment research.

From the point of view of independent research operators, they would like this to be changed quickly (so that firms such as JP Morgan would need to have much higher minimum fees for their investment research). However, from what I can gather, that does not seem likely. Rather, the more likely scenario appears to be that a new compromise among Mifid II regulators, investment banks, and major asset management firms regarding the appropriate levels of minimum fees for investment research of global investment banks would need at least an additional one to two years before any changes.

What this entails is that there could be further weeding out of smaller independent research firms and platform operators over the next one to two years. Plus, many mid-sized investment banks are likely to further downsize their research operations. For example, in the past several months, Macquarie's European research division has announced a major streamlining of its investment research business, laying off many analysts. Even after this bloodbath, it is unclear exactly how much and when global investment banks such as JP Morgan will be forced to raise their minimum pricing for investment research.

Difficulties of Pricing Investment Research

Investment research is difficult to price. Pre-Mifid II or post-Mifid II, it does not matter. There are so many controversies on how to price investment research as well as many legal ramifications. For example, Porsche can price its 911 at a fat price because this is what customers are willing to pay and it is at a price that Porsche can generate a **reasonable amount of profit**. Porsche can price its 911 at US\$10,000 per car but that would be much lower than its cost and this move could quickly put Porsche out of business. So it comes back to the difficult negotiations between regulators and investment banks as to what the appropriate levels of minimum investment research fees are. I wish I was at the negotiation table when the regulators approved JP Morgan's decision to undercut all major competitors and price its basic research at US\$10,000. I wonder exactly how this decision was made.

If the regulators continue to allow JP Morgan and other investment banks to significantly undercut the smaller competitors out of the business by having such low investment research fees for an extended period of time, one really needs to ask if regulators are really serious about enforcing Mifid II. In my view, the regulators are very serious about enforcing Mifid II. Regulators have spent so much time and effort on trying to get Mifid II right, but it will take more time.

From the Point of View of Regulators and Investors - Fair Pricing for Research

Regulators and investors want an improved balance of investment research from leading investment banks and smaller independent research firms. In the long run, ideally they want a greater coverage of the entire spectrum of big caps, mid caps, and small caps, rather than the bigger investment banks focusing just on the big caps.

Many people would consider it unfair if JP Morgan priced its basic research at US\$100 per year. So how would the regulators convince or force leading investment banks such as JP Morgan to raise their pricing to make it a more fair competitive environment? One of the ways would be to come back to the "*reasonable level of profits*" idea.

For those well-versed in the legal area, you could probably help me here but the idea is simple. What Mifid II has done is to try and separate out investment research divisions as separate business units, and business units should try to generate their own profits.

So we could take a look at the research operations in this way. I do not know exactly how much JP Morgan pays all of its personnel in investment research (salaries and bonuses combined) and how many people it employs in research globally but I guess this will probably be a lot of money. Let's say that the entire cost is 1,000. Then, we take all the revenues generated from investment research (basic fees as well as premium fees such as taking calls with analysts, complex excel models, etc.). Assume all the revenues from the investment research come up to be 100, which would represent only one-tenth of the total costs of operating a research business. In this manner, regulators could have a clear case of JP Morgan trying to undercut all smaller competitors with an extremely predatory pricing. But there are many complications with this scenario. *(Note: I have written this note using publicly available information only from numerous media accounts and from my own experience as an independent research analyst. I do not exactly know how much JP Morgan and other leading global investment banks make from all the different research services of their investment research units).*

For example, do regulators really have a right to know from the the leading banks exactly how much they pay their investment research analysts? Do regulators have a right to try and force these major investment banks to break down their operating costs? In our capitalism-driven Western society, corporations have a fiduciary duty to their shareholders to protect their operating costs basis and it may be difficult for the regulators to force these cost breakdowns from these investment banks. In the midst of this difficult operating environment, what can regulators and smaller independent research operators do to compete against industry behemoths?

It Comes Down to Rule Number One - Focus on the Customer and Provide Better Value

In the midst of these challenges, what can be done to survive the difficult operating environment of the global investment research sector? For independent research outfits, it is not enough to count on the regulators to make sweeping changes in favor of the independent research sector. History has shown that major changes in the financial sector usually take a long time to make, and Mifid II is no exception.

In the end, as in every service industry, it all comes down to **focusing on the customer and delivering a great value proposition**. There is no shortcut to providing great investment research. Whether it be timely, in-depth thematic research, a great long-short call, or helping the client to better understand a new technological concept, independent research providers need to provide great ideas and differentiated research on a consistent basis so that investment managers have reason to continue to purchase their research services.

It remains to be seen how European regulators will try to change the status quo of Mifid II. Asian and US financial regulators are closely monitoring the progress of Mifid II since there are hopeful prospects that, eventually, the major concepts of unbundling investment research could expand on a global basis in a few years. Perhaps the regulators have become a bit more complacent since we are in one of the longest streak of equity bull markets since the Great Recession of 2008/2009. For now, there does not seem to be any major hurry among Asian and US regulators to quickly follow the steps of Mifid II in Europe.

Scenario Analysis for Investment Research Post-Mifid II

The following are the three major scenarios for investment research in a post-Mifid II environment:

- I. **Maintain status quo** - Under this scenario, maintaining the status quo becomes a priority. JP Morgan and the other global investment banks are allowed to continue to price their basic research at an ultra-low annual pricing of US\$10,000 per year for many years from now on. People lose sight of the major changes that Mifid II was intended to bring. As such, in this scenario, JP Morgan and other global investment banks would win. Most of the independent research outfits would face a very difficult operating environment and the investment managers would see little improvement to investment research prior to Mifid II.
- II. **Go back to home plate** - This is an even worse outcome than the first scenario. Many investors and investment banks may be dissatisfied with Mifid II altogether. As such, they may work together to get rid of Mifid II and waste all the work and resources that have been spent. Realistically, this may be the lowest-probability outcome, given the fact that regulators are not likely to give up on Mifid II. They want an improvement to investment research by making changes through Mifid II. But if they ever give up

completely and go back to home plate, again, this would result in a win for the global investment banks and a huge loss for independent research firms - and it would likely be a loss for investment managers as well.

- III. **Improve the competitive environment so that more independent research firms could survive** - In 1899, Rockefeller's Standard Oil refined 90 percent of the oil in the United States, and this is perhaps the most famous case of a monopoly that was eventually broken up. Although no company globally has a monopoly on the investment research sector right now, it is fair to say that the current landscape of investment research where the leading global investment banks are able to provide their basic research at such low prices is an unfair competitive environment and even comparable to the oil-refining operations in America more than a century ago.

For example, in 2016 JP Morgan's investment research unit produced nearly 120,000 equity research reports on more than 3,500 companies globally. Some of the independent research firms produce only about 1-2 percent of what JP Morgan produces in a year but their annual basic pricing is similar to that of JP Morgan. From clients' perspectives, what are they going to choose, if they are given a choice of similar pricing (JP Morgan versus other much smaller independent research firms) but with much more comprehensive research coverage and depth? This is a no-brainer.

So what can be done? This is where the regulators come in. There needs to be a way to make the competition more fair and reasonable. The status quo needs to be changed. I thought long about how to achieve this. The table below is a framework to improve the current unfair competitive environment. There are likely to be many faults with this framework but I encourage many others to think about ways to improve it.

In the table below, I broke down global investment research into four main categories (Groups 1 to 4). Group 1 refers to investment research providers (mostly independent research firms) with annual revenue of less than US\$10 million. Most of the independent research providers would fall under this category. Group 2 refers to those investment research providers with annual revenue of more than US\$10 million and less than US\$100 million. Group 4 refers to companies such as JP Morgan, whose annual revenue is more than US\$1 billion.

In this example, a sample of the top 20 independent research providers and their annual revenue is taken (whose annual revenue is less than US\$10 million). Let's just assume that these 20 firms charge an annual fee of US\$8,000 for their basic research services. Then the Group 2-included companies would need to charge at least twice the

level as Group 1 companies, and the Group 4-included companies would need to charge at least 8x the average annual price of Group 1 companies. In other words, if the Group 1-included independent research providers charge an average fee of US\$8,000 for their basic research, investment banks such as JP Morgan would be required to charge at least 8x (US\$64,000) annually for their basic research, which would be much higher than current levels. **Overall, the basic objective should be that the leading global investment banks should not be pricing their entire range of investment research services at prices that are much below their operating costs.**

A Framework of Pricing Basic, Comprehensive Research for Investment Research

A Framework of Pricing Basic, Comprehensive Research for Investment Research			
Groups	Annual Revenue	Annual pricing for basic, comprehensive research (US\$)	Note
Group 1	Less than US\$10 million	8,000	A sample of the top 20 players in independent research providers
Group 2	Higher than US\$10 million and less than US\$100 million	16,000	At least 2x the average annual price of Group 1.
Group 3	Higher than US\$100 million and less than US\$1 billion	32,000	At least 4x the average annual price of Group 1.
Group 4	More than US\$1 billion	64,000	At least 8x the average annual price of Group 1.

Source: Our estimates

Disclosure & Certification

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— Douglas Kim (25 June 2018)



Hemindra Hazari

More than 23 years of experience in the Indian capital markets, specialising in banking and economy research. He has worked with firms like UBS, Societe Generale, HSBC, and more.

Indian Banks Are Swept Up in a Maelstrom of Their Own Making

May 2018

Indian private lending institutions have been suffering from bad governance and number fudging, and Yes Bank has been at the forefront of the controversy. It all came to a head towards the end of the year, with significant reshuffles at the helm of financial institutions like Yes Bank and ICICI, and the eventual resignation of the Governor of the Reserve Bank of India. But long before that, Hemindra Hazari had been pointing out the bad actors in the market with Insights like this one.



"This amazing feat of banking by Yes Bank needs to be investigated by the banking supervisor, as Yes Bank has supposedly not only been able to get its loans serviced when the company was unable to service loans from the consortium of banks, but it has also been able to extract a highly liquid security from the company during a period of acute financial crisis."

Miracle at Yes Bank

By Hemindra Hazari | 2 May 2018

EXECUTIVE SUMMARY

It seems miracles do happen. The lame walk, the dying return to life, the blind see. Well, maybe not the last, if they are sell-side analysts and the business media, in which case they keep their eyes closed for life. Had they attempted a close analysis of Yes Bank's 4QFY2018 results, they would have found that Reliance Naval Engineering's (RNE) account of Rs 4.85 billion was classified by the bank as a standard performing asset - a feat surely equaling the lame walking or the dead returning to life. This, despite the fact that RNE's 4QFY2018 results, declared prior to Yes Bank's, show worsening financials, with most of the 20-member bank consortium of the company likely to classify the account as non-performing for the 4QFY2018.

An issue that naturally arises is how Yes Bank is able to get its loan serviced by RNE in the March quarter, when RNE was unable to service the consortium banks since the December quarter. Moreover, the precarious financial health of RNE indicates that it will be difficult for any bank to continue to classify the account as performing in 1QFY2019. Given that Yes Bank is a repeat offender, reporting untrustworthy accounts for FY2016 and FY2017, the regulator should examine how such an account has been classified as standard by the bank in the March quarter.

DETAIL

In an earlier Insight, [Reliance Naval Sinking Into NPA - Yes Bank to Take a Hit](#), on 19 April 2018, this writer had cautioned that RNE was a problem account in the industry and that most banks in the consortium would be classifying the account as a non-performing asset (NPA).

Standalone RNE Quarterly Results in FY2018

Rs mn	1QFY2018	2QFY2018	3QFY2018	4QFY2018
Revenue	1,648	833	540	331
EBITDA	794	130	115	-2,145
Interest	-1,511	-1,677	-1,825	-1,960
Depreciation	-493	-499	-499	-491
PBT	-1,210	-2,045	-2,202	-4,596
Exceptional item	-1,632	0	0	0
Tax/DTA	538	539	539	509
Net Loss	-2,304	-1,506	-1,663	-4,087

Source: RNE

Consolidated RNE Annual Results

Rs mn	FY2017	FY2018	Change (%)
Revenue	5,641	3,786	-32.9
EBITDA	733	-1,002	
Interest	-6,255	-7,541	20.6
Depreciation	-2,079	-2,077	-0.1
PBT	-7,601	-10,620	39.7
Exceptional item	0	-1,624	
Tax/DTA	1,828	2,125	16.2
Net Loss	-5,773	-10,119	75.3

Source: RNE

Consolidated RNE Annual Results

On 23 April 2018, RNE declared its results, which clearly showed a marked deterioration both in standalone quarterly results as well as the consolidated annual results. In consolidated annual results, revenue has fallen by 33 percent while interest has risen by 21 percent. And in both years, interest is more than revenue and losses have increased by 75 percent. Indeed, Pathak H.D. Associates, the company's auditor, commenting on certain observations, qualified the accounts and stated:



These conditions indicate the existence of a material uncertainty that may cast significant doubt on the Holding Company's ability to continue as going concern.

RNE Auditor's Comment

5. We draw your attention to the:

a) Material Uncertainty Related to Going Concern

Note no. 3 to the statement regarding preparation of consolidated financial results of the Holding Company on going concern basis and also recognition of Deferred Tax Assets (DTA) on tax losses notwithstanding the fact that the Holding Company has been incurring cash losses, its net worth has been substantially eroded as on 31st March, 2018, loans have been called back by secured lenders, current liabilities are substantially higher than current assets, applications have been made to the National Company Law Tribunal (NCLT), Ahmedabad, under section 9 of the Insolvency Bankruptcy Code 2016 and winding up petitions been filed before Hon'ble Gujarat High Court for recovery of their dues by few operating creditors, for the reasons stated in the said note. The Holding Company is also of the view that no impairment of its noncurrent assets is required. **These conditions indicate the existence of a material uncertainty that may cast significant doubt on the Holding Company's ability to continue as going concern.** The appropriateness of assumption of going concern, recognition of DTA and evaluation of recoverable value of its noncurrent assets is critically dependent upon the approval of Holding Company's resolution plan by the secured lenders, the Holding Company's ability to raise requisite finance / generate cash flows in future to meet its obligations and to earn profits in future.

Source: RNE

When RNE's own auditor is questioning whether the company can continue as a going concern, it is no surprise that the banks should be classifying the account as a NPA, especially when the company itself issued a press release on 1 March 2018 stating that banks will be classifying the account as NPA.

Yes Bank, as per the Registrar of Companies filing, has a sanctioned exposure of Rs 4.85 billion on RNE, and this account was classified by all the banks as a standard account as of 3QFY2018, although for most banks the company had not serviced interest dues as of 31 December 2017. Since, as of 31 March 2018, it had become 90 days past due, most of the banks would classify the account as NPA - with the notable exception of Yes Bank.

When Yes Bank reported its 4QFY2018 results on 26 April 2018, three days after RNE, it became apparent that the bank's RNE exposure was classified as performing as the total corporate slippages to NPAs in the quarter was only around Rs 3.17 billion - lower than its RNE exposure.

Yes Bank: Slippages to Gross NPAs

		Corporate		Retail	Total
Rs mn	Normal Corporate	Divergences for FY17	Restructured+NCLT		
1QFY2018	1,280	0	0	730	2,010
2QFY2018	7,400	12,190	0	300	19,890
3QFY2018	2,146	0	2,454	349	4,949
4QFY2018	3,170	0	282	350	3,802
FY2018	13,996	12,190	2,736	1,729	30,651

Source: Yes Bank

Responding to a journalist's query during the results press conference on the status of the RNE account, Rana Kapoor, the promoter-CEO of the bank, said that the RNE account was performing for the bank and it was a well-collateralised exposure, which could be easily liquidated.

The Basel-3 disclosures pertaining to industry-wide loans and collateral held show that Yes Bank, under the shipyard classification, has a total fund-based exposure of Rs 4.6 billion, which is close to the ROC disclosure, and hence one can infer that the fund-based shipyard exposure is that of RNE. More importantly, it reveals that, prior to the 4QFY2018, this exposure was not backed by lien but in 4QFY2018, a lien of Rs 4.45 billion suddenly appears.

Shipyard Exposure of Yes Bank as per Basel-3 Disclosures

Rs mn	4QFY2017	1QFY2018	2QFY2018	3QFY2018	4QFY2018
Fund-based	4,526	4,563	4,568	4,588	4,588
Backed by Lien	0	0	0	0	4,445
Non-fund based	1,827	2,452	2,456	2,532	2,292
Total Exposure	6,353	7,015	7,024	7,120	6,880

Source: Yes Bank

It appears that this lien of Rs 4.45 billion is the well-collateralised security that Rana Kapoor is alluding to. The issue is that, by 3QFY2018, all the banks were aware that RNE was a problem account and the likelihood of it becoming a NPA was very high. Not only was RNE cash-strapped and excessively leveraged, the Anil Ambani business group it belonged to was also experiencing financial difficulties. As per the bankers this analyst interacted with, RNE was unable to even pay for normal banking fees but yet miraculously, it was able to exclusively carve out a security of Rs 4.4 billion for Yes Bank, a non-consortium bank in a period of financial crisis when even the company's auditor was questioning its existence as a going concern.

This amazing feat of banking by Yes Bank needs to be investigated by the banking supervisor, as Yes Bank has supposedly not only been able to get its loans serviced when the company was unable to service loans from the consortium of banks, but it has also been able to extract a highly liquid security from the company during a period of acute financial crisis. Whether Yes Bank can continue to classify RNE as a standard account in FY2019 remains to be seen. It cannot be ruled out that it would instead contribute to a hat-trick in mis-reporting of the bank's accounts in FY2018.

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— Hemindra Hazari (2 May 2018)



John DeMasi

Over 20 years of experience on the buy-side as an event-driven-focused portfolio manager and analyst at numerous hedge funds and proprietary trading desks in New York and London.

IBM Wants to Put On That Red Hat

November 2018

In October 2018, IBM announced its intention to buy open-source enterprise software developer Red Hat for US\$34 billion. Potentially the largest software acquisition ever, the deal was recently - and overwhelmingly - approved by Red Hat shareholders. Ever since the announcement, John DeMasi has scrutinised the deal and assessed the feasibility of a close in Q2-Q3 2019 in a series of Insights. In this inaugural one, he breaks the sum down to its parts and dives deep into the parties, the market landscape, and the regulatory framework.



"A quickly growing industry with large, deep-pocketed competitors and rapid technological change sets the stage well for what I feel could be quick clearances. But even in a longer time line scenario the return is still attractive."

Red Hat/IBM: Does This Red Hat Go with My Big Blue Outfit?

By John DeMasi | 14 November 2018

EXECUTIVE SUMMARY

An analysis of IBM's announced acquisition of Red Hat.

On Sunday, 28 October 2018 [Intl Business Machines \(IBM US\)](#) and [Red Hat Inc \(RHT US\)](#) jointly announced Big Blue's acquisition of Red Hat for US\$190 per share in cash, or about US\$34 billion. The price was a huge premium to Red Hat's previous close on Friday and sent thunder claps throughout the Cloud community. Not only was it IBM's largest acquisition ever, it was also a bold, risky gambit by IBM head Ginni Rometty to pull the yoke back on IBM's stalled growth and loss of altitude. But would the acquisition even make it off the ground?

Red Hat is trading at a hefty discount to the deal price, creating uncertainty over prospects for the deal's successful completion. In this piece, I look at some of the key factors in determining how things will play out and give my take on whether Red Hat will be bought or land back on the discount rack.

DETAIL

Overview

On 28 October 2018, [Intl Business Machines \(IBM US\)](#) ("IBM") and [Red Hat Inc \(RHT US\)](#) ("RHT") jointly announced a definitive agreement, in which IBM would acquire Red Hat for US\$190.00 per share in cash for a total of about US\$34 billion. The deal, structured as a cash merger, was unanimously approved by each company's board of directors.

The deal price is a whopping 62.8 percent premium to RHT's closing price of US\$116.68 the trading day prior to the announcement (which itself was a greater than 12-month low) and a 52.7 percent premium to the average closing price of US\$124.43 for the month prior to the deal's announcement.

The market price of RHT has been creeping up since the deal's announcement but still offers a healthy return and an attractive risk/reward profile for investors in event-driven names. At Monday, 12 November 2018's closing price of US\$172.88, the deal's gross spread of 9.9 percent offers very attractive returns to event-driven investors.

Annualised rate of return from today, assuming various timelines	
18 months - to last possible extension of termination date	2.3
6.6%	7.2
12 months - to initial termination date of 28 October 2019	11.0
9.9%	14.1
6 months - to assumed closing after withdrawal and refiling of HSR, etc.	2.0
19.8%	146,667
3 1/2 months - to typical clean cash merger timeline	33.9%

The last scenario is the likely best-case if the deal clears regulatory muster with no extended antitrust reviews after timely filings. Of course this attractive spread is likely the result of concerns over regulatory scrutiny, which I will discuss later in this piece.

Using a US\$116 "busted deal" price, there are about 57 points of downside and about 17 points of upside for a very attractive (for an announced, definitive arb deal) risk/reward ratio below 3.4 : 1.

Red Hat is the leading provider of open-source software offering Linux, hybrid cloud, container, and Kubernetes technologies. The Company also offers support, training, and consulting services to clients. Within IBM it will become part of its Hybrid Cloud team.

The price IBM is paying for Red Hat is high but, as shown by this deal's multiples and the announcement of SAP's acquisition of Qualtrics for a massive price (US\$8 billion for US\$575 of 2019e revenues, or ~14x, per [CNBC](#)), buying growth in this space doesn't come cheap.

Multiples being paid for RHT:	Trailing	FYE 28Feb19	FYE 28Feb20
Price / adjusted EPS	84.8x	54.8x	47.6x
Enterprise value / revenue	10.5x	9.8x	8.5x
Enterprise value / EBITDA	55.2x	n/a	n/a

Source: Bloomberg data, author's calculations

In evaluating a rate-of-return arb deal, or a deal in which an overbidder is not expected (because, according to this [CNBC article](#), the company has been shopped), the quality and commitment of the buyer is an important element in risk evaluation. IBM is an A1/A credit-rated buyer with an equity market capitalisation of about US\$110 billion. It is a long-standing member of the Dow Jones Industrial Average index and a classic blue chip company.

IBM

Strategically, this deal is extremely important to IBM. Not only is it the largest acquisition IBM has ever announced, IBM's CHB/CEO/President, Ginni Rometty, described it as "a transformational deal, a game changer for IBM that will reset the Cloud landscape" to create the number one hybrid cloud provider. She stated that, financially, it further strengthens IBM's revenue growth by 200 basis points to CAGR (compound annual growth rate) over five years, is accretive to IBM's high value model, is accretive in year one to free cash flow and gross margins, and will contribute to IBM's growing dividend.

The two companies have had a longstanding commitment to open source software and a working relationship for 20 years, which was strengthened even further this past May with the announcement of a major expansion of their relationship to accelerate hybrid cloud adoption. It appears from comments made by both CEOs in interviews that the deal came about from conversations that started in April that likely saw the above relationship expansion as part of these talks and an interim step towards the deal announced on 28 October.

Regarding the quality of IBM as a buyer, Big Blue ticks all the boxes. The two companies' longstanding and growing relationship for the past 20 years, plus the fact that Red Hat will retain its separate identity and operate as a distinct unit within IBM is unusual and bodes well for the deal's success within IBM. Furthermore, the two CEOs took pains during interviews to highlight that this deal is a revenue synergy story, not a cost-cutting story. Lastly, the acquisition of Red Hat appears to be the capstone to a transition from IBM's legacy businesses towards a cognitive solutions and cloud platform company.

Today's IBM:

Today's IBM: Built for smarter businesses

For over a century, IBM has reinvented itself again and again to help its clients move from one era to the next. Today, we are witnessing another such transition, at the dawn of smarter business. All companies need an enterprise-strength cloud platform. They need AI capable of understanding all their data. They need

services grounded in their professions and industries. And they need a technology infrastructure infused with intelligence, protected with advanced security and future-proofed against the flow of new breakthroughs and risks.

That is, they need today's IBM.

IBM Cloud:

The platform for smarter businesses

IBM Cloud uniquely provides a single architecture that unifies infrastructure and higher-value services, including AI, IoT, quantum computing and blockchain.



58

cloud data centers across 19 countries

10

of the largest global banks and 9 of the top 10 retailers use IBM Cloud-as-a-Service

1,900+

cloud-technology patents awarded in 2017

IBM Watson:

AI for the enterprise

Watson offers the fullest spectrum of cognitive technologies to professionals who are transforming work and decision-making in healthcare, transportation, retail, insurance, education and more.



100,000+

patients and consumers touched by Watson Health

70+ percent

growth in organizations using Watson

1,400+

artificial intelligence patents awarded in 2017

IBM Services:

Business and technology partners of choice

Teams of global experts in business strategy, technology and design, with professional experience across multiple industries, help companies transform for competitive advantage.



1,000+

clients served from the IBM Services Platform with Watson

Half

of the world's telecommunications IT infrastructure managed by IBM Services

38 IBM iX studios

where clients co-create with IBM strategists and designers

IBM Systems:

The industry's most powerful infrastructure

IBM's mainframe, cognitive systems and storage offerings provide the world's most powerful, secure and flexible foundation for AI and data-intensive applications and workloads.



z14

is the only server that can encrypt all data pervasively without requiring application changes or downtime

87 percent

of all credit card transactions and nearly \$8 trillion in payments are supported by IBM Z systems

POWER9

introduced as the most advanced servers for enterprise AI and data-intensive workloads

IBM Security:

The gold standard for cyber protection

IBM's industry-leading enterprise security offerings have been taken to the next level through AI and advanced analytics.



60 billion

security events monitored each day

22 of 25

of the world's largest banks protected

X-Force Command

opened as the industry's first commercial cyber range, allowing clients to experience simulated cyberattacks

IBM Research:

The world's premier private research organization

Twelve global research labs bring an unmatched range of scientific expertise—from AI, to blockchain, to quantum computing and more—to bear on the needs of clients and their industries.



50-qubit

prototype quantum system debuted

5 nanometer

transistors developed, which will lead to high-performance, low-power chips

MIT-IBM Watson AI Lab

launched as a large, long-term collaboration with MIT for joint research in AI science and technology

Source: IBM 2017 annual report

Some Highlights of the Merger Agreement:

- The merger agreement specifically states that it is the intention of both parties that Red Hat remain an open and neutral platform, partnering broadly with information technology participants and continuing to support the open-source community (“Neutral Platform Model”).
- RHT is to promptly file the draft merger proxy and, in conjunction with IBM, respond to any SEC comments. An RHT shareholder meeting to vote on the proposed transaction will be called as soon as practicable after clearance of the merger proxy by the SEC.
- The parties must use reasonable best efforts to take all actions necessary to consummate the merger, including by seeking regulatory approvals. These include making divestitures etc. but not if such actions would result in a Material Adverse Effect on RHT or on IBM measured on a scale relative to the size of the Company (RHT), such being defined as a “Burdensome Condition”. Furthermore, each party must use reasonable best efforts to “oppose fully and vigorously” any judicial action or Governmental proceeding challenging the merger, though not to the extent such would result in a Burdensome Condition.
- There is no “Go Shop” provision but RHT is permitted to evaluate any bona fide takeover proposal that the board of RHT determines could lead to a Superior Proposal. IBM has the right to top such takeover proposal before RHT’s board accepts it.
- There is no reverse break-up fee such as where IBM would pay a fee to RHT if it is unable to secure all antitrust approvals. Such fees are sometimes included to entice a target to endure a potentially difficult approval process. This could be because the parties (especially RHT since they didn’t negotiate one) truly believe regulatory approvals will be received or because the high price IBM is offering is incentive enough to take the risk of a possible disruption to RHT’s business with no certainty of closure.
- The Material Adverse Effect definition carves out a decent array of scenarios and can be seen in section 8.03 (l) of the merger agreement.

Key Conditions to the Merger:

- Approval of a majority of outstanding RHT shares at a stockholders’ meeting.
- Receipt of antitrust/competition approvals, including in the USA under the Hart-Scott-Rodino Act and under the EU’s competition regulation.
- The absence of any court order, injunction, or judgement/law prohibiting consummation of the merger.
- The accuracy of each party’s representations and warranties and compliance with covenants and agreements in the merger agreement.
- Absence of an RHT material adverse effect.

There is no financing condition. Note IBM had over US\$14 billion of cash and investments at the end of Q3, and said it plans to fund the balance required with credit lines and bridge lines already in place.

Walk date/Merger Termination

The merger agreement has a termination date of 28 October 2019, subject to two consecutive three-month extensions (by either party) if all conditions are satisfied other than regulatory approvals. The merger may also be terminated by either party if an order prohibiting the merger becomes final and non-appealable, or if RHT Shareholder Approval is not obtained.

Break-Up Fee

There is a US\$975 million break-up fee payable by RHT to IBM if prior to the Shareholder Meeting RHT receives a Takeover Proposal and the merger is terminated either at the walk date, if Shareholder Approval is not obtained at the S/H Meeting or if, within 12 months of termination, RHT enters into an acquisition agreement with respect to a Takeover Proposal.

Red Hat Financial Advisors: Guggenheim Securities and Morgan Stanley

Red Hat Legal Advisors: Skadden, Arps, Slate Meagher & Flom LLP

IBM Legal Advisors: Paul, Weiss, Rifkind, Wharton & Garrison LLP

Overall, the merger agreement is fairly straightforward with no unusual provisions or tests. The “reasonable best efforts” language in the pursuit of antitrust clearances is a typically strong standard and the MAE carve-outs protect RHT in a number of scenarios that might sink some deals.

Antitrust Thoughts:

Regarding China, *Bloomberg* reported on 29 October that “IBM doesn’t need to get Chinese approval for its acquisition of Red Hat, IBM spokesman tells *Bloomberg* in email.” Recall that China let Qualcomm’s offer to buy NXP Semiconductors die by not granting approval by the termination date. Avoiding Chinese scrutiny is an important factor in the investment thesis for this deal. When I independently verify that Chinese regulatory approval is not required, I will, of course, post a note on the Discussion Stream.

The Competition section of Red Hat’s annual form 10-K filed with the SEC specifically mentions IBM (among others) as a competitor in:

1. operating system offerings, along with Microsoft, Hewlett Packard Enterprises, Oracle, and Unisys (each offers a UNIX operating system), as well as the following competitors in Linux operating systems: AWS, Micro Focus International Plc (with its SUSE Linux brand), and Oracle.
2. middleware offerings, along with Microsoft, MuleSoft, Oracle, and Pivotal Software under typically proprietary software license models, as well as Apache Tomcat and Wildfly under freely available middleware distributions.
3. emerging technology offerings, along with Docker Inc., Microsoft, Mirantis Inc., Oracle, Pivotal, and VMware, AWS, and Google.

As pointed out in Red Hat’s form 10-K, “the open source model is not characterised by the traditional barriers to entry that are found in the proprietary software model.”

The presence of a number of large, financially strong competitors such as Microsoft, Oracle, VMware, Google, AWS (Amazon Web Services), etc. is a positive in terms of robust competition.

At the end of the analyst conference call on Monday, 29 October, both CEOs said the companies didn’t compete:

Ginni Rometty, IBM CHB/CEO on the conference call stated, “We said in the release second half of ’19 (for deal completion) but this is a complementary acquisition, we do not see any regulatory inhibitors; we are going to close as fast as possible...”

The last Q&A question - Analyst: “There is obviously a lot of overlap in the product portfolios between Red Hat and IBM...”

Ginni Rometty, IBM CHB/CEO: “Hold on, if you know those overlaps you know technology better than the two of us do together. There is really hardly any overlap there that we know of. We’re both the guys who wrote the stuff. There just must be a misperception of what’s out there. Of course, we would deal with that if we had some kind of overlap but we don’t see it.”

Jim Whitehurst, RHT CEO: “I think I would flip that around the other way. I think we both talk about hybrid cloud but what makes this so valuable is the fact that we don’t have product overlap and so bringing together we can offer holistic solutions. So, if you hear us both saying products in hybrid cloud but we are at different layers of that and therefore we come together, we can offer the most compelling solution, but it’s because we have complementary products solving a problem around open hybrid multi-cloud and so that’s where the real value is. You’re right, we have overlap in terms of that broad market but not at the product level, and so that’s the beauty of bringing this together is we can offer solutions that can accelerate our customers’ businesses.”

Ginni Rometty, IBM CHB/CEO: “This does happen when we use words like hybrid; it’s a very big set of capabilities needed. Even when we talk about it with clients on a private cloud fabric and we have one. Actually if you stack them up to each other they hardly overlap one iota, so they’re actually quite complementary. So devil’s always in the detail.”

According to this *Bloomberg* story, “While the deal will get antitrust scrutiny in the US and Europe, there’s little competitive overlap between the two companies. One area competition enforcers will probably look into is whether

IBM will gain an incentive and the ability to raise prices for Red Hat's services sold to IBM's cloud-computing competitors like Amazon.com Inc. and Microsoft Corp."

The above *Bloomberg* quote highlights a vertical element of the deal that could affect IBM's competitors who work with Red Hat and, depending on which US competition cop takes on this deal for antitrust review, the DOJ or the FTC, this could be an area of investigation. Recall the DOJ was focused on vertical aspects of AT&T's acquisition of TimeWarner. While the DOJ lost that battle in court, it could still lead to a significant delay in this deal's completion if the government goes there. While IBM's competitors haven't made any negative comments on the deal yet, such noise is something to watch out for. The Neutral Platform Model stressed by the two CEOs in interviews and spelled out in the merger agreement is clearly meant to assuage such concerns up front.

The antitrust red flag of customers complaining seems to have been anticipated with both CEOs talking about the hundreds of notes they received from customers praising this deal as something they support.

According to this article reproduced in *Forbes* magazine:



"One large customer of both IBM and Red Hat, the Royal Bank of Canada, was also quite bullish on the deal.

"RBC views technology as a strategic enable in creating great customer experiences so we've been keen investors in technology and have been aggressively pursuing our cloud strategy," said Royal Bank of Canada CIO and group head of technology and operations Bruce Ross.

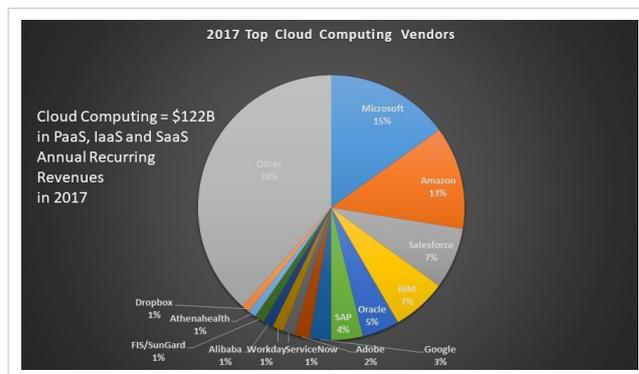
"We have long relationships with both IBM and Red Hat and both relationships have been vital for us, and we see this deal as very good for the cloud marketplace because it allows IBM to deliver more effectively on the hybrid cloud."

Ross emphasized RBC's need for speed in getting advanced digital capabilities to market more rapidly—RBC does about 10 upgrades per year to its mobile app, called NOMI—and said Red Hat would help IBM become "more of a player in DevOps" and compete more aggressively with the big guys like Amazon and [Microsoft] Azure and Google."

So, from all of the above, it looks like there is a possibility of an HSR second request and/or an EU phase II competition review but I'd not expect it to end up with a block.

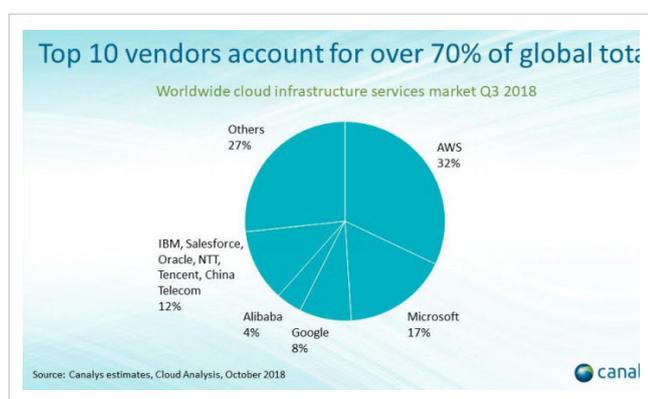
Since "The Cloud" is actually a broad term defining many different things, it makes sense to look further into what is usually meant by the term. The Cloud is usually used to cover Software-as-a-Service, or SaaS, which includes Microsoft Office 365 or Google G-Suite; Platform-as-a-Service, or PaaS, such as Google App Engine or Red Hat OpenShift, and Infrastructure-as-a-Service, such as Amazon Web Services or Google Cloud Platform. It could be on-premises, private cloud, public cloud, or hybrid cloud - IBM's focus with this deal.

Getting accurate breakdowns for all these different areas of cloud computing is difficult, though there is some estimated data available for certain aspects of The Cloud. However, the data can differ greatly depending on the source. For example, this published piece from *Apps Run The World* includes this chart below for "2017 Cloud Computing Vendors":



From the data in the article, if “cloud computing” were one simple market and the above data were accurate, there’d be little problem as the Herfindahl-Hirschman Index (HHI) commonly used in market-concentration calculations would be well below the 1,500 measure upper limit considered a competitive marketplace, and combining Red Hat with IBM would result in very little change to the index. Unfortunately, it will not be that simple in reality.

The worldwide cloud infrastructure services market grew 46 percent to US\$21 billion in Q3 2018, according to Canalys in this [press release](#) published recently. The chart (below) in this article shows a more concentrated market for cloud infrastructure than the general “cloud computing” market shown by “Apps Run The World” above.



Yet even applying the HHI calculations to the above market share percentages works out to a total HHI under 1,500 (a “competitive market”), according to my calculations. It is likely from the above that the RHT/IBM combo would cause a negligible change in the HHI. So, based on the limited information I could find, there doesn’t seem to be a major problem in IaaS. The above market shares are worldwide, so the numbers for the USA are likely higher and this could be where the concentration looks greater, adding uncertainty.

I could not find information on platform-as-a-service (PaaS) market share breakdown though it appears to be a smaller market with total revenues of about US\$18 billion, according to Statistica, compared to a Q3 annualised run rate of US\$84 billion for IaaS. Detailed market share for the hybrid cloud market was even more difficult to find.

And of course, the real antitrust scrutiny will focus on a product-by-product analysis, so there are many pieces missing from our mosaic, but the above gives some insight.

On the merger conference call, IBM made reference to its US\$19 billion of cloud revenue though it should be noted IBM includes US\$7-8 billion of consulting/training revenue in this figure, so its true IaaS/PaaS/SaaS revenues are far lower.

While the limited data makes it difficult to draw firm conclusions, I believe that antitrust will not be a dealbreaker for the RHT/IBM deal. Of course there could be an extended antitrust review in the USA and/or Europe but I don’t consider this a certainty. Based on everything above, there is an argument for no second request/Phase II review, so the weighted average of potential scenarios certainly favours a timeline that is quicker than that implied by RHT’s trading price, in my opinion. And with a Chinese prior approval requirement seemingly out of the picture, the regulatory risk looks acceptable for the return on offer.

CONCLUSION

While nothing is certain in the event-driven world, we assemble the mosaic and read the tea leaves as best we can. In looking at IBM’s proposed acquisition of Red Hat we see a committed, strategic buyer who has been moving away from its legacy business for a number of years and has chosen Red Hat as its partner to complete its transition with this “transformational” deal.

We have a merger agreement that is balanced and well-written with no unexpected surprises. While some commentators have pegged this deal being in the tech industry as a reason for the large spread, the merger agreement MAE definition specifically carves out financial and securities market declines that do not disproportionately affect Red Hat relative to similar sized peers in its industry. So even a tech industry sell-off that affects the whole industry (and not RHT disproportionately) is not a dealbreaker, though it would worsen the downside numerator of the risk/reward calculation.

The antitrust picture, while far from clear, doesn’t appear to present any obvious dealbreakers, and most event-driven funds will hire antitrust/competition economists and lawyers to look at this more closely to get comfortable with the risk. A quickly growing industry with large, deep-pocketed competitors and rapid technological change sets the stage well for what I feel could be quick clearances. But even in a longer time line scenario, the return is still attractive. I do find the language of “2nd half of 2019” for expected closing odd and have tried to get more clarity as to why that language was chosen, but have not yet. But as IBM’s CEO said on the conference call “we are going to close as fast as possible”.

So my conclusion ends with a fashion tip: Dress up your event-driven portfolio with some Red Hat.



Disclosure & Certification

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— John DeMasi (14 November 2018)



William Keating

A senior executive in the IT/Semiconductor industry for over 25 years, 22 of which he spent in key roles at Intel. As part of his research and consulting business, he specialises in niche topics of high significance within the semiconductor industry.

Autonomous Driving Is Bigger Than Ever but Not Quite There Yet

March 2018

In 2018, autonomous driving became one of the most exciting tech breakthroughs of recent years - one that corporations from General Motors to Google are pouring billions of dollars into. While advances in self-driving cars are undeniable, it's also hard to look past the significant hurdles the technology faces. William Keating has been dubious about the feasibility of autonomous driving tech and the timeframe in which it can become mainstream, and he outlined the key reasons why in a series of Insights that started with this one.



"Incidents involving other autonomous vehicles highlight some astonishing shortcomings of the technology being used on our streets today. Indeed, there are now serious questions about the viability of so-called Level 3 autonomous driving in so far as they rely on emergency intervention by a driver highly likely to have been distracted by something more exciting than monitoring an automobile driving by itself."

Autonomous Driving- Are We There Yet?

By William Keating | 20 March 2018

EXECUTIVE SUMMARY

Autonomous Driving represents the perfect fusion of our love affair with automobiles and our fascination with artificial intelligence. It has been part of our collective imagination for decades, first epitomised at the 1939 New York World Fair Futurama exhibit, which posited an automated highway system (AHS) sponsored by General Motors. Research on AHS conducted at The Ohio State University led to the development of the world's first partially autonomous vehicle in 1962. Fast-forward half a century and the goal of achieving autonomous driving is firmly fixed in the glare of our automobile headlights. Leading automakers as well as technology companies are promising autonomous, or at least highly autonomous, automobiles within the next three years. At the forefront is [Alphabet Inc Cl C \(GOOG US\)](#), represented by its automotive spin-off Waymo, in the process of launching the world's first driverless taxi service in Phoenix, Arizona. [General Motors Co \(GM US\)](#), arguably the closest to Waymo in technology terms, has announced similar plans to launch an autonomous ride-sharing service in 2019.

Not all is rosy in the autonomous driving garden, however. The sector has been plagued by high-profile defections of key staff, leaving to either create their own startups or join competitors. These moves have led to equally high-profile and, in some cases, embarrassing lawsuits. The rush by other companies to hire talented artificial intelligence engineers has decimated the research ranks of leading universities.

The safety and reliability of autonomous driving technology on our streets today has also been thrown into doubt in recent times. Just two days ago, on 18 March, the first fatal accident involving an autonomous vehicle occurred in Phoenix, Arizona - details [here](#). That vehicle was a Volvo XC90 and was part of [Uber Technologies Inc's](#) self-driving

test fleet in the city. According to initial reports, the vehicle was operating in autonomous mode and had a safety driver on board. While we need to await the outcome of this particular investigation, previous incidents involving other autonomous vehicles highlight some astonishing shortcomings of the technology being used on our streets today. Indeed, there are now serious questions about the viability of so-called Level 3 autonomous driving in so far as they rely on emergency intervention by a driver who is highly likely to have been distracted by something more exciting than monitoring an automobile driving by itself.

Autonomous driving is a subject far too broad to be covered in a single Insight. Consider this a primer where we begin by examining the origins of autonomous driving, tracing its roots back to 1960s - which, by no coincidence, was also the starting point for much of the research on modern-day artificial intelligence. We look at the specific factors which combined to propel autonomous driving from the AI laboratories of prestigious universities to the drawing boards of multinationals around the globe. We review the framework for the different levels of autonomous driving and highlight the fact that most auto OEMs choose to largely ignore them. We then examine in detail the aforementioned issues with Level 3 autonomous driving and reveal that the technology used in the Volvo XC90, the vehicle involved in the recent fatal accident in Phoenix, specifically warns in its user manual that it should not be used for city driving and that it cannot detect pedestrians, cyclists, etc.

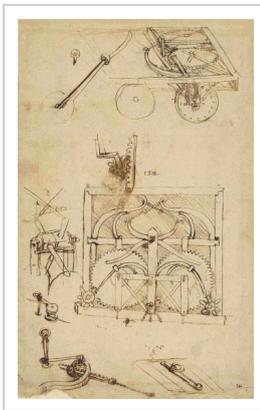
Recognising the seminal role that [Alphabet Inc Cl C \(GOOG US\)](#) has played in advancing the technology, we provide an in-depth review of their self-driving initiative from its inception as a secretive Google X project to its current-day incarnation as Waymo. By way of contrast, we examine the autonomous driving ambitions of one of the world's leading auto OEMs, General Motors, and provide a detailed review

of their progress to date. Finally, we address the question on everybody's mind when it comes to autonomous driving: Are we there yet?

DETAIL

A Brief History Of Autonomous Driving

This article, courtesy of the Computer History Museum, is a good place to begin understanding the origins of autonomous driving. Perhaps the earliest recorded concept of autonomous driving is reflected in the design of a clockwork cart by Leonardo da Vinci, circa 1478.



Leonardo da Vinci's
Clockwork Cart

The clockwork cart concept (it was never built) was powered by coiled springs, capable of propelling it on a pre-programmed track. Centuries later, with the automobile firmly entrenched in the psyche of the time, the 1939 New York World Fair Futurama exhibit featured an [automated highway system](#) (AHS) sponsored by General Motors.

The Futurama AHS concept was based on trench-like lanes that would keep cars apart in their own "tracks". The idea was to drive to the freeway normally, then engage the automatic systems and kick back until your exit. Related visions involved magnetic trails built into the road's surface, or physical slots or troughs, or train-like rails engaging hidden steel wheels on the inside of each tyre.

In the early 1960s, research on AHS was conducted at The Ohio State University (OSU) led by Robert Fenton, funded by the US Federal Highway Administration. This resulted in the world's first automated vehicle in 1962. It incorporated a computer which controlled steering, braking, and speed using onboard electronics that occupied the entire vehicle apart from the driver's seat.



Also around 1960, a project was launched at Stanford University that ultimately had a significant impact on the development of modern-day autonomous driving. John Adams was working at the Jet Propulsion Laboratory on a NASA project to remotely control a moon rover vehicle. He built a four-wheel vehicle that was powered by a car battery and carried a TV camera. According to the Computer History Museum (where the so-called Stanford Cart is now on display):

It was redesigned between 1967 and 1970 to automatically follow a white line on a road. An onboard television camera transmitted information to a remote computer that controlled the Cart's movements. Hans Moravec rebuilt the Cart in 1977, equipping it with stereo vision. A television camera mounted on a rail on top of the Cart took pictures from several different angles and relayed them to a computer. The computer then gauged the distance between the Cart and obstacles in its path and maneuvered the Cart around these obstacles. In 1979, Moravec's Cart successfully crossed a chair-filled room without human intervention."



Stanford Artificial Intelligence Laboratory Cart, 1964-71

You can find further details on the technology behind the cart, which was remarkable for its time, [here](#). In 1980, the Stanford AI Lab was shut down and the cart went into storage, remaining largely forgotten until some twenty-three years later when Sebastian Thrun moved to Stanford in 2003 and revitalised the Stanford

AI Lab (SAIL). One of his first initiatives was to launch an autonomous vehicle project. In 2005 that project resulted in an automated vehicle called Stanley, which won the [Defense Advanced Research Projects Agency \(DARPA\) Grand Challenge](#), a race by autonomous vehicles across the Mojave desert in Nevada (more on this shortly).

In 1987, a project called [PROMETHEUS](#) (PROgraMme for a European Traffic of Highest Efficiency and Unprecedented Safety) was launched by EUREKA, a publicly-funded, intergovernmental network of countries, mainly European. With a budget of €749 million, the project aimed to create concepts and solutions for a road traffic system which would be more efficient and less detrimental to the environment while guaranteeing an unprecedented degree of safety. One of the highest profile participants in the project was Ernst Dickmanns, a pioneer of driverless car technology. In 1994, his partnership with [Daimler AG \(DAI GR\)](#) under the auspices of the PROMETHEUS project resulted in an autonomous vehicle which drove for more than one thousand kilometers on a Paris highway at speeds up to 130 km/h, demonstrating convoy driving, automatic tracking of other vehicles, lane changes etc.

Meanwhile, back in the US, DARPA had been authorised by the US Congress to award cash prizes to encourage research into technologies that would help them achieve their goal

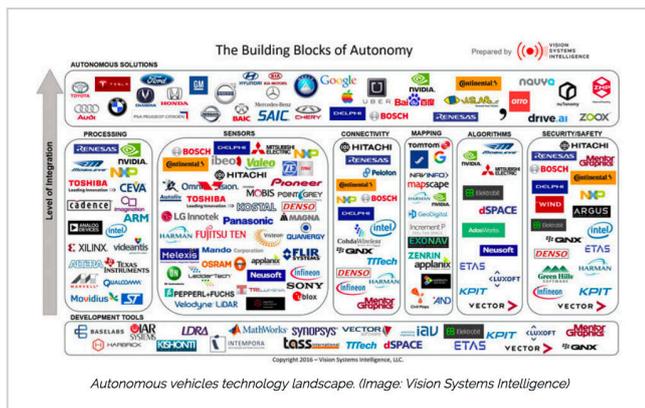
of making one-third of military vehicles autonomous by 2015. The first DARPA Grand Challenge was held in 2004, along a 240 km route. The furthest any entrant got was about 12 km and, as there was no winner, the US\$1 million cash prize was not awarded. One of the participants was a young Berkeley graduate named Anthony Levandowski. His bizarre entry was an autonomous motorbike called Ghost Rider, which now resides in the National Museum of American History. He later went on to become one of the pioneering names in modern-day autonomous driving.

A second DARPA Grand Challenge event was scheduled for 2005. This time, out of 23 finalists, five finished the course with the Stanford team (led by Sebastian Thrun) taking the #1 place. The next DARPA challenge took place in 2007, this time in a simulated urban setting. The race was won by [Team Tartan](#), which was led by Chris Urmson, and was a collaboration between Carnegie Mellon University, home of famous [Robotics Institute](#), and General Motors. This time, the Stanford team took second place.

The DARPA Challenges were pivotal milestones in the development of autonomous driving. In their aftermath, the key players from the leading participants went on to play central roles in developing and commercialising the technology, initially at Google then later through the plethora of startups founded by those key individuals as they left Google.

Autonomous Driving Landscape Today

The present-day landscape of autonomous driving is barely recognisable compared to how it looked when Google first launched its self-driving project in 2009 (more on this later). At the time, Google's research was secretive and regarded with the same bemusement as other Google "moonshot" projects, many of which never came to fruition. To begin with, the following graphic, courtesy of Vision Systems Intelligence, is a good starting place to begin to comprehend the complexity of the autonomous driving ecosystem today.



The sheer number of companies with a connection to autonomous driving is breathtaking and continues to grow. To begin with, every major automaker is involved - as you might expect. Their long-time partners, the automotive component suppliers such as Bosch, Aptiv (Delphi), Continental AG (CON GR), Valeo SA (FR FP), Denso Corp (6902 JP), ZF-TRW, etc. are all following in their footsteps and their automotive semiconductor suppliers such as Infineon Technologies AG (IFX GR), STMicroelectronics NV (STM IM), Texas Instruments Inc (TXN US), Renesas Electronics Corp (6723 JP), etc. are in lock-step. Vying to dominate the computing platform are the likes of Intel Corp (INTC US), Nvidia Corp (NVDA US), Qualcomm Inc (QCOM US) along with a host of other, smaller ARM-based companies. Google was a pioneer in developing self-driving technology and Chinese competitor Baidu Inc (ADR) (BIDU US) followed suit, beginning its own research program in 2014 and continuing to invest heavily ever since.

The landscape is further characterised by the emergence of many startups, all striving to build their own self-driving platforms independently from the auto OEMs and usually led by formers from Google, Baidu, and Uber. These include Aurora, Argo.ai, Cruise Automation, Drive.ai, Comma.ai, AutoX.ai, AIMotive, Oxbotica, and Nutonomy. Most of these companies have since either been acquired (e.g. Cruise Automation by GM, Nutonomy by Delphi) or have taken significant investment and/or formed alliances with major OEMs or ride-hailing companies, e.g. Argo.ai with Ford Motor Co (F US), Aurora with Hyundai and Volkswagen AG (VOW GR), Drive.ai with Lyft, etc.

As if their future survival might depend on it (and it pretty much does), ride-hailing companies like Uber, Lyft, MyTaxi,

and Didi Chuxing have rushed to either develop their own self-driving technology (Uber and Didi Chuxing), solicit significant investment and/or partnerships with auto OEM's (Lyft with GM and Ford) or get acquired (MyTaxi by Daimler).

As you might expect, the market for sensors to support autonomous driving is undergoing explosive growth. For example, one particularly crucial sensor, LiDAR, has spawned dozens of startups in recent years including Strobe (recently acquired by GM), Princeton Lightwave (acquired by Ford), Luminar, Robosense, Ouster, Quanergy Systems, LeddarTech, Oryx Vision, and Innoviz. At the same time, the manufacturer of the original LiDAR used in the DARPA Grand Challenge, Velodyne, recently announced that it was quadrupling production to meet demand, details [here](#):

Velodyne, largely considered the current leader in LiDAR tech for autonomous vehicle development, announced today that it has increased its production capacity by more than 400 percent in order to meet growing global demand. This means it's now actually offering immediate availability for its LiDAR sensors, for the first time in a long time, for clients in Europe, Asia Pacific and North America.

As a side note, Tesla famously refutes the belief that safe autonomous driving requires the use of LiDAR sensors, a view we strongly disagree with and will discuss in detail in a future Insight.

IHS Markit has an extraordinary forecast for the growth in LiDAR revenues, which they predict will reach US\$2.5 billion in 2026 from US\$230 million in 2016, with LiDAR semiconductor revenues to reach US\$1.8 billion in 2026 from US\$103 million in 2016.

Not surprisingly, mapping technologies are central to autonomous driving and the leading companies in the sector have been the subject of much investment, and merger and acquisition activity in recent years. One such high-profile deal was the purchase of HERE in August 2015 by a consortium of three leading German automakers for US\$2.8 billion: Volkswagen AG (VOW GR), Bayerische Motoren Werke AG (BMW GR), and Daimler AG (DAI GR) -

details from [this](#) Nokia press release. The rationale for the deal was explained by Daimler chairman Dieter Zetsche as follows:

“High-precision digital maps are a crucial component of the mobility of the future. With the joint acquisition of HERE, we want to secure the independence of this central service for all vehicle manufacturers, suppliers and customers in other industries.”

The acquisition of HERE by the German automakers generated significant discussion and debate at the time. [This](#) CNBC article speculates that the reason behind this deal was “fear of becoming too heavily reliant on US tech giants Apple and Google.”

In January 2017, Intel [announced](#) that it was taking a 15 percent stake in HERE for an undisclosed sum. In conjunction with the investment, the two companies also agreed to collaborate on the research and development of a highly scalable proof-of-concept architecture to support real-time updates of high definition (HD) maps for highly and fully automated driving.

Other leading mapping companies with a significant interest in autonomous driving include Japanese Zenrin, Chinese companies Navinfo and Autonavi, India’s MapMyIndia, and Holland’s [TomTom NV \(TOM2 NA\)](#). Needless to say, [Alphabet Inc Cl C \(GOOG US\)](#) and [Apple Inc \(AAPL US\)](#)’s mapping products are central to their self-driving ambitions.

The Israeli company MobilEye is in many ways the poster child for an early autonomous driving success story. The company was founded in 1999 and develops vision-based advanced driver-assistance systems (ADAS) providing warnings for collision prevention and mitigation. The company garnered widespread public attention when it parted ways with [Tesla Motors Inc \(TSLA US\)](#) in July 2016 after having supplied its autopilot systems for the previous three years - details [here](#). The move came after a fatal crash in June 2016 involving a Tesla car in auto-pilot mode - details from the Tesla press release [here](#). In March 2017, Intel announced its intention to acquire Mobileye for a

whopping US\$15.3 billion - details from Intel’s press room available [here](#). Intel’s rationale for the deal was summarised by the company as follows:

The combination is expected to accelerate innovation for the automotive industry and position Intel as a leading technology provider in the fast-growing market for highly and fully autonomous vehicles. Intel estimates the vehicle systems, data and services market opportunity to be up to US\$70 billion by 2030. The transaction extends Intel’s strategy to invest in data-intensive market opportunities that build on the company’s strengths in computing and connectivity from the cloud, through the network, to the device.

In an update by Intel on the sidelines of the January 2018 CES in Las Vegas, the company reported that:

Advanced consumer-targeted systems, which take over the driving tasks under many conditions (on-highway and beyond), have gained significant momentum. Many were included in Mobileye’s 30 ADAS design wins in 2017 and are among Mobileye’s 15 program launches in 2018. The ability to deliver precision maps at scale and low cost by leveraging the proliferation of camera-based safety systems on cars takes these systems to a new level at an affordable price. Overall, Mobileye has design wins for advanced L2+ and L3 autonomous systems with 11 automakers who collectively represent more than 50 percent of the auto industry – designs that will launch this year and in 2019.

In addition to all of the above, there are also a plethora of companies, too numerous to list, involved in other key areas such as connectivity, security, operating systems, software, algorithms, etc.

Autonomous Driving Levels

Originally, there were two competing standards defining different levels of autonomous driving: one by the US Department of Transportation National Highway Traffic Safety Administration (NHTSA) and one by the Society of Automotive Engineers (SAE). Both were quite similar and, in October 2016, the NHTSA adopted the SAE standard outlined in the following graphic courtesy of the SAE.

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	The full-time performance for the human driver of all aspects of the dynamic driving task, even when enhanced by sensing or intervention systems.	Human driver	Human driver	Human driver	N/A
1	Driver Assistance	The driving mode-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the human driver perform all remaining aspects of the dynamic driving task.	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	The driving mode-specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the human driver perform all remaining aspects of the dynamic driving task.	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	The driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task with the expectation that the human driver will respond appropriately to a request to intervene.	System	System	Human driver	Some driving modes
4	High Automation	The driving mode-specific performance by an automated driving system of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene.	System	System	System	Some driving modes
5	Full Automation	The full-time performance by an automated driving system of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver.	System	System	System	All driving modes

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Key definitions in J3016 include (among others):
Dynamic driving task includes the operational (steering, braking, accelerating, monitoring the vehicle and roadway) and tactical (responding to events, determining when to change lanes, turn, use signals, etc.) aspects of the driving task, but not the strategic (determining destinations and waypoints) aspect of the driving task.
Driving mode is a type of driving scenario with characteristic dynamic driving task requirements (e.g., expressway merging, high speed cruising, low speed traffic jam, closed-campus operations, etc.).
Request to intervene is notification by the automated driving system to a human driver that s/he should promptly begin or resume performance of the dynamic driving task.

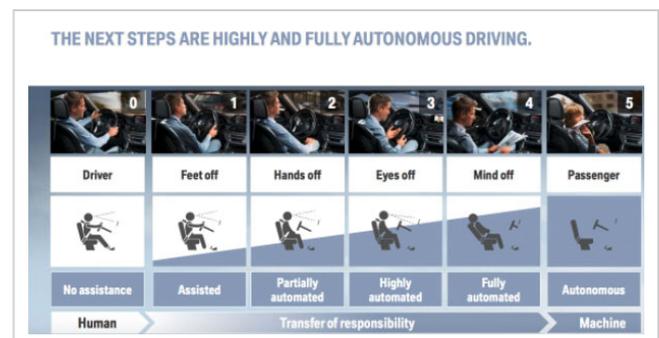
A firm grasp of these levels is important when trying to understand exactly what a particular auto OEM means when they refer to their autonomous driving capabilities and roadmaps.

- *Level 0 basically means no driving automation of any description.*
- *Level 1 introduces the concept of driver assistance, including capabilities such as cruise control, ABS, park assist, etc. - pretty much where most modern cars are at today.*
- *Level 2 involves more advanced features, including automatic braking and lane control. Such capabilities are featured in Tesla's Autopilot, Volvo Pilot Assist, Mercedes-Benz Drive Pilot, and Cadillac Super Cruise for example.*
- *Level 3, referred to as Conditional Driving Automation, means that the car can assume full control under certain conditions. However, the*

driver may be required to resume control at any time. The 2018 Audi A8 is generally held to be the first car to achieve Level 3 capability.

- *Level 4, or High Driving Automation, means that as long as the car remains within a geographically pre-defined space (e.g. college campus, city limits, etc.) the driver will not be expected to intervene. The recently announced self-driving "robo" taxi service by Waymo using a modified Chrysler Pacifica Hybrid minivan in Phoenix, Arizona is an example of Level 4 automation.*
- *Level 5 or Full Driving Automation, is the point when the car's geographic limits are removed, the car may not even have a steering wheel/pedals, and driver is surplus to requirements.*

These autonomous driving levels are described in somewhat simpler terms in this following graphic courtesy of BMW:



While you might imagine that the simplicity and clarity of the autonomous driving levels system would eliminate any confusion about a particular automobile's autonomous capability, you would be greatly mistaken. In fact, most automakers rarely ever refer to these levels, preferring to rely instead on terminology such as "Autopilot", "Traffic Assist", "Self-Driving", etc. In the run-up to Audi's A8 launch, they originally stated the following:

The driver no longer needs to monitor the car permanently. They can take their hands off the steering wheel permanently and ... focus on a different activity that is supported by the car, such as watching the onboard TV.

Their claims were heavily criticised by the automotive media, including [this](#) article in *The Drive*. Subsequently, their promotional materials emphasised the need for drivers to remain vigilant and capable of taking over control at all times. The latest description of the 2018 A8 “driver assistance” features can be found on the company’s website [here](#).

Driver assistance systems are based on continuous and, in key areas, redundant monitoring of the vehicle surroundings. Delivering that takes a huge set of sensors comprising radar and ultrasonic sensors, cameras and—for the first time in the new Audi A8—a laser scanner. Compiled in the central driver assistance controller (zFAS) to create a comprehensive model of the surroundings, all the sensor data are made available to a wealth of driver assistance functions. About the size of a tablet, the zFAS, now celebrating its debut in the A8, is a high-tech data cruncher. It integrates high-performance computers, including the Nvidia Tegra K1 as well as the EyeQ3 made by Mobileye, one of the world’s leading providers of image processing algorithms for automotive applications.

* Assistance systems can only support the driver within the specified system limits. The responsibility for remaining sufficiently alert and performing driving tasks always rests with the driver.

It’s not just Audi that has made irresponsible claims. Mercedes did something very similar with the launch of their 2017 Mercedes E-Class, clearly referring to it as a “self-driving” car, and taking some serious criticism in this article, also from [The Drive](#).

Introducing a self-driving car from a very self-driven company.

The all-new Mercedes-Benz E-Class. The 2017 E-Class embodies Mercedes-Benz’s commitment to transforming not just the automobile, but mobility itself. A self-parking, self-correcting luxury sedan with intelligent advances like PRE-SAFE Impulse Side, which anticipates a side-impact collision and repositions you to minimize the effect, and PRE-SAFE Sound, which helps protect the ears from damaging sound should an impact occur. The revolutionary new E-Class is the very future of transportation. Here and now. MBUSA.com/E-Class

The Problem With Level 3

Tesla famously refers to its driver assistance capability as “Autopilot”. It first launched in October 2015 - you can find the details in the company press release [here](#), where they compare their Autopilot to the systems that airplane pilots use routinely.

Tesla Autopilot relieves drivers of the most tedious and potentially dangerous aspects of road travel. We’re building Autopilot to give you more confidence behind the wheel, increase your safety on the road, and make highway driving more enjoyable. While truly driverless cars are still a few years away, Tesla Autopilot functions like the systems that airplane pilots use when conditions are clear. The driver is still responsible for, and ultimately in control of, the

car. What’s more, you always have intuitive access to the information your car is using to inform its actions.

Barely nine months later, in June 2016, there was a fatal crash involving a Tesla car in Autopilot mode - details from the Tesla press release [here](#).

What we know is that the vehicle was on a divided highway with Autopilot engaged when a tractor-trailer drove across the highway perpendicular to the Model S. Neither Autopilot nor the driver noticed the white side of the tractor-trailer against a brightly lit sky, so the brake was not applied. The high ride height of the trailer combined with its positioning across the road and the extremely rare circumstances of the impact caused the Model S to pass under the trailer, with the bottom of the trailer impacting the windshield of the Model S.

While Tesla was cleared of responsibility for the fatal accident, there was a generally held view that they had over-emphasised the capabilities of their Autopilot system while under-emphasising the criticality of the driver remaining vigilant and able to retake control at a moment’s notice. You can find the full text of the National Transportation Safety Board (NTSB) investigation into the accident [here](#). Remarkably, the NTSB noted that:

The Tesla’s automated vehicle control system was not designed to, and did not, identify the truck crossing the car’s path or recognise the impending crash; consequently, the Autopilot system did not reduce the car’s velocity, the forward collision warning system did not provide an alert, and the automatic emergency braking did not activate.



Culver City Firefighters
@CC_Firefighters



While working a freeway accident this morning, Engine 42 was struck by a #Tesla traveling at 65 mph. The driver reports the vehicle was on autopilot. Amazingly there were no injuries! Please stay alert while driving! #abc7eyewitness #klla #CulverCity #distracteddriving

3:57 AM - Jan 23, 2018 · Irvine, CA

♥ 343 💬 473 people are talking about this

Well, call me a perfectionist, but wouldn't you expect that a truck crossing your path would be exactly the kind of thing you would want your "Autopilot" to pick up on and take evasive action? Another, more recent example of a Tesla involved in a (non-fatal) accident highlights yet another weakness in Tesla's "Autopilot". In January 2018, a Tesla Model S traveling at 65 mph, with "Autopilot" engaged, crashed into a stationary firetruck on a California freeway.

According to [this](#) report on the incident, this scenario is covered in the Tesla Model S user manual:

Warning: Traffic-Aware Cruise Control cannot detect all objects and may not brake/decelerate for stationary vehicles, especially in situations when you are driving over 50 mph (80 km/h) and a vehicle you are following moves out of your driving path and a stationary vehicle or object, bicycle, or pedestrian is in front of you instead. Always pay attention to the road ahead and stay prepared to take immediate corrective action. Depending on Traffic-Aware Cruise Control to avoid a collision can result in serious injury or death. In addition, Traffic-Aware Cruise Control may react to vehicles or objects that either do not exist or are not in the lane of travel, causing Model S to slow down unnecessarily or inappropriately.

Reacting to vehicles that do not exist is rather akin to a driver being high on some form of psychotropic substance, normally not an ideal condition in which to take to the roads. Yet another report of a Tesla incident, which you can find [here](#), shows a video of another scenario in which Tesla's "Autopilot" failed to spot a stationary vehicle, this time because it was locked onto the car in front of it and was unable to react quickly enough when that car swerved to avoid a stationary van in its path.

The Model S was on Autopilot, or at least the Traffic-Aware Cruise Control (TACC) feature of the Autopilot, in the left lane on the highway in heavy traffic. While in heavy traffic, TACC will lock on the vehicle in front of the Model S to determine the speed of the vehicle and consequently when to move in traffic. The problem here is that a van stopped in the left lane with its hazard lights on and the vehicle TACC was following didn't stop. If it had stopped, it's likely the Model S on Autopilot would have too. Instead, the preceding vehicle swerved past the van by partly impinging on the right lane.

According to [this](#) report, Volvo's semi-autonomous system, Pilot Assist, has the same shortcoming when it comes to stationary objects that suddenly come into view.

Say the car in front of the Volvo changes lanes or turns off the road, leaving nothing between the Volvo and a stopped car. "Pilot Assist will ignore the stationary vehicle and instead accelerate to the stored speed," Volvo's manual reads, meaning the cruise speed the driver punched in. "The driver must then intervene and apply the brakes." In other words, your Volvo won't brake to avoid hitting a stopped car that suddenly appears up ahead. It might even accelerate towards it.

Apparently, the same is true for any car currently equipped with adaptive cruise control, or automated emergency braking. Even worse, according to this report, incredibly, this behavior is a feature, not a flaw.

It sounds like a glaring flaw, the kind of horrible mistake engineers race to eliminate. Nope. These systems are designed to ignore static obstacles because otherwise, they couldn't work at all.

The Volvo XC90 user manual, which you can reference [here](#), lists some further pretty serious limitations of its “Pilot Assist” capability, including:

- *Pilot Assist is an aid which cannot handle all traffic, weather and road conditions.*
- *Pilot Assist must only be used if there are clear lane lines painted on the road surface on each side of the lane. All other use involves increased risk of contact with surrounding obstacles that are not detected by the function.*
- *Pilot Assist is not a collision avoidance system. The driver must intervene if the system does not detect a vehicle in front.*
- *Pilot Assist does not brake for humans or animals, and not for small vehicles such as bicycles and motorcycles. Nor for low trailers, oncoming, slow, or stationary vehicles and objects.*
- *Do not use Pilot Assist, for example, in city traffic, in dense traffic, at junctions, on slippery surfaces, with a lot of water or slush on the road, in heavy rain/snow, in poor visibility, on winding roads or on slip roads.*

These limitations make for pretty grim reading. Under adverse weather conditions, when you could perhaps benefit most from a little technological assistance, the system doesn't work, blinded by raindrops, snow, and sleet - just like us humans. The clear lane lines requirement is all very well, but largely impossible to achieve on a consistent basis from city to city, country to country. The revelation that the system does not brake for humans or animals, bicycles, motorcycles, low trailers, slow or stationary vehicles, or objects should be a wake-up call for anyone either fitting into or transporting themselves on one of those many categories. Lest you should have any doubt that the XC90

really does NOT brake for people, check out [this](#) YouTube video of the car doing exactly that - smashing into a group of people who obviously had not read the user manual.

In this context, the previously mentioned recent fatal accident involving a pedestrian and a Volvo XC90 in autonomous mode was essentially an accident waiting to happen. Back in August 2016, Uber and Volvo formed an [alliance](#) to co-develop self-driving technology.

The partnership will see the Swedish-based carmaker, owned by China's Geely, and ride-hailing service Uber, pool resources into initially developing the autonomous driving capabilities of its flagship XC90 SUV. The investment will be shared roughly equally by the two companies. Uber will purchase Volvos and then install its own driverless control system for the specific needs of its ride-hailing service. Volvo will use the same vehicle for its own autonomous driving project, which is based on a plan that still envisages having a driver in the car.

In November 2017, Uber contracted with Volvo to supply 24,000 self-driving vehicles, presumably those same XC90 models - details [here](#). In the wake of this recent fatal accident, at issue will be two key questions: Firstly, was the XC90 being pushed beyond its design limits, in that it was engaged in city driving, something explicitly excluded in the car's user manual? Secondly, why was the safety driver unable to take control and prevent the accident from happening?

The upshot of all of this is not to claim that these types of Level 2/3 capabilities are inherently dangerous. They clearly have a role to play in ensuring driver and passenger safety under very specific circumstances - and for the small number of incidents we cited which involved semi-autonomous driving, there were undoubtedly many thousands of accidents caused by good old-fashioned human error. However, the issue occurs when we rely on these systems too much and get lulled into a false sense of security, allowing ourselves to become distracted and consequently incapable of resuming control in an emergency situation. Such considerations led Ford to

announce in February 2017 that they intended to skip Level 3 altogether - details [here](#).

As Ford Motor Co. has been developing self-driving cars, the US automaker has started noticing a problem during test drives: Engineers monitoring the robot rides are dozing off. Company researchers have tried to rouse the engineers with bells, buzzers, warning lights, vibrating seats and shaking steering wheels. They've even put a second engineer in the vehicle to keep tabs on his human counterpart. No matter -- the smooth ride was just too lulling and engineers struggled to maintain "situational awareness," said Raj Nair, Ford's product development chief. "These are trained engineers who are there to observe what's happening," Nair said in an interview. "But it's human nature that you start trusting the vehicle more and more and that you feel you don't need to be paying attention."

While the company later denied the reports of their test engineers falling asleep, they did confirm the decision to skip Level 3.

"Reports that Ford engineers were falling asleep while testing autonomous vehicles are inaccurate," Ford said in a statement. "We believe that high levels of automation without full autonomy capability could provide a false sense of security and that this presents a challenge for the driver to regain full awareness and control of the vehicle if a situation arises where the technology cannot function. That is why we're currently pursuing SAE Level 4 autonomous capability that will take the driver completely out of the driving process in defined areas."

Google's Waymo shares those concerns, clearly demonstrated by their plans to launch what would be considered a Level 4 driverless taxi service in Phoenix later this year. According to Waymo CEO John Krafcik, "Level 3 may turn out to be a myth. Perhaps it's just not worth doing."

Toyota has its doubts about Level 3 also, as indicated in [this Car & Driver](#) article from November 2017.

Citing safety concerns regarding the handoff between self-driving technology and human driver, Kiyotaka Ise, Toyota's chief safety technology officer, said the biggest issue with these kinds of systems is that "there is a limbo for several seconds between machine and human" in incidents when a car prompts a human to retake control if it cannot handle operations.

Members of Toyota's R&D team said the handoff creates uncertainty about how long the changeover from automated to human driving should take after the car requests the human driver to take over. Ise said further that some sort of global consensus on a legal framework for such features would need to take place before Toyota is willing to make Level 3 driving a reality.

Volvo too has come to much the same conclusion according to [this](#) report in *Wired* magazine from January 2017.

And so Volvo and a growing number of automakers are taking you out of the equation entirely. Instead of developing autonomous vehicles that do their thing under most circumstances but rely upon you take the wheel in an emergency—something regulators call Level 3 autonomous capability—they're going straight to full autonomy where you're simply along the ride.

While automakers have developed systems to monitor driver awareness and behavior during periods when Level 3 driving systems are engaged, there is now a growing sense that the incremental benefits of moving from Level 2 to Level 3 are insufficient to justify the greatly increased risk posed by driver inattention when handover from computer to human driver is required. Consequently, they have, by and large, intensified their focus on developing systems capable of Level 4 - or highly automated driving - instead.

Google's Self-Driving Car Project

Google launched its self-driving car project in 2009 under the leadership of Sebastian Thrun, who eventually left Stanford to join Google in 2011. The project was part of Google's X research lab, whose other projects included Google Glass and Street View. Thrun moved quickly to hire two other high-profile participants from the DARPA Challenges. Anthony Levandowski, famous for his Ghost rider motorcycle entry in the 2004 and 2005 DARPA Challenges, joined Google in 2007, initially working on Google Street View before moving to the Self-Driving project in 2009. Chris Urmson, leader of the 2007 DARPA Urban Challenge winning team from Carnegie Mellon University joined as CTO in 2009. This [Google Blog](#) from 9 October 2010 provides an excellent insight into AD developments at the company back then.

So we have developed technology for cars that can drive themselves. Our automated cars, manned by trained operators, just drove from our Mountain View campus to our Santa Monica office and onto Hollywood Boulevard. All in all, our self-driving cars have logged over 140,000 miles. We think this is a first in robotics research. Our automated cars use video cameras, radar sensors, and a laser range finder to "see" other traffic, as well as detailed maps (which we collect using manually driven vehicles) to navigate the road ahead. This is all made possible by Google's data centers, which can process the enormous amounts of information gathered by our cars when mapping their terrain.

To develop this technology, we gathered some of the very best engineers from the DARPA Challenges, a series of autonomous vehicle races organized by the US Government. Chris Urmson was the technical team leader of the CMU team that won the 2007 Urban Challenge. Mike Montemerlo was the software lead for the Stanford team that won the 2005 Grand Challenge. Also on the team is Anthony Levandowski, who built the world's first autonomous motorcycle that participated in a DARPA Grand Challenge, and who also built a modified Prius that delivered a pizza without a person inside.

A Toyota Prius modified with Google's experimental driverless technology was licensed by the Nevada Department of Motor Vehicles (DMV) in May 2012. This was the first licence issued in the United States for a self-driving car. One year later, around August 2013, Google made its then-largest investment ever of US\$258 million in ride-sharing company Uber ([details here](#)), signaling the company's broader perspective as to where its self-driving technology might eventually be deployed. While Google initially started out modifying existing vehicles such as the Prius, it was clear from [this](#) May 2014 interview with Chris Urmson that their goal was to build an autonomous car from the ground up.

For the past five years, Google has retrofitted existing cars to experiment with autonomous driving. They look mostly normal except for a spinning laser mounted on top. Not these cars — they look and feel totally zany. They are small and round, studded with little black sensors (and a spinning laser on top, too), have a foam front bumper and a big flexible windshield, and are controlled by a mobile app plus just two physical buttons: Go and stop.

Can you explain how Google got to the point that it's building its own cars?

We're really excited about the idea of fully self-driving vehicles. As we started down that path, we came to the realisation that to do that right, you really want a vehicle built from the ground up.

What can you do in a Google-built car that you can't do in a retrofitted car?

These prototype vehicles will have new sensors, some new radars that allow them to see further, some new lasers that allow them to see further and some new cameras as well. For example, the Lexus vehicles have this wonderful 360-degree view on the top, but because of the geometry, there are parts right up close to the side of the vehicle that they can't see. And so the prototype vehicles will have a laser sensor mounted on the side of the car that will allow them to see right up to the vehicle. They'll also have safety built into the vehicles from the behaviors we've learned from the

Lexus, things like waiting at a traffic light for a second after the light turns green. We call it defensive driving.

This July 2015 Google Blog, (actually a Q&A hosted by Chris Urmson, who by that time was in charge of Google's self-driving car program following the departure of Sebastian Thrun in September 2014) fills us in nicely on the status of Google's AD program at that time.

Q: Why is Google working on self-driving cars?

A: Because we've always looked for ways that technology can change the world. More than a million people worldwide die each year in traffic accidents—94 percent of which are caused by human error. If we can solve this, it will prevent the majority of traffic-related deaths and injuries, and also help the millions of people who are unable to drive because of disabilities.

Q: Where is the program right now?

A: We've reached a couple of major milestones this year. We've now self-driven over one million miles total in our Lexus SUVs, and continue to cover 10,000 miles each week—about what a typical American adult drives in a year. Our new prototype vehicles—with safety drivers on board—are now on public roads in Mountain View. We've also got two Lexus SUVs in Austin, Texas, so we can learn from different driving environments, traffic patterns, and road conditions.

Q: Why build your own cars instead of using existing vehicles?

A: We actually did start out by modding two existing vehicles, the Toyota Prius and the Lexus RX450h. But designing our own prototype from scratch opened up possibilities that can't exist in a car that's built for and around a driver. For example, we were able to take out the steering wheel and pedals and change the shape of the vehicle so our sensors can be placed in their optimal field of view. We were also able to build in backup systems for braking, steering, computing, and more into the vehicle.

Q: What's the difference between your self-driving technology and what automakers are doing with autonomous driving?

A: Automakers are focused on driver assistance systems like advanced cruise control and automated parking. But in those systems, the driver is still expected to take over as needed. With fully self-driving technology, which is what we're working on, the car is designed to do all the work of driving all the time, and a human is never expected to take control of the vehicle. We think this will have the biggest impact on safety and mobility for people.

In September 2015, amidst rumors of strife within the self-driving team, Google hired former Hyundai and Ford executive John Krafcik as CEO of their autonomous driving project. Several reports surfaced in December 2015 that Google was partnering with Ford to work on self-driving cars. However, the deal never materialised, and Ford went on to work on self-driving cars on its own. Not long after John Krafcik was brought on board, Google's key technologists started to leave the company. Urmson left in August 2016, posting about his decision in [this](#) blog.

"Now, 1.8 million miles of autonomous driving later, I've decided the time is right to step down and find my next adventure," Urmson wrote in a Medium post about his departure in August. "If I can find another project that turns into an obsession and becomes something more, I will consider myself twice lucky."

Urmson moved quickly to start a new company, [Aurora Innovation](#), together with Sterling Anderson, former director of autopilot programs for [Tesla](#). Aurora and Anderson were hit by a lawsuit from Tesla in January 2017, alleging that Anderson stole critical data relating to their autopilot program. This lawsuit was settled out of court on 19 April 2017 according to [this report](#). Tesla commented on the settlement as follows:

Tesla's lawsuit against Mr. Anderson, Mr. Urmson, and Aurora has been settled. Under the settlement,

Mr. Anderson's contractual obligations to Tesla will remain in place and will also be extended to Aurora, with additional specific protections being added to ensure there are no further violations. The settlement also establishes a process to allow Tesla to recover all of the proprietary information that was taken from the company, and it provides for Aurora's computer systems to be subject to ongoing audits to monitor for any improper retention or use of Tesla's property. Finally, US\$100,000 was paid to Tesla.

Meanwhile, Anthony Levandowski, also central to the self-driving team, left Google in January 2016 and went on to create Otto, a self-driving truck company the following month. Just four months later, Otto was acquired by Uber for a reported US\$680 million - details [here](#).

I'm excited to announce that Uber has acquired Otto, a 90-plus person technology startup whose mission is to rethink transportation, starting with self-driving trucks. Anthony Levandowski, Otto's co-founder, will now lead our combined self-driving efforts reporting directly to me—across personal transportation, delivery and trucking—in San Francisco, Palo Alto and Pittsburgh.

When it comes to this advanced technology stack, Otto plus Uber is a dream team. Anthony is one of the world's leading autonomous engineers: his first invention, a self-driving motorcycle called Ghost rider, is now in the Smithsonian. Just as important, Anthony is a prolific entrepreneur with a real sense of urgency.

In May 2016, Google signed a deal with Fiat Chrysler to build their self-driving technology into a fleet of 100 Pacifica Minivans - details [here](#). In December 2016, Google announced that its self-driving team would be split out into a separate entity under the Alphabet umbrella, known as Waymo. The name was derived from its mission to find “a new way forward in mobility.” You can find the official announcement [here](#), along with some good coverage of the details from *TechCrunch* [here](#) and from *Forbes* [here](#). Speaking at the launch of Waymo, CEO John Krafcik made an important clarification on the direction the company was taking.

“Self-driving technology is awesome in all these categories. But one thing Waymo won't be doing is building its own cars. We are a self-driving technology company. We've been really clear that we're not a car company, although there's been some confusion on that point. We're not in the business of making better cars. We're in the business of making better drivers.”

Shortly after Waymo launched, CEO John Krafcik [revealed](#) that the company had designed and built its own sensor suite, processing system, and software for autonomous driving and that a fleet of Chrysler Pacifica hybrids would be the first vehicles equipped with their entirely in-house developed technology. The same *Forbes* article also reveals that while previous generations of Waymo's test vehicles used a medium range LiDAR sensor, the Pacifica would have three types of LiDAR operating at short, medium and long ranges, all designed by Waymo. Equally important, Waymo claimed to have slashed the cost of its LiDAR sensors by 90 percent compared to the roughly US\$75,000 cost of the Velodyne Puck VPP-16 LiDAR systems used in their original designs.

On 8 February 2017, Alphabet's (Google) Waymo dropped a bombshell when they announced that they were suing Uber & Otto for theft of trade secrets. You can get the full details of the Waymo statement [here](#). The primary reason for the lawsuit? Waymo's in-house developed LiDAR technology.

Recently, we uncovered evidence that Otto and Uber have taken and are using key parts of Waymo's self-driving technology. Today, we're taking legal action against Otto and its parent company Uber for misappropriating Waymo trade secrets and infringing our patents.

On 1 May 2017, it was [reported](#) that Anthony Levandowski had stepped down from his position as head of Uber's Advanced Technology Group and moved to a different role within Uber. One month later, Uber announced that they had fired Levandowski after he failed to meet an internal deadline to hand over documents related to the court case - details [here](#). Litigation between the two companies dragged on for many months before finally reaching a surprise out-of-court settlement in February 2018 whereby Uber agreed to pay Waymo US\$240 million (in Uber equity) - [details](#) here. One interesting revelation from the protracted trial was the fact that Waymo paid Levandowski US\$120 million in incentive payments prior to his departure, demonstrating the extraordinary efforts the company was making to retain core staff.

After so much posturing, and originally looking for US\$1.4 billion in damages, why did Waymo settle for so little so quickly in the end? The answer may lie in understanding just how critical autonomous driving technology is for ride-sharing companies in general and Uber in particular. Uber, as you may well know, has been a hugely loss-making venture to date. The company has shared some more details of its finances in recent times, presumably in preparation for an upcoming IPO. The latest results date from February 2018 and can be found [here](#).

Uber has just revealed its fourth-quarter financial results, which show that the ride-hailing company's loss jumped 61 percent in 2017. The company lost US\$4.5 billion last year, up from US\$2.8 billion in 2016, according to figures first reported by The Information and confirmed by CNBC on Tuesday. However, in the fourth quarter, which was CEO Dara Khosrowshahi's first full period at the helm, Uber's loss narrowed to US\$1.1 billion from US\$1.46 billion in the third quarter. Revenue during that stretched climbed about 14 percent to US\$11.1 billion from US\$9 billion.

In a nutshell, Uber had revenues of US\$37 billion in 2017, out of which almost US\$30 billion was paid directly to their drivers, leaving just US\$7.4 billion net revenue for the company. Yes, it's no great surprise to learn that Uber's

single biggest expense is paying its drivers. By contrast, in a world where Uber didn't need drivers, their profitability would skyrocket. Uber founder and former CEO Travis Kalanick admitted during the Waymo trial that, back in 2015, Uber was facing an existential crisis, knowing the company was behind in autonomous driving technology and would potentially be driven out of business if it didn't take action. Kalanick was also concerned that Google was secretly planning to enter the ride-sharing business, as this excerpt from the recent trial documents discloses:

From: David Drummond [ddrummond@google.com]
Sent: 3/7/2015 11:58:43 PM
To: Travis Kalanick (travis@uber.com)
Subject: Re: Fwd: Google Intel

I'm sorry that these things keep coming up in this way. I will speak to Larry again to reiterate the importance of a meeting with you very soon. I'm returning from London tomorrow and will report back with next steps. I continue to believe that the value of a partnership now far outweighs concerns about an uncertain future.

On Mar 7, 2015 7:45 AM, "Travis Kalanick" <travis@uber.com> wrote:
Is the below true?

We get stuff like this more than I would like.

A meeting with Larry could calm this down if it's not true but he has been avoiding any meeting with me since last fall.

Without any dialogue we get pushed into the assumption that Google is competing in the short term and has probably been planning to do so for quite a bit longer than has been let on.

I hope I'm wrong here, just need to do a meeting with Larry ASAP to get clarity and a mutual understanding of how to do a proper partnership here.

Γ

Begin forwarded message:

----- Forwarded message -----
From:
Date: Fri, Mar 6, 2015 at 7:57 PM
Subject: Intel
To:

Heard from a reliable source that Google will be starting a self driving service in MV in 3 months.

Kalanick's response to this threat was to go on an unprecedented hiring spree in early 2015, hiring more than 50 engineers from Carnegie Mellon University's Robotics Institute, with whom Uber had earlier established a partnership on autonomous driving - details [here](#).

All told, Uber snatched up about 50 people from Carnegie Mellon, including many from its highest ranks. That's an unusually high number of people to leave at once, and accounted for about a third of the staff NREC had at the end of last year. Many were top employees, including David Stager, who had been there since 1997 and is now Uber's lead systems engineer; Jean-Sébastien Valois, a senior commercialisation specialist who had been with NREC for nearly 12 years (and lists himself as "on leave" on CMU's site); and Anthony Stentz, NREC's director for the past four and a half years, who had been at the centre since 1997.

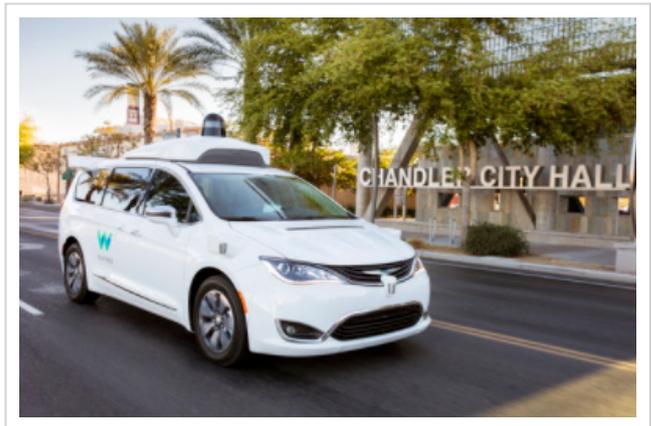
In our opinion, the reason for the abrupt and largely nominal settlement is that the two companies have decided they have more to gain through collaboration than through the courtroom. Waymo is close to launching the first trial of fully autonomous taxi service (details below). If that proves successful, they would benefit greatly from a partnership with Uber in order to speed up the proliferation of their technology. Uber, for its part, is having to recalibrate on its autonomous driving ambitions after the Otto/Levandowski fiasco. While it would have preferred to build its own self-driving technology from the ground up, partnering with Waymo may be a more pragmatic approach, one that may hasten the company's path to profitability and IPO. Furthermore, given its parent company investment in Uber back in 2013, Waymo has a vested interest in ensuring a successful IPO for Uber. Further litigation and larger awards would ultimately hurt Waymo as much as Uber.

In October 2017, Waymo announced that it would no longer pursue the development of discrete autopilot functionality typical of Level 3 systems, choosing instead to focus on fully autonomous Level 4 and 5 systems - details [here](#). The reason? Drivers losing contextual awareness and struggling to retake control of the automobile when required to do so.

“What we found was pretty scary,” Krafcik said on Monday during a media tour of a Waymo testing facility. “It’s hard to take over because they have lost contextual awareness.” Krafcik said the company determined a system that asked drivers to jump in at the sound of an alert was unsafe after seeing videos from inside self-driving cars during tests. The filmed tests were conducted in 2013, with Google employees recorded napping behind the wheel. The company decided to focus solely on technology that didn’t require human intervention a couple of days after the napping incident, said Krafcik, who joined as CEO in 2015. It has also since argued against allowing “handoffs” between automated driving systems and people.

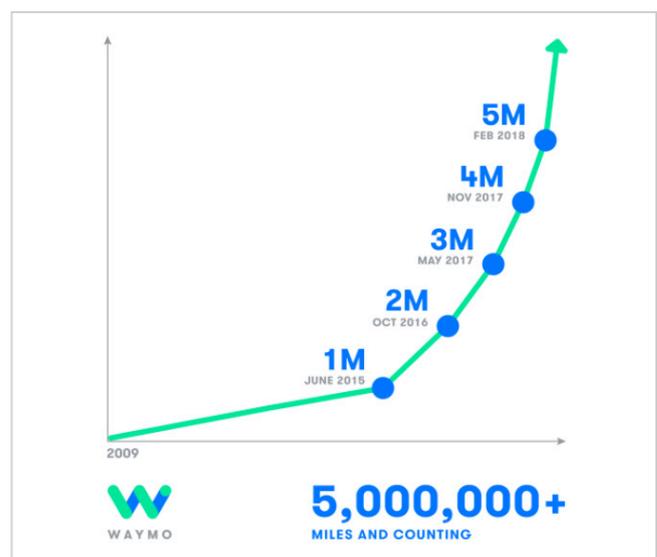
In November 2017, Waymo became the first company to operate autonomous vehicles on the public roads in Arizona, without a safety driver - details [here](#).

Waymo, the autonomous vehicle division of Alphabet, Google’s parent company, reached an important milestone recently: since mid-October, the company has been operating its autonomous minivans on public roads in Arizona without a safety driver — or any human at all — behind the wheel. And starting very soon, the company plans to invite regular people for rides in these fully self-driving vehicles.



Waymo’s fully self-driving Chrysler Pacifica Hybrid minivan on public roads

On 24 January 2018, it was [reported](#) that Waymo was granted a licence to operate as a transportation network company (TNC) in Arizona. Achieving TNC status will allow it to charge for rides, which were previously free. According to Waymo’s website, the company has clocked up over 5 million autonomous miles on its vehicles as of February 2018, putting it far ahead of its closest competitor (at least in terms of autonomous miles driven).



General Motors

The company we know today as General Motors (GM) was formed in 2009 following the bankruptcy of the **General Motors Corporation** with the purchase of the majority of the assets of the old GM, including the brand “General Motors”. With some 180,000 employees around the world, GM is ranked number 1 in the US and number 3 globally according to the OICA, the Paris-based International Organization of Motor Vehicle Manufacturers. The company’s results for fiscal 2017 indicate sales of US\$145.6 billion, down slightly from the previous year due primarily to a downturn in the US auto market, and EBIT-adjusted revenues of US\$12.8 billion.

	Years Ended December 31,		Favorable/ (Unfavorable)	%
	2017	2016		
GMNA	\$ 111,345	\$ 119,113	\$ (7,768)	(6.5)%
GMI	21,920	20,943	977	4.7 %
Corporate	342	149	193	n.m.
Automotive	133,607	140,205	(6,598)	(4.7)%
GM Financial	12,151	8,983	3,168	35.3 %
Eliminations	(170)	(4)	(166)	n.m.
Total net sales and revenue	\$ 145,588	\$ 149,184	\$ (3,596)	(2.4)%

n.m. = not meaningful

According to GM estimates in their latest annual filing, in 2017 they had the largest market share in North America and South America, and the number 3 market share in the Asia/Pacific, Middle East and Africa region, which included the number 2 market share in China. During 2017, GM sold its European brands Opel and Vauxhall to Peugeot S.A. (PSA Group), leaving it with its traditional brands which include Cadillac, Buick, Chevrolet, and GMC. Also in their latest annual filing, GM made the following comments with regard to their autonomous driving technology:

We see autonomous technology leading to a future of zero congestion, zero emissions, and zero crashes, since more than 90 percent of crashes are caused by driver error, according to the National Highway Traffic Safety Administration (NHTSA). We are among the leaders in the industry with significant global real-world experience in delivering connectivity, safety and security services to millions of customers through OnStar, LLC (OnStar) and advanced safety features that are the building blocks

to more advanced automation features that are driving our leadership position in the development of autonomous technology.

An example of advanced automation is Super Cruise, a hands-free driving customer convenience feature that is available on the 2018 Cadillac CT6 sedan. We are actively testing autonomous vehicles on public roads in San Francisco, California; Scottsdale, Arizona; and Warren, Michigan. Additionally, we plan to develop an integrated network of on-demand autonomous vehicles in the US. In 2017 we announced that our growing fleet of test vehicles will accumulate a significant number of miles in 2018, and based on our current rate of change, we expect commercial launch at scale in dense urban environments in 2019.

GM has an excellent track record when it comes to innovative automotive technologies. The company was a pioneer of the connected car, a topic we touched on in a recent Insight, [Automotive Semiconductors - All You Never Wanted To Know But Probably Should - Part 2](#), where we noted that GM introduced their OnStar service way back in 1996. The system enabled voice calls to a call center that contacted emergency responders in the case of accidents when an airbag was deployed. They added further capabilities over time, including GPS locations and the ability to have voice and data at the same time. After the success of OnStar, many automakers followed with similar safety programs connecting the car to emergency responders. Today, GM has about 12 million connected vehicles on the road, and 4.5 million of those are 4G LTE connected, vehicles using AT&T as their network provider.

GM came somewhat late to the table when it comes to autonomous driving, perhaps in part due to the faulty ignition scandal and litigation that engulfed the company for much of the current decade, and was only finally settled in October 2017 - details [here](#).

Beginning in January 2016, the company played catch-up with a vengeance, starting with the [announcement](#) of a US\$500 million investment in ride-sharing startup Lyft. GM’s investment represented half of Lyft’s fundraising for that round and was a major bet by the automaker on the

future of shared mobility. According to a joint statement by the two companies, the partnership was founded on their common belief that *self-driving cars will first reach consumers as part of a ride-sharing service, rather than vehicles owned by drivers*. The general idea was to leverage GM's driverless car technology (which was at best nascent at that point) and Lyft's ride-hailing & route tracking software to create a network of on-demand, self-driving cars. At the time, it was [rumored](#) that GM wanted to purchase Lyft outright, but this idea was a non-starter for the latter.

In February 2016 came the formation of a new team dedicated to autonomous driving within GM, to be lead by company executive Doug Parks. Speaking about the new team some months later, CEO Mary Barra noted that:

To capitalise on GM's deep engineering talent and speed the arrival of self-driving cars, we created a new Autonomous and Technology Vehicle Development team this past February. The team will focus on everything from electrical controls and software to safety integration and vehicle development – all crucial elements to realising the full promise of autonomous vehicles.

In March 2016, GM [announced](#) the acquisition of Cruise Automation, an autonomous driving startup based in Silicon Valley, for a package reported to be worth US\$1 billion in cash, stock, and retention incentives. More details of the deal were provided in the company's latest annual report:

On 12 May 2016, we acquired all of the outstanding capital stock of Cruise, an autonomous vehicle technology company, to further accelerate our development of autonomous vehicles. The deal consideration at closing was US\$581 million, of which US\$291 million was paid in cash and approximately US\$290 million was paid through the issuance of new common stock. The fair value of the common stock issued was determined based on the closing price of our common stock on 12 May 2016. In conjunction with the acquisition, we entered into other agreements that will result in future

costs contingent upon the continued employment of key individuals and additional performance-based awards contingent upon the achievement of specific technology and commercialisation milestones.

What exactly did they get with Cruise Automation?

Primarily, a talented entrepreneur in the form of CEO and co-founder Kyle Vogt, together with a team of 40 engineers. Vogt had previously co-founded streaming service Twitch, which was purchased by Amazon in 2014 for US\$1.1 billion. Prior to that acquisition by Amazon, Vogt had already launched his second company, Cruise Automation, to focus on his passion for autonomous driving - something he had demonstrated over a decade earlier when he was an entrant in the first DARPA Grand Challenge while still an undergraduate at MIT.

This [interview](#) conducted (prior to the GM acquisition) with Vogt, provides some excellent detail on what the company had been working on. They had an ambitious plan to sell their so-called "RP-1" aftermarket kit, which they claimed would convert any Audi A4 or S4 to a self-driving car, for US\$10,000. Their goal at the time was to make it work with any vehicle. They abandoned that idea in early 2014 when they decided instead to produce a fully autonomous vehicle based on the Nissan Leaf. Some 12 months later, their reputation as a self-driving startup was growing and GM president Dan Ammann had become a regular visitor to monitor their progress.

"Every time we went there they'd moved along another nine steps," says Dan Ammann, president of GM. "We were super excited with what the guys there had achieved already technically, but also the caliber of the talent and speed of development."

This [Fortune](#) article provides a detailed insight into how the Cruise team was fitting into the GM culture some six months later, in September 2016. Today, Cruise Automation remains a distinct entity within GM and has grown in size to more than 400 employees.

GM's overarching goal in relation to autonomous driving is neatly summarised in the following graphic, courtesy

of a recent investor presentation published by the company [here](#). (Note, this is an excellent presentation, giving an in-depth insight into the company's thinking & overall strategy)

In October 2017, GM announced the acquisition of LiDAR technology company Strobe - details [here](#). The plan is for Strobe's engineering talent to join GM's Cruise Automation team to help define and develop next-generation LiDAR

AV TECHNOLOGY: PHILOSOPHY

ACCELERATE TIMELINE TO FIRST MAJOR DRIVERLESS DEPLOYMENT

DEPLOY IN KEY MAJOR METRO-AREAS TO DISRUPT INCUMBENTS AND DEVELOP COMPETITIVE MOATS

SCALE TO DRIVE DOWN COSTS AND RAPIDLY DEPLOY IN ADDITIONAL MARKETS

CONTEMPORANEOUSLY, BUILD THE WORLD'S BEST ENGINEERING TEAM AND CONTINUOUSLY IMPROVE PRODUCT AT UNMATCHABLE RATE

GENERAL MOTORS

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The slide features a white Chevrolet Cruise vehicle with a red and white bus in the background. The text is arranged in a structured, bullet-point style with horizontal lines separating sections.

solutions for self-driving vehicles. LiDAR uses light to create high-resolution images that provide a more accurate view of the world than cameras or radar alone and is generally viewed as critical to the future success of self-driving technology. According to GM's press release,

“Strobe’s LiDAR technology will significantly improve the cost and capabilities of our vehicles so that we can more quickly accomplish our mission to deploy driverless vehicles at scale,” said Kyle Vogt, Founder and CEO, Cruise Automation.

“The successful deployment of self-driving vehicles will be highly dependent on the availability of LiDAR sensors,” said Julie Schoenfeld, Founder and CEO, Strobe, Inc. “Strobe’s deep engineering talent and technology backed by numerous patents will play a significant role in helping GM and Cruise bring these vehicles to market sooner than many think.”

The significance of the Strobe acquisition and of LiDAR to GM's autonomous driving ambitions is underscored in the following graphic, courtesy of [this](#) GM investor

presentation:

As you may recall from earlier in this Insight, proprietary LiDAR technology was at the root of the recent Waymo-Uber lawsuit. Waymo has previously indicated that it has

PROPRIETARY AV SENSORS

Category	Specifications
Currently Available LiDAR	• Effective range: 1x • Cost: ~\$20,000 • Quality Issues
Next Gen LiDAR	• Expected effective range: ~1.25x • Cost: ~\$10,000
Strobe + GM + Cruise	• Expected effective range: ~2.5x • Cost: ~\$300

STROBE ACQUISITION ENABLES SIGNIFICANT PERFORMANCE IMPROVEMENT AND COST REDUCTION

GENERAL MOTORS

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The graphic includes a photograph of a LiDAR sensor unit and a pen for scale. A navigation menu at the top lists various AV technologies, with 'Proprietary AV sensors' highlighted in blue.

developed its own LiDAR technology for about 10 percent of the cost of the Velodyne LiDAR used at the outset of its self-driving project. GM's claim that it can reduce the cost of its LiDAR to ~US\$300 would be a significant improvement on what Waymo has accomplished internally. Kyle Vogt provided further detail on the acquisition in [this](#) blog post from October 2017 where he noted the following:

To solve these problems we've acquired Strobe, a company that has quietly been building the leading next-generation LiDAR sensors. Strobe's new chip-scale LiDAR technology will significantly enhance the capabilities of our self-driving cars. But perhaps more importantly, by collapsing the entire sensor down to a single chip, we'll reduce the cost of each LiDAR on our self-driving cars by 99 percent.

Just one month earlier, in September 2017, Vogt heralded the launch of GM's third-generation driverless car - details [here](#).

So, today, we're unveiling the world's first mass-producible car designed to operate without a driver. This isn't just a concept design — it has airbags, crumple zones, and comfortable seats. It's assembled in a high-volume assembly plant capable of producing 100,000's of vehicles per year, and we'd like to keep that plant busy.

The car we're unveiling today is actually our third generation self-driving car, but it's the first that meets the redundancy and safety requirements we believe are necessary to operate without a driver. There's no other car like this in existence. In a few weeks, these cars will be a part of the fleet that carries Cruise employees anywhere in San Francisco using our app. For now, there will still be a human behind the wheel.

In the fall of 2017, GM launched its long-awaited "Super Cruise" capability in its 2018 Cadillac CT6 - details and review [here](#). While the company refuses to assign it an SAE level, we can imagine it as falling between Levels 2 and 3. Billed by GM as the world's first true hands-free driving system for the freeway, it allows for hands-free driving on 160,000 miles of expressway in the US and Canada, all previously mapped by GeoDigital, a startup in GM Venture's portfolio. The launch of Super Cruise was delayed considerably to allow GM time to incorporate an important safety feature in the form of a camera that monitors driver attentiveness. The system was designed by a company called FOVIO, part of SeeingMachines, and requires drivers to keep their eyes on the road ahead. After five seconds of the driver not paying attention, it starts to issue audible warnings. If the driver does not respond to its satisfaction, it shuts the system down and cannot be re-engaged until the car is next started.

On 15 March 2018, GM [announced](#) that it will invest more than US\$100 million to upgrade two facilities to enable mass production of its fourth generation Cruise AV, which is expected to begin in 2019.

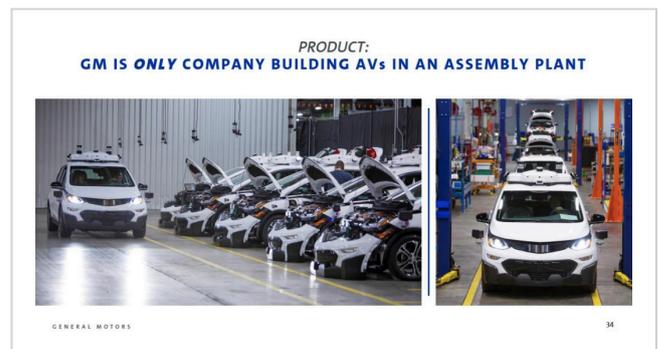
After more than a year of building test vehicles for the development of its self-driving technology, General Motors today announced it will build production versions of its Cruise AV at its Orion Township assembly plant in Michigan. Roof modules for GM's self-driving vehicles will be assembled at its Brownstown plant. The Cruise AV, which the company plans to commercialise in 2019, is the first production-ready vehicle built from the ground up to operate safely on its own with no driver, steering

wheel, pedals or manual controls. "We're continuing to make great progress on our plans to commercialise in 2019," said GM President Dan Ammann. "Our Orion and Brownstown teams have proven experience in building high-quality self-driving test vehicles and battery packs, so they are well-prepared to produce the Cruise AV."

Waymo Versus General Motors

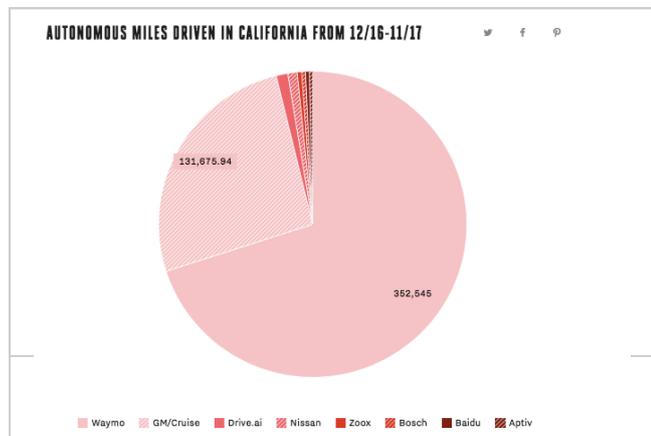
So, how do Waymo and GM compare in terms of their autonomous driving technology? To begin with, GM has clearly assembled an excellent team with the Cruise Automation acquisition at its core. Their thoughtful approach to the integration of the tiny startup into the GM behemoth would appear to have been highly successful thus far. GM claims that it is the only company in the world currently building AV's in a high-volume assembly plant. In fact, their whole point is that autonomous vehicles only become economical at scale.

The company further points out that mass-producing autonomous vehicles is a thousand times harder than developing a prototype - and again, we share that view. On the downside, we find their level of experience in



terms of autonomous miles driven and their so-called disengagement rate - the frequency with which their autonomous system is disabled by a physical driver to avert a potential accident - are both far behind Waymo. Take the latest results for 2017, available on the California Department Of Motor vehicles (DMV) website [here](#). Firstly, the following graphic, courtesy of *The Verge*, clearly shows that Waymo clocked up far more autonomous miles in California testing compared to GM - 2.7 times as many in fact.

Actually, most of Waymo's autonomous miles are now recorded in Phoenix, Arizona where the majority of its fleet is located. All told, Waymo claims to have clocked up over 5 million autonomous miles. When it comes to miles driven between disengagements, GM's data for 2017 is



summarised in the following chart, which we compiled from their annual disengagement report. As you can see, GM's performance showed significant improvement from month to month. However, its average number of miles between disengagements for the year was just 1,254.

Looking at the same data for Waymo for 2017, we see a much different picture as the following table shows:

In fact, Waymo's track record is almost 4.5 times better than GM when it comes to miles driven between disengagements.

Month	Year	Autonomous Miles	Disengagements	Miles Between Disengagements
December	2016	2948.63	8	368.58
January	2017	4729.82	12	394.15
February	2017	4160.15	10	416.02
March	2017	5595.61	8	699.45
April	2017	6908.4	19	363.60
May	2017	8838.12	7	1262.59
June	2017	10487.29	9	1165.25
July	2017	10442.18	12	870.18
August	2017	14877.2	8	1859.65
September	2017	16594.3	5	3318.86
October	2017	27576.32	3	9192.11
November	2017	18517.92	4	4629.48
Totals		131675.94	105	1254.06

This superior performance is hardly surprising, given that Waymo began its self-driving project way back in 2009

Month	Year	Autonomous Miles	Disengagements	Miles Between Disengagements
December	2016	57,614.80	11	5237.71
January	2017	45,392.20	7	6484.60
February	2017	35,459.70	4	8864.93
March	2017	35,873.20	4	8968.30
April	2017	27,238.70	10	2723.87
May	2017	16,617.20	5	3323.44
June	2017	13,917.20	6	2319.53
July	2017	19,182.50	3	6394.17
August	2017	20,456.70	3	6818.90
September	2017	22,967.00	6	3827.83
October	2017	27,308.70	3	9102.90
November	2017	30,516.70	1	30516.70
Total	63	352,544.60	63	5595.95

whereas GM really just got started in 2016. From that perspective, GM has made remarkable progress in a very short space of time and they are rapidly closing the gap with Waymo.

Waymo, for its part, will be the first company in the world to launch a driverless taxi service later this year. While their original vision was to build a driverless car from the ground up, that plan quickly changed with the appointment of Waymo's current CEO, John Krafcik. Krafcik's challenge was to rapidly commercialise Waymo's technology and he was (rightly) concerned about the company being in the complex business of manufacturing automobiles, something that was clearly not a core strength of the fledgling spin-out. His move to partner with Fiat Chrysler for the supply of minivans, which the company could equip with its own self-driving technology, gave Waymo a faster path to market - one that is rapidly coming to fruition in Phoenix, Arizona.

However, that partnership decision looks decidedly less strategic now in the light of Waymo's announcement in December 2017 that it would no longer pursue the development of discrete autopilot functionality typical of Level 3 systems, choosing instead to focus on fully autonomous Level 4 and 5 systems. The problem for Waymo is that their Pacific Chrysler minivans all come equipped

with manual driving controls, which are completely unnecessary in a Level 4 vehicle. In theory, Waymo could contract with Fiat Chrysler to manufacture a vehicle designed to their specifications. However, the relationship with Fiat Chrysler does not seem to run very deep, particularly in view of the fact that in August 2017, Fiat Chrysler announced that they were joining the Intel/BMW/MobilEye alliance - details [here](#).

BMW Group, Intel Corporation, Mobileye, an Intel company, and Fiat Chrysler Automobiles (FCA) signed a memorandum of understanding for FCA to join them in developing a world-leading, state-of-the-art autonomous driving platform. The cooperation allows the companies to leverage each other's individual strengths, capabilities, and resources. The platform will be scalable for Level 3 to Level 4/5 automated driving and can be used by multiple automakers around the world while maintaining their unique brand identities.

Ultimately, Waymo will need to find a solution for the mass-production of a vehicle suitable for Level 4 operation. Until they do, their scope will be limited to small-scale pilots and their economics will be disadvantaged by both the additional cost of unnecessary components (e.g. steering wheels, gas & brake pedals etc.) and the inefficiency of an unnecessary driver's seat which could accommodate a passenger instead.

Are We There Yet?

In answering this question, an anecdote about an American tourist lost in a remote part of Ireland asking for directions to Dublin comes to mind. The reply from a local wit? I wouldn't start from here if I were you! This is essentially the issue with autonomous driving and, specifically, the issue with Level 3 systems which we alluded to previously in this Insight. Merging Level 3 autonomous systems with a human driver still required to remain vigilant and capable of retaking control a moment's notice is fraught with risk, something that was underscored yet again by this week's fatal accident in Phoenix.

This simple reality has not been lost on the auto OEMs or, indeed, any of the leading players, and they have been quietly adjusting their plans to focus on taking the human driver completely out of the loop - in other words, achieving SAE Level 4. This change in strategy brings with it two important consequences, one technical and other financial. From a technical perspective, Level 4 systems will initially be restricted to specific urban areas, which have been digitally mapped with extreme precision, and which will need to be constantly updated. This will make them unsuitable for use as "consumer" vehicles, which traditionally have had no such geo-restrictions imposed on them.

The financial implications also need to be understood. While automobiles like the XC90 with reasonably advanced driver assistance features retail for around US\$50,000, Level 4 vehicles will initially be far more expensive to manufacture and maintain. Let's just say that, for now, most of us won't be buying one anytime soon. Hailing a ride in a driverless taxi powered by Waymo or GM will be the closest most of us will get to an autonomous driving experience for the remainder of this decade. So, no, we're not there yet!



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— William Keating (20 March 2018)



Jim Handy

Over 35 years of experience in the electronics industry including 20 years as a leading semiconductor and SSD industry analyst. His career spans roles at Intel, National Semiconductor, and Infineon.

The Ongoing Collapse of NAND and DRAM Flash Prices Is Bad News for the Semiconductor Market

September 2018

NAND and DRAM flash prices are expected to drop 10 percent in the first quarter of 2019. In August 2018, Jim Handy first pointed out to an audience at Flash Memory Summit that NAND flash memory was headed towards a contract price of US\$0.08 per gigabyte - even though it sold for three times as much throughout the previous two years. In this Insight, he warned that the price collapse would evaporate the profits of NAND flash makers like Samsung, Toshiba, and Intel.



"This trouble will eventually bleed into the DRAM market, as older planar NAND flash capacity will be re-purposed into DRAM production and lead to an oversupplied DRAM market. Eventually this will evolve into an industry-wide oversupply with losses in 2019-20, and even longer as China comes into the fray."

NAND Flash Prices Continue to Drop

By Jim Handy | 13 September 2018

EXECUTIVE SUMMARY

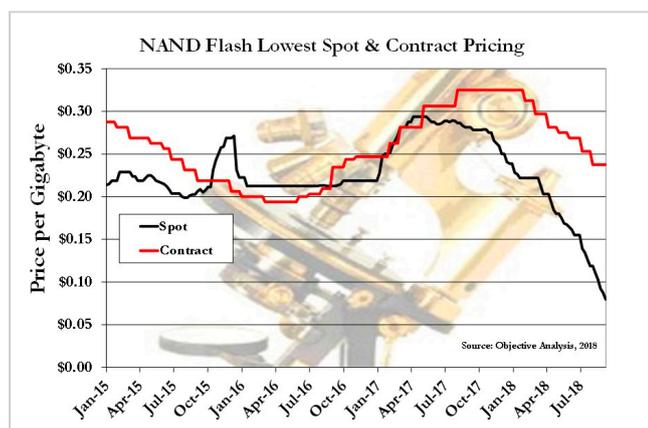
NAND flash prices, which have been in decline for the entire year, reached an interesting level of US\$0.08/GB on the spot market last week. This will have an adverse effect on NAND flash makers' incomes but will be positive for their customers, whose profits have been negatively impacted by the past two years of high prices.

DETAIL

I raised a number of eyebrows in early August at the [Flash Memory Summit](#), a Silicon Valley technology conference, when I told an audience that NAND flash was headed towards a contract price of [eight cents per gigabyte](#). For most of 2016 and 2017, it had been selling for three times that number.

Last week, spot market tracking firm [InSpectrum](#), whose flash data is generally more accurate than that of its more popular competitor, [DRAMeXchange](#), reported that the lowest prices on the spot market for the 512GB and the 256GB TLC NAND chips were US\$5.10 and US\$2.55. This works out to just less than 8 cents.

I track these numbers every week. This is a chart of NAND's lowest price per gigabyte on both the contract and spot markets based on pricing from InSpectrum.



Quite clearly, this technology is in a price fall and this is just the beginning of the general unraveling of semiconductor profits that I have been predicting for the past two years.

I should explain what the spot market is to anyone who is not close to this market. There are brokers who find homes for excess product by keeping in touch with a network of buyers who may need something in a hurry and are unable to get it from the manufacturer. Say that a phone manufacturer found that one of their models wasn't selling as well as they forecast and they want to get rid of an excess of NAND flash that they have in inventory. The broker matches them up with someone who has the opposite problem. This activity, known as the "Spot Market", accounts for a very small portion of the overall market - far below 5 percent.

Naturally, prices in this environment are extraordinarily sensitive to shortages and oversupplies. Prices skyrocket when there's a shortage and, when there's an oversupply, prices plummet. The spot market attracts a lot of attention because it serves as a leading indicator for contract prices, which account for the bulk of the market.

Although the chart also shows price per gigabyte derived from InSpectrum's contract price information, this data is far less consistent than other sources like the [World Semiconductor Trade Statistics](#), or [WSTS](#). Please treat the red line with caution.

What does a NAND flash price collapse mean to the market? To the NAND flash makers - Samsung, SK hynix, Toshiba, WDC, Micron, and Intel - it indicates that profits are evaporating. Even worse, this trouble will eventually bleed into the DRAM market, as older planar NAND flash capacity will be repurposed into DRAM production and lead to an oversupplied DRAM market. Eventually, this will evolve into an industry-wide oversupply with losses in 2019-20 and even longer as China comes into the fray. ([Objective Analysis](#) has just released a report on [China's Memory Ambitions](#).)

To consumers of NAND flash this means that their COGS will drop, allowing some relief for margins. This will impact all of the cell phone makers and many producers of flash cards, cameras, and similar consumer goods. As the oversupply broadens, it will do the same for DRAM users (PCs, servers, and cell phones) and then, eventually, for all semiconductor users.

In their second quarter earnings calls, SK hynix reported a 9 percent quarterly decrease in NAND flash prices and Samsung reported declines in the “low teens”. Watch for Micron’s earnings announcement next week to include a noticeable reduction in NAND flash prices, although I don’t anticipate a DRAM decline quite yet.

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— Jim Handy (13 September 2018)



Mio Kato

Specialises in quantitative and regression analysis of financial statements with emphasis on putting valuation in context against history, peers, and market conditions.

Aston Martin Sputtering into the Public Markets

September 2018

Mid-2018, the FCA went ahead with a long-planned reform of the IPO process in the UK. The changes made it possible for analysts to access prospectus information and data on companies going public, enabling greater transparency and polyphony in investment research. Insight Providers publishing on Smartkarma made the most of it by going in-depth in the legendary automaker's IPO. Mio Kato was not floored by what he found, as concerns about positive cash flow and a thin balanced sheet reared their head - in what ended up being a disappointing listing.



"The stock is a very leveraged bet on the success of the launch of high luxury SUVs and the high luxury market in general. This probably depends on a conducive market and strong economic conditions to be successful, and the extrapolation of post GFC growth in luxury goods spending out another eight years strikes us as decidedly optimistic."

Lagonda: IPO Dressed Up Prettier Than Their Cars

By Mio Kato | 26 September 2018

EXECUTIVE SUMMARY

Aston Martin Holdings UK Ltd (8444762Z LN) looks poised for strong growth in the very near term, but we consider the sustainability of the company's business model to be in question.

- Capitalisation of R&D expenses and advances from customers for limited-edition vehicles are masking a severe drain on cash.
- They also present significant risks in the event of a downturn due to an extremely stretched balance sheet.
- Volume trends for Aston Martin models look unstable with significant incidences of year-1 peak-outs in volume, and the launch of the company's two highest-volume models within the span of about two and a half years opens the possibility of chronically weakening sales until the next model changes in seven years' time.
- Given that the DBX will be a new model category and will be produced at a new factory, it may be early to start discounting success and if the company's investments for the launch are impaired, that could severely harm an already weak balance sheet.

DETAIL

1H2018 Revenue and Profitability Inflated by Licensing Income and Special Editions

According to the company's prospectus:



*The increase in revenue for the six months ended 30 June 2018 is primarily attributable to increased revenue from the sale of special editions, in particular the Vanquish Zagato family and DB4GT Continuation models as well as the sale of intellectual property and related assets by Aston Martin Consulting. **In particular, revenue increased as a result of the new revenue stream from partnerships including brand extension activities, Aston Martin Consulting and motorsport, following the sale of a licensing contract in the period for £20.0 million for the use of certain intellectual property.** As at the Latest Practicable Date, the first stage payment for the licensing contract of £5.0 million, due 31 August 2018, had not been received. Further stage payments in the same amount are expected 31 December 2018, 30 June 2019, and 31 December 2019.*

This £20 million is actually reasonably significant as excluding it would imply that underlying revenue only grew 3.6 percent rather than the 8.4 percent reported, while gross margin would have been 42.4 percent rather than the 45.0 percent reported.

	(£ in millions)	(% of total revenue)	(£ in millions)	(% of total revenue)
Consolidated statement of comprehensive income: (unaudited)				
Revenue	410.3	100.0	444.9	100.0
Cost of sales	(251.2)	(61.2)	(244.5)	(55.0)
Gross profit	159.1	38.8	200.4	45.0
Selling and distribution expenses	(30.0)	(7.3)	(45.1)	(10.1)
Administrative and other expenses	(74.1)	(18.1)	(90.9)	(20.4)
Operating profit / (loss)	55.0	13.4	64.4	14.5
Finance income	23.1	5.6	2.3	1.0
Finance expense ⁽¹⁾	(57.8)	(14.1)	(45.9)	(10.3)
Net finance expense	(34.7)	(8.5)	(43.6)	(9.8)
Profit / (loss) before tax	20.3	4.9	20.8	4.7
Income tax (charge) / credit	(4.2)	(1.0)	(9.3)	(2.1)
Profit / (loss) for the period	16.1	3.9	11.5	2.6
Other comprehensive income / (expense) for the period, net of income tax	(5.9)	(1.4)	8.6	1.9
Total comprehensive income / (expense) for the period	10.2	2.5	20.1	4.5

Source: Company disclosures

Furthermore, it seems likely that underlying demand for core models was weak (volumes YTD appear to be down in regions other than Asia). Short-term performance should pick up with the release of the new Vantage model and the DBS Superleggera but we question the sustainability of recent volumes if the new DBX luxury SUV fails to generate significant volumes. Historical data suggests that Aston Martin models tend to see volumes peak out in the first full year of sales and decline steadily thereafter whereas Ferrari models tend to peak in the second or third year and decline more gradually. With the high-volume DB11 and Vantage being released in quick succession and the company's special edition sales providing a boost to revenue and profit, this is a good a time for an IPO if you are a seller. But for buyers, that would mean depending on the new DBX, which is in a category that is new to Aston Martin and is being built at a new factory, to buffer volumes as sales of the key volume models decline.

Revenue Declined YoY in EMEA and Americas in 1H2018 and, Excluding Licensing Revenue, was Probably Flat in the UK

£m, except percentages	For the year ended 31 December			For the six months ended 30 June	
	2015	2016	2017	2017 (unaudited)	2018
U.K.	135.4	165.4	227.9	110.0	133.3
U.K. year on year growth	-	22.2%	37.8%	-	21.2%
EMEA	114.5	150.6	201.2	107.7	102.9
EMEA year on year growth	-	31.5%	33.6%	-	(4.5)%
Americas	142.6	146.8	242.1	101.0	84.5
Americas year on year growth	-	2.9%	64.9%	-	(16.3)%
Asia Pacific	117.7	130.7	204.8	91.6	124.2
Asia Pacific year on year growth	-	11.0%	56.7%	-	35.6%
Revenue	510.2	593.5	876.0	410.3	444.9

Source: Company disclosures

Core Business May Not be Able to Generate Positive Cash Flow

As Sumeet Singh pointed out in [Aston Martin Lagonda Pre-IPO Under the New IPO Process - Lots to like Apart from R&D Capitalisation and Aston Martin IPO - It Ain't No Ferrari - Fairly Priced at the Low End at Best](#), Aston Martin is capitalising R&D in an extremely aggressive fashion.

£m	Note	For the year ended 31 December			For the six months ended 30 June	
		2015	2016	2017	2017 (unaudited)	2018
Consolidated statement of cash flows						
Operating activities						
Profit/(loss) for the period	(107.0)	(147.6)	76.8	16.1	11.5	
Tax on continuing operations	3.3	(21.0)	(15.2)	7.7	4.2	
Net finance costs	66.8	122.3	37.9	20.2	40.8	
Other non-cash movements	1.1	1.0	(0.7)	(0.8)	0.4	
Losses/(gains) on sale of property, plant and equipment	0.1	-	(0.1)	-	-	
Depreciation and impairment of property, plant and equipment	5.1	46.3	38.3	27.4	12.6	
Amortisation and impairment of intangible assets	5.2	73.2	94.9	54.8	25.4	
Difference between pension contributions paid and amounts recognised in income statement	(0.4)	(1.1)	(20.0)	2.1	(1.5)	
Decrease/(increase) in inventories	18.1	(36.8)	(10.6)	(17.8)	(42.1)	
(Increase)/decrease in trade and other receivables	(19.8)	(39.1)	(7.8)	14.6	(73.5)	
Increase in trade and other payables	21.6	150.3	166.6	14.4	80.3	
Movement in provisions	(2.9)	(1.3)	12.5	4.1	-	
Cash generated from operations	78.1	165.7	344.5	95.1	66.7	
Income taxes paid	(0.9)	(1.1)	(0.7)	(0.6)	(4.7)	
Net cash inflow from operating activities	77.2	164.6	343.8	94.5	62.0	
Cash flows from investing activities						
Interest received	2.1	2.2	3.1	1.8	2.3	
Proceeds on the disposal of property, plant and equipment	0.1	0.5	0.2	-	-	
Loan to shareholders	-	-	(5.6)	-	-	
Payment to acquire subsidiary undertaking	4.0	-	(50.0)	-	-	
Payments to acquire property, plant and equipment	(38.5)	(68.3)	(75.0)	(32.8)	(60.9)	
Payments to acquire intangible assets	(124.7)	(124.6)	(218.1)	(74.5)	(81.5)	
Net cash used in investing activities	(161.0)	(190.2)	(346.4)	(105.5)	(150.1)	
Cash flows from financing activities						
Interest paid	(32.3)	(32.6)	(49.8)	(31.1)	(20.3)	
Proceeds from equity share issue	2.4	-	-	-	-	
Dividend paid to non-controlling interest	-	-	-	-	(3.0)	
Repayments of existing borrowings	(3.8)	(13.8)	(474.3)	(472.4)	-	
Proceeds from new borrowings	100.0	100.0	606.1	549.9	16.2	
Transaction fees paid	(3.5)	-	(12.1)	(13.2)	(0.1)	
Net cash inflow from financing activities	62.8	53.6	89.9	33.1	(7.2)	
Net (decrease)/increase in cash and cash equivalents	(22.0)	28.0	67.3	22.1	(64.3)	
Cash and cash equivalents at the beginning of the period	59.2	65.5	101.7	101.7	167.9	
Effect of exchange rates on cash and cash equivalents	(0.7)	8.2	(1.2)	(0.8)	(1.0)	
Cash and cash equivalents at the end of the period	6.1	65.5	167.8	123.0	71.5	

(1) Adjustments comprise changes in working capital, depreciation and amortisation, changes in provisions, income taxes and net finance costs.

Source: Company disclosures

GBP m	2015	2016	2017	1H2017	1H2018
Net cash inflow from operating	75.2	164.6	343.8	94.5	62.0
Less payments to acquire	-124.7	-124.6	-219.1	-74.5	-91.5
Less increase in trade and other	-21.6	-150.3	-166.6	-14.4	-80.3
Adjusted operating cash flow	-71.1	-110.3	-41.9	5.6	-109.8

As far as the cash flow statement is concerned, this essentially inflates “net cash inflow from operating activities” by roughly the amount noted under “payments to acquire intangible assets”. Furthermore, customer advances for special edition vehicles have grossly inflated payables and appear to be the driver of the £150.3 million, £166.6 million, and £80.3 million increases in 2016, 2017, and 1H2018 respectively. Adjusting for these discrepancies shows operating cash flow that is consistently deep in the red.

company also disclosed that it had booked impairment charges of £30.2 million in 2015 and £48.7 million in 2016, though thankfully none were booked in 2017 just prior to the IPO... of course. These values would have corresponded to about 8.7 percent and 12.3 percent of the carrying values of deferred development costs at those points in time. Unless these impairments were, in fact, unusual and not a recurring occurrence for the company, there is a significant risk of the company remaining chronically unprofitable.

Paper Thin Balance Sheet

On headline numbers, Aston Martin Lagonda’s balance sheet is extremely weak with just £153.1 million in equity and £822.4 million in net debt (of which £276.6 million is preference shares). A 356 percent net D/E ratio suggests a very weak balance sheet but this number may actually flatter reality.

	and other		cost			
Amortisation						
Balance at 1 January 2015	-	60.7	28.9	140.3	0.2	230.1
Amortisation charge	-	19.4	9.7	44.0	0.1	73.2
Balance at 31 December 2015	-	80.1	38.6	184.3	0.3	303.3
Amortisation charge	-	0.5	9.3	85.0	0.1	94.9
Disposals	-	(80.1)	-	-	-	(80.1)
Balance at 31 December 2016	-	0.5	47.9	269.3	0.4	318.1
Amortisation charge	-	1.9	3.6	49.2	0.1	54.8
Acquisitions	-	-	1.9	-	-	1.9
Disposals	-	-	(1.5)	-	-	(1.5)
Balance at 31 December 2017	-	2.4	51.9	318.5	0.5	373.3
Amortisation charge	-	0.9	2.2	25.4	0.1	28.6
Balance at 30 June 2018	-	3.3	54.1	343.9	0.6	401.9
Carrying amounts						
At 1 January 2015	242.6	40.6	19.7	237.7	85.2	625.8
At 31 December 2015	242.6	21.2	12.6	315.8	85.1	677.3
At 31 December 2016	242.6	20.7	11.3	347.4	85.0	707.0
At 31 December 2017	297.6	18.8	18.0	511.4	84.9	930.7
At 30 June 2018	297.6	17.9	19.7	573.6	84.8	993.6

Source: Company disclosures

Of the company’s £993.6 million of intangible assets as of June 2018 (649 percent of equity), £573.6 million were deferred development costs (375 percent of equity). The

Trade and other payables					
Current liabilities					
(£m)	As at 31 December			As at 30 June	
	2015	2016	2017	2018	2018
Trade payables	63.6	93.1	54.9		93.7
Due to related parties	0.5	1.7	0.6		0.7
Accruals and other payables	116.2	246.1	427.6		470.8
	180.3	340.9	483.1		565.2

In addition, the company is carrying £470.8 million accruals and other payables, which we assume are related to the advances from customers for limited edition models. We would note that the Aston Martin Valkyrie and Valkyrie AMR Pro, which should start deliveries in 4Q2019 are priced at £2,399,940 and £4,000,000 respectively and 150 and 25 respectively have been ordered. The implied value for these vehicles would be about £460 million and there are a variety of other special edition models so we believe these liabilities are indeed customer deposits. The key issue is whether it is possible to continue generating such demand and we do not view these limited edition sales as being sustainable at the current rate.

On the negative side, if we treat these deposits as debt, that would mean net debt and prefs worth £1,293.2 million set against just £153.1 million in equity. Looking at it positively, it stands to reason that margins for these deliveries could be extremely high and assuming, say, a 50 percent net margin would imply that £235.4 million would be added to equity at the end of 2019, which would strengthen the balance sheet significantly.

The Bottom Line

What confuses us is why no capital is being raised for the company and why only existing shares are being sold. Especially with the balance sheet in the state it is in. Perhaps it can be taken as a sign of confidence in the near term future of the company and that R&D expenses will peak out quickly. With several key model launches and a potential windfall from the production and sale of the Valkyrie hypercars, there are things to get excited about. However, this strategy seems like a very all-or-nothing approach and the additional headwind with very demanding valuations makes this an IPO worth avoiding, in our opinion.

Ultimately the stock is a very leveraged bet on the success of the launch of high-luxury SUVs and the high-luxury market in general. This probably depends on a conducive market and strong economic conditions to be successful, and the extrapolation of post-GFC growth in luxury goods spending out another eight years strikes us as decidedly optimistic. This looks like the definition of a Hail Mary pass to us and if rate hikes or trade wars engender a global recession, this would probably be one of the juicier shorts out there.

Disclosure & Certification

- I/We have no position(s) in any of the securities referenced in this Insight.
- Views expressed in this Insight accurately reflects my/our personal opinion(s) about the referenced securities and issuers and/or other subject matter as appropriate.
- This Insight does not contain and is not based on any non-public, material information.
- To the best of my/our knowledge, the views expressed in this Insight comply with Singapore law as well as applicable law in the country from which it is posted.
- I/We have not been commissioned to write this Insight or hold any specific opinion on the securities referenced therein.
- I/We have signed the Insight Provider Agreement and this Insight does not violate any of the terms specified therein.
- This Insight is for informational purposes only and is not intended to provide financial, investment or other professional advice. It should not be construed as an offer to sell, a solicitation of an offer to buy, or a recommendation for any security.

— LightStream Research (26 September 2018)



Sumeet Singh

Head of IPO & Placements for Aequitas Research, covering listings across Asia, with a two-year hit rate of 77 percent across 170+ IPOs and 65 percent across 180+ placements.

He has also covered ASEAN property and the banking space in India.

Japan's First Unicorn Delivered On Massive IPO

June 2018

Mercari was the first technology startup in Japan to achieve “unicorn” status - that is, reach a valuation of more than US\$1 billion. In a country where startup activity is still lukewarm, the peer-to-peer ecommerce app not only managed to grow and expand out of Japan, but also raised US\$1.2 billion in a massively oversubscribed IPO in late June 2018 - the largest since the listing of fellow tech company Line Corp. Sumeet Singh presented the following analysis of Mercari's position, offering a positive view of the stock but cautioning against the company's prospects in the US and European markets. Since then, Mercari's stock price has wavered and it's announced the winding down of its UK operations, but the company continues to forge ahead.



“In its Japan operations, Mercari seems to be far ahead of its global peers in the space in terms of dominance in its home country and ability to monetise. Its shipping tie-ups in Japan solve a major pain point, along with its payment and feedback mechanism. The company seems to have executed its Japan operations exceptionally well and can easily turn profitable on a consolidated basis. At the same time, the founder seems to have a penchant for world dominance which might lead to the company overextending in terms of geography and product verticals. Both of which could drag profitability and create a negative overhang.”

Mercari IPO - Going Bold, Without Fear of Failure - Some Bits Might Apply to Investors

By Sumeet Singh | 5 June 2018

EXECUTIVE SUMMARY

[Mercari Inc \(4385 JP\)](#) plans to raise US\$1.2 billion in its IPO through a mix of a sale of primary and secondary shares. The IPO has been well-covered by [Chacko Jacob](#) and [Mio Kato, CFA](#) over the past month, you can find their Insights [here](#).

In our view, Mercari compares very favourably in terms of monetisation versus some other flea market apps in Southeast Asia and the US. Moreover, despite the high download numbers in Japan, the transacting MAU figure seems to be fairly low versus MAUs and downloads, which provides ample opportunity for growth on its home turf even if downloads plateau.

The main risks for the company will arise from well-funded global peers who could force it to cut its selling fees overseas or increasing ad spending. The other main risk for investors would stem from the company's ethos of "Going Bold, Without Fear of Failure", which might not be such a great idea for profitability in the near/medium term.

Nonetheless, the company has been able to demonstrate a great monetisation track record as well as a knack for innovative solutions (barcode scanning to correctly tag products, MercariNOW, etc). Given the revised price range, one would have to be bold to go in big but valuations aren't as expensive as the P/S ratio makes it appear.

DETAIL

Deal and framework score overview

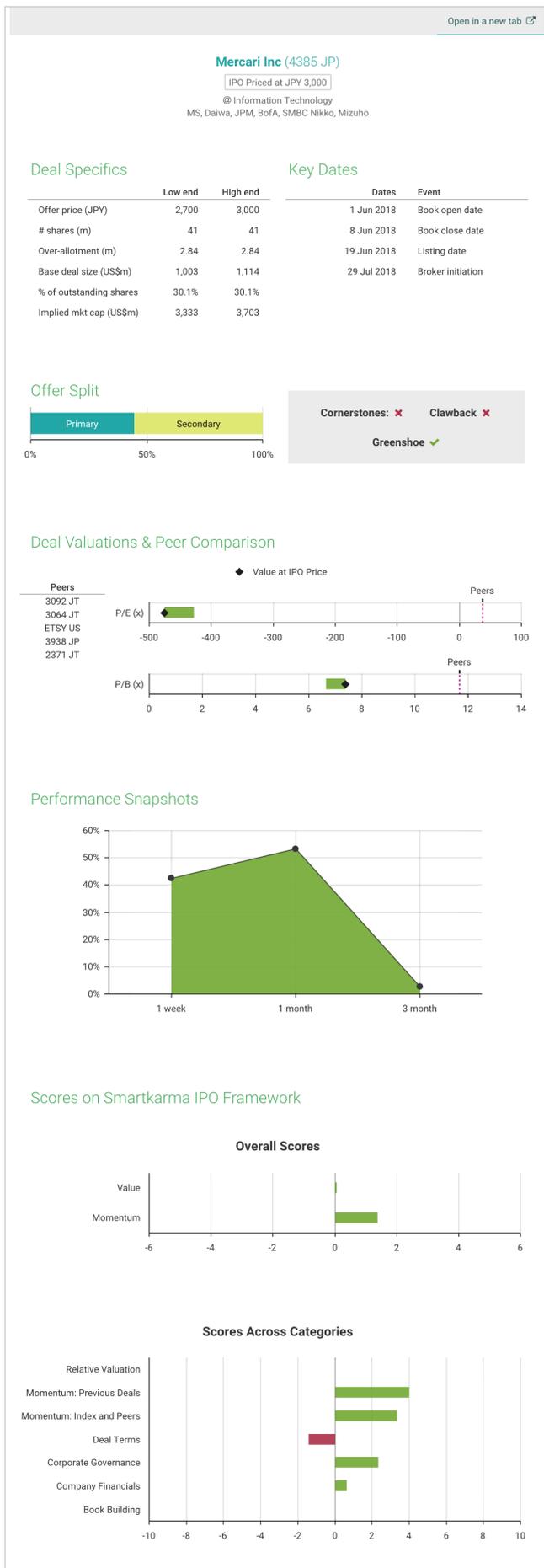
The below chart is from Smartkarma's IPO tool, which has been designed to provide you with timely information on all IPO-related events (book open/closing, listing, initiation, lock-up expiry, etc). It also provides easy access to all the past deals that we have worked on. You can view the tool [here](#) or through the [tools](#) menu.

See details of scoring on our framework [on the next page](#).

Our take on the deal

Mercari IPO has been very well covered by [Chacko Jacob](#) and [Mio Kato, CFA](#) from [LightStream Research](#). For the sake of brevity, we will not cover the points that have already been dealt with. Hence, we would encourage you to read the earlier write-ups by the [LightStream Research](#) team:

- [Mercari Inc: The Hunt for Discounts Gives Birth to a Unicorn - I](#)
- [Mercari Inc: Flea-Market Apps Are the Future For The Second-Hand Goods Market in Japan - II](#)
- [Mercari Inc: A Case For Directing Attention to the East - III](#)
- [Mercari: Valuation and Some Observations](#)
- [Mercari: Valuation Update and Some Peer Charts for Context](#)



For a little more industry context you can also read this series for insights, [Can Tech Save the Declining Japanese Apparel Industry? : FashionTech Series \(3/ 3\)](#) from [Euromonitor International Ltd.](#)

Thoughts from trying second-hand sales apps - it's a painful process

To give you a bit of context of where I am coming from while writing on this deal, I've written a brief summary of my own (mostly my wife's) limited experience in trying to sell/buy something using the local homegrown app in Singapore, Carousell.

The painful process

As a seller:

- You have to answer multiple questions. Most of them linked to how low one can go on the price. After multiple rounds of back and forth, a lot of would-be buyers disappear.
- If someone is genuinely interested then you have to arrange a time and place to meet. It is a lot harder to do than it sounds, even in a relatively dense city like Singapore.
- If you do find a buyer, again there is the last-minute haggling on the price.
- Despite the painful process, we have managed to sell a few things. **Mostly cheaper items.**

As a buyer:

- You have to worry about checking everything before you hand over the cash.
- You have to get the exact cash, which means a dash to the ATM before the meeting.
- You have to arrange for a time and convenient place to meet. It is a lot harder to do than it sounds, as mentioned earlier.
- The description is always a little too rosy. While looking for an [Osprey Poco Child carrier](#) (for some reason these aren't retailed in Singapore), a description read, "very sparingly used". Needless to say, that wasn't the case and we walked away within 15 seconds of seeing the

item without even bothering to ask for a lower price. We did finally get a child carrier that was sparingly used but that wasn't bought through Carousell. **We have yet to buy anything on Carousell.**

Apart from Carousell, there are numerous Facebook groups dedicated to selling/buying particular category items. In addition, there are a number of condos in Singapore that have their own Facebook/WhatsApp/some other app groups for residents to buy and sell things within their vicinity. There is also the newly launched Facebook Marketplace, which I haven't tried yet. They all have issues - for one, you can't really be anonymous and the whole process of going back and forth is generally a little more painful than Carousell with some having weird queuing systems etc. Nonetheless, we did get the child carrier finally through a Facebook group.

There are even blogs dedicated to the funny side of the painful process which you can find [here](#) and [here](#). It's worth a read if you have time - it's quite funny!

Mercari addresses some of these pain points

While I haven't used Mercari, from what I've read it already addresses most of these pain points.

- The shipping options with over 74,000 access points sound like a game changer because they take away the pain of meeting to buy and sell. ***This almost places it on par with doing a regular online transaction where the goods arrive at your house.***
- Making a payment before the item is shipped and a review before the payment is released takes away the pain of a dash to the ATM to get the exact cash amount for the buyer and the disappearance of buyers for the seller.
- The ratings take away the pain of having to make sure everything is all right within the 5-10 minutes that one spends looking at the product before paying.

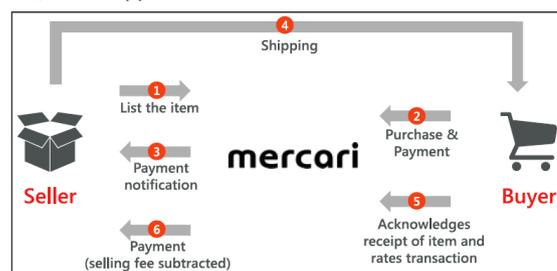
We offer our sellers a number of stress-free shipping options at reduced fixed rates for delivery throughout Japan through our shipping partners. In Japan, sellers can drop off packages for shipping at roughly 74,000 locations nationwide or have packages conveniently picked up from their home by a shipping provider. Mercari simplifies the shipping process by generating a QR code or barcode that our sellers can scan at

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participating shipping outlets, and provides anonymous shipping without the need for buyers and sellers to share their personal shipping information, thereby protecting their privacy.



Mercari provides a safe and secure escrow payment service. Once the buyer decides to make a purchase, we receive the payment in escrow, and the seller receives a notification from us after payment is made by the buyer that the item may be shipped. Once the buyer receives the item and both the buyer and the seller rate the transaction, we release the payment to the seller.



Transparent Rating and Review System

As part of each sale process, buyers and sellers are required to review each other by providing both a numerical rating and review commentary. These reviews are made available to the entire Mercari community. As our business has expanded, we have accumulated a large pool of review data. Cumulative user ratings are displayed on the user pages. Our transparent marketplace enhances accountability for sellers and buyers and helps support an enjoyable and trustworthy marketplace.

Some pain points will remain, like spending time going back and forth with enquiries and the prospect of goods being defective/reviews being wrong/dealing with returns/fakes, etc. but it seems to have done a fairly good job in getting rid of some of the bigger pain points.

Some other positives

- **Fast sales** - During the three months ending March 2018, Mercari had an average 24.6 million items listing per month and 10.6 million completed transactions per month. This implies that around 43 percent of the items that are listed are being sold within the first month.

The math is not exact, since it's averages, and some of the items sold could be from prior months but nonetheless, for a second-hand market, the 43 percent number seems quite credible. As per some media reports and analyst reports, the company claims that 50 percent of the items that are listed are sold within 24 hours. That is quick.

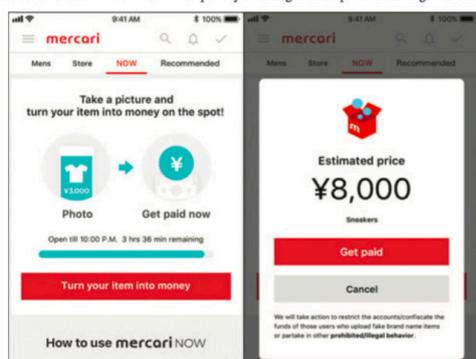
C2C Network Effects and "Sticky" Community Create a Self-reinforcing Platform

Our marketplace benefits from C2C network effects that encourage our users to more actively engage as buyers and sellers, which in turn generates more listings and purchases. For users' convenience, we also allow sellers to convert proceeds from sales of their items to points that can be used to purchase other items. Partly as a result, a large portion of our users engage in our marketplace as both buyers and sellers. During the three months ended March 2018, an average of 55.2% sellers per month who had listed at least one item in a particular month had also bought at least one item on Mercari in the same month and an average of 36.7% per month of buyers who had purchased at least one item in a particular month had also listed at least one item for sale on Mercari in the same month, and we had an average of 24.6 million item listings per month and 10.6 million completed transactions per month on our marketplace. Comparing the three months ended March 2018 to the three months ended March 2017, the number of monthly unique buyers increased by 35.2% and the number of unique sellers who had listed at least one item increased by 26.4%, reaching a monthly average of 3.1 million unique buyers and 2.0 million unique sellers in the three months ended March 2018. We continue to win loyalty from buyers and sellers, with repeat users continuing to drive the substantial majority of our GMV growth. In addition, our substantial pool of user ratings reinforces a sense of community and security, making it comparatively difficult for other services to compete for our user base.

- **Has been addressing other pain points as well through new products** - Even though Mercari is a relatively young company, it has been addressing more pain points in the second-hand market through new apps. It has launched apps for specific categories and, more recently, it launched MercariNOW, which allows users to immediately sell certain brand-name items at a proposed sales price. **This takes out another pain point of needless haggling and back-and-forth.**

Mercari NOW

In November 2017, we introduced *Mercari NOW*, a feature which allows users to immediately sell certain brand-name items to us by uploading a photo of the item and agreeing to our proposed sales price. We believe this service addresses a need for sellers who want to sell items quickly without waiting for a buyer. We generate the sales price for items by using artificial intelligence to analyze the extensive transaction data we have accumulated through the *Mercari* marketplace. After purchasing items, we resell the items through the *Mercari* marketplace or to third parties. Each user may use *Mercari NOW* to sell goods up to an amount of ¥20,000 per item. We have established a limit of ¥10 million per day of total goods we purchase through *Mercari NOW*.



Some Negatives

See no rationale for US or UK entry

To put it bluntly, apart from the founder wanting to make it big on a global basis, we see no other rationale for the app's presence in the US and UK. There are absolutely no

synergies between Japan and these two markets and, given the distinctive cultures, there is probably little learning that the company can transport across. Moreover, there seems to be **ample competition overseas**.

Furthermore, we feel that Mercari's moat in Japan is its tie-up with retailers, Yamato, and Japan Post to make shipping seamless - which doesn't seem to have been replicated in the US. While it does have a tie-up with USPS and FedEx, it doesn't mention the total access points, which seems to imply that they aren't as high and the tie-up is not exclusive.

United States

In the United States, sellers can choose between using a prepaid shipping label that we email to them or procuring their own shipping label using the carrier of their choice that supports package tracking. We offer fixed, low-rate shipping labels for U.S. Postal Service, or USPS, and FedEx for packages with a range of weights. Sellers who choose to use our shipping service select the weight of the item when creating the listing automatically receive prepaid and addressed label by email after the item is sold. Current USPS and FedEx shipping rates vary depending on the package size. USPS labels offer tracking information and easy drop-off at numerous retail locations. FedEx labels similarly offer tracking information and easy drop-off at any FedEx location or participating Walgreens pharmacy.

Chacko Jacob wrote about some of this in his earlier insight. We tend to agree that the company would have been better off trying to expand in Southeast Asia and, if it really wanted to be ambitious, it could have allowed highly rated sellers and buyers (to reduce the risk of returns) to buy/sell items from overseas and thus, become a truly regional platform.

Ecosystem plans look a little far-fetched

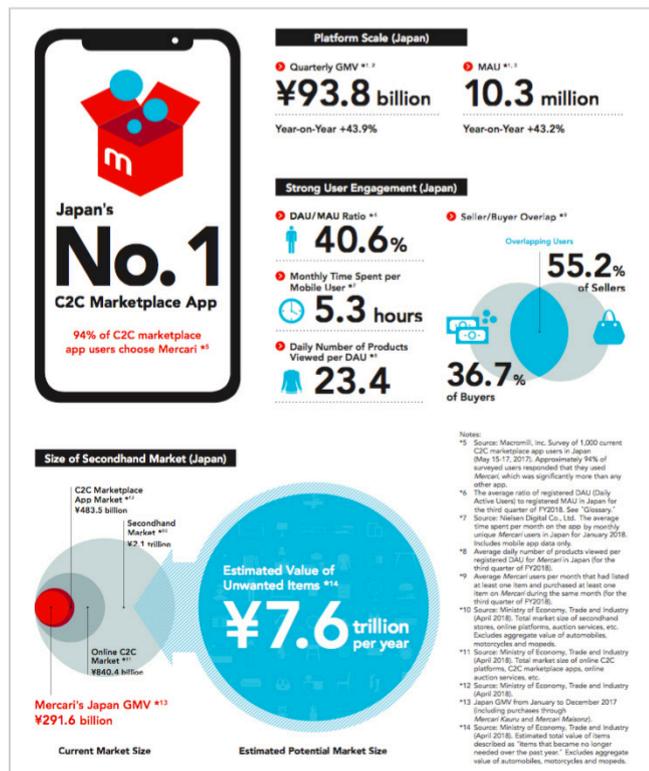
The company is not short of ambition. Even domestically, in true conglomerate fashion, it seems it wants to be present where it can be present. While an expansion into payments makes sense, bike sharing and teacher-student matching service just seem to be a rip-off of ideas that have been doing well in China and which the company probably feels it could do some justice to in Japan.

Develop a Self-reinforcing Mercari Ecosystem

We are also seeking to leverage our large user base and further expand our business in Japan by developing an ecosystem of services for our users built around the integrated use of the *Mercari* user ID. We expect an ecosystem linked through the *Mercari* user ID will enable us and our users to benefit from our extensive *Mercari* user ratings and transaction history. We contemplate permitting payments through our planned *merpay* payment platform which offers a number of payment methods including the use of *Mercari* account balances across a broad range of online and offline services. Our concept for this ecosystem, which is expected to encompass services offered by us as well as services provided by third party partners, is to be focused on meeting various needs of our users' everyday lives and may include services such as C2C and B2C online marketplace transactions, online C2C services such as housekeeping or tutoring services and offline payments at shopping and dining establishments. Users will be able to demonstrate their creditworthiness and reliability based on their *Mercari* user rating and also make online and offline payments for such services through *merpay*, including through using *Mercari* sales proceeds. We believe that this ecosystem concept will allow us to further reinforce our user base and enhance user engagement by increasing the number of contact points with our services through supporting everyday transactions. As an initial step in building our ecosystem, we have launched *Merchari*, a bicycle-sharing service, and *teacha*, a C2C teacher-student matching service, and we plan to continue to explore other services that may contribute to expansion of our ecosystem. With respect to payment services, we believe that our planned *merpay* platform will have a distinct competitive advantage due to the high engagement of our existing user base and because *Mercari* sales proceeds provide a convenient source of funds, making it unnecessary to deposit funds from an outside account. Moreover, we may explore a variety of possibilities for *merpay*, including developing mobile payment services and providing other financial services by leveraging *Mercari* user data such as transaction history and user ratings as a tool to evaluate the creditworthiness of users.

Number of transacting users is lower than it seems

Mercari states that over 3Q18 (quarter ending March 2018), on an average over the three months, 55.2 percent of its sellers who had listed at least one item also bought an item, and 36.7 percent of buyers had listed an item.



In a different part of the prospectus, it also states that, over the same months, on an average it had 3.1 million unique buyers and 2.0 million unique sellers - which had shown YoY growth of 26.4 percent and 35.2 percent respectively.

C2C network effects and "sticky" community create a self-reinforcing platform

Our marketplace benefits from C2C network effects that encourage our users to more actively engage as buyers and sellers, which in turn generates more listings and purchases. For users' convenience, we also allow sellers to convert proceeds from sales of their items to points that can be used to purchase other items. Partly as a result, a large portion of our users engage in our marketplace as both buyers and sellers. During the three months ended March 2018, an average of 55.2% sellers per month who had listed at least one item in a particular month had also bought at least one item on Mercari in the same month and an average of 36.7% per month of buyers who had purchased at least one item in a particular month had also listed at least one item for sale on Mercari in the same month, and we had an average of 24.6 million item listings per month and 10.6 million completed transactions per month on our marketplace. Comparing the three months ended March 2018 to the three months ended March 2017, the number of monthly unique buyers increased by 35.2% and the number of unique sellers who had listed at least one item increased by 26.4%, reaching a monthly average of 3.1 million unique buyers and 2.0 million unique sellers in the three months ended March 2018. We continue to win loyalty from buyers and sellers, with repeat users continuing to drive the substantial majority of our GMV growth. In addition, our substantial pool of user ratings reinforces a sense of community and security, making it comparatively difficult for other services to compete for our user base.

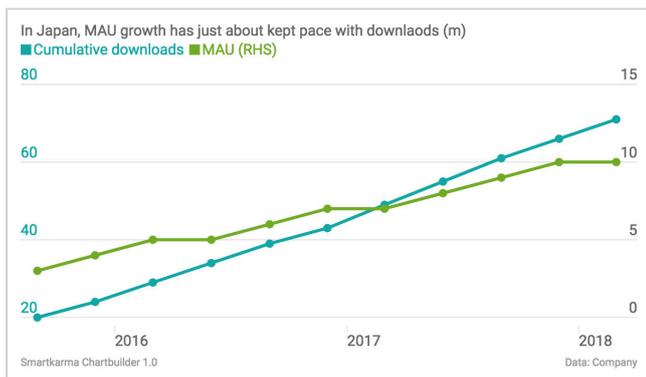
For this particular quarter, we also know that the MAU figure was 10.3 million users for Japan. Putting all these numbers together, some interesting stats emerge:

- First, there are 50 percent more buyers than sellers, which is great for moving goods quickly. One would rather have this over 50 percent more sellers who have to end up selling at rock-bottom prices due to lack of buyers.
- If we account for the overlap between the buyers and sellers, then the total unique buyer and seller number that Mercari had in 3Q18 was only 3.98 million. Workings are shown in the table below. After accounting for the overlap of around 1.12 million users who were both buyers and sellers, Mercari had 1.96 million only buyers and 0.90 million only sellers, making for a total of 3.98 million transacting users when combined with customers who were buyers and sellers.
- This would imply that only 38.6 percent of MAUs actually participated in a transaction on the app.
- If we make an assumption that the overlap in users was the same a year ago, then we can make the same calculations for March 2017. Mercari has provided the YoY growth number for unique buyers and sellers at 35.2 percent and 26.4 percent, respectively. Using these numbers and a similar calculation for March 2017 as shown below, one comes to a total of 3.0 million transacting users. **On a base of 7.2 million MAUs, that would imply 41.7 percent participation for March 2017.**
- While the numbers might not be accurate, as we don't know the overlap number for March 2017, it would imply that transacting users as a percentage of MAU trended down over the past year. Which is not the way it should be heading.
- Another way to look at the same point, the quarterly GMV and MAU were up 43 percent YoY in March 2018. At the same time, the unique buyers increased by 35 percent and sellers by 26 percent. Thus, there was a definite trend down in the number of transacting users, unless the overlap ratio changed drastically.

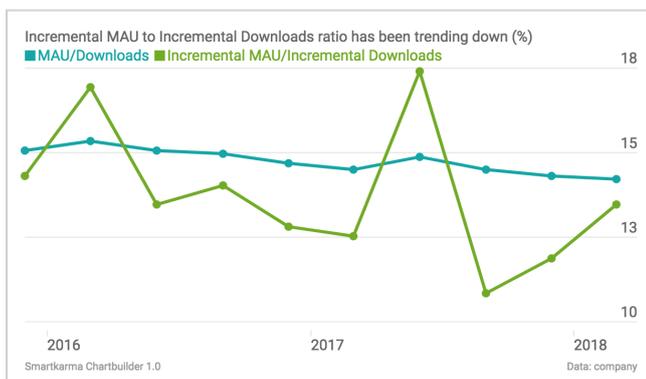
As of Mar-18 (m)	Buyers	Sellers	Total	Others
Unique	3.10	2.00	5.10	
Overlap (36.7% of buyers and 55.2% of sellers)	1.14	1.10	1.12	
Only (people who only bought or only sold)	1.96	0.90	2.86	
Total transacting users				3.98
MAU				10
As % of MAU				38.6%

Conversion from downloads to MAU hasn't been picking up

From September 2015 to March 2018, Mercari's cumulative downloads increased 3.6x in Japan to 70 million. At the same time, its MAUs increased 3.3x to 10 million. Thus, its MAU growth has broadly been keeping pace with its downloads growth.



Mercari's ratio of MAUs to cumulative downloads has only slightly decreased, from 15.6 percent in September 2015 to 14.5 percent in March 2018. However, its incremental MAU-per-quarter versus incremental downloads has been a little more volatile and seems to imply a steady downward trajectory from around 15-16 percent in December 2015 to 12-13 percent by March 2018.



The conversion ratio did show a sharp spike in the quarter ending June 2017. It's not clear what transpired in that quarter. The only media news we could find was of Mercari launching its [entertainment sub-app MercariKauru](#). Comparing its 9M17 numbers with the full year 2017 we can see that Mercari booked 30 percent of its full-year Japan GMV during that quarter and spent 41 percent of its full-year ad expense during that quarter. Hence, it could have just been a big marketing push.

Potential user base size is unclear

As per the study commissioned by Mercari from Nielsen, the potential user numbers are not a lot higher than the currently active users. Although the company does showcase the huge industry potential of JPY 2.1 trillion for the second-hand goods space versus its current GMV of JPY 290 billion.

Further Grow the Mercari Marketplace in Japan

As demand in the C2C secondhand market continues to increase, we believe there is significant room to leverage our leading market position to further grow our user base and GMV for *Mercari* in Japan. Our user base is still significantly lower than that of more established online services in Japan. For example, based on publicly available information, our MAU are significantly below the levels for Facebook, Yahoo! Japan, Twitter and LINE, and our quarterly unique buyers, which is defined as the number of buyers who have purchased at least one item during the relevant quarter, were at what we believe to be a still relatively low level of 5.2 million for the three months ended March 2018. We believe this indicates the potential for future growth in user base as we continue to scale our business in Japan.

In addition, we believe there is significant potential to increase users across a broad range of demographic groups, particularly among demographic groups that are relatively underrepresented in our existing user base. For example, as shown by the results of an online user survey that we commissioned from Nielsen Digital Co., Ltd. in February 2018 set forth in the table below, the number of users we consider to be potential users significantly exceeded the number of users we consider to be active users for both women and men in their 20s, 30s, 40s and 50s. The survey results further indicate that the number of such potential users was significantly higher than the number of active users particularly among men in their 30s, 40s and 50s and women in their 40s and 50s, indicating what we believe to be untapped market potential. For the purposes of this survey, we considered potential users to be individuals who have not used *Mercari* within the past month but had heard of it and who were willing to try it depending on the nature of any new functions or services and active users to be individuals who had used *Mercari* within the past month.

Age group:	Women		Men	
	Active users	Potential users	Active users	Potential users
	(millions of users)			
20 to 29	1.3	1.6	0.8	1.3
30 to 39	1.2	1.9	0.6	1.2
40 to 49	0.9	2.2	0.7	1.7
50 to 59	0.5	2.0	0.3	1.1

Source: Nielsen Digital Co., Ltd. (February 2018)

Note:

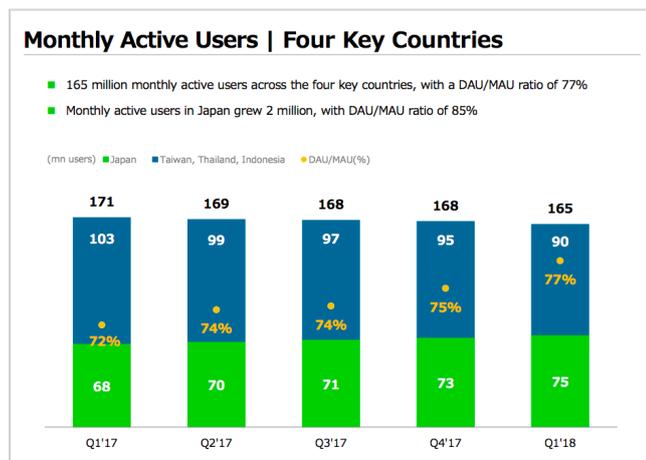
(1) Based on an online survey of 5,000 people (between ages 18 to 59). Estimated figures for active users and potential users have been extrapolated from the survey results assuming a total population of smartphone users (between ages 18 to 59) of 45.71 million users.

The way forward

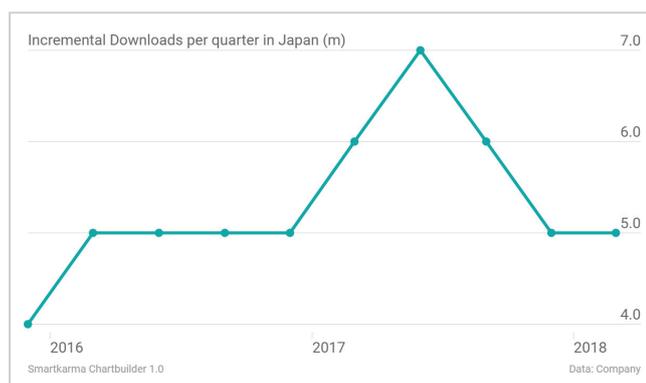
Still large headroom to increase participation without more downloads

A flip side of the transacting MAU (the number of MAUs who undertook a transaction) being so low is that there is ample room for more growth. In other words, if the company can increase its transacting MAUs to match its actual MAUs, that would imply a 2.6x increase in transacting MAUs from 3.98 million to 10.3 million. Further growth could be coming from the company's ability to convert more of its download MAUs to active MAUs, which implies another 18x growth in transacting MAUs.

In other words, the company doesn't need to spend more money to get more downloads. Instead, it needs to spend more time and effort in converting those downloads to active MAUs. As a benchmark, even **LINE Corp (ADR) (LN US)**, which is probably one of the most pervasive smartphone apps in Japan, had around 70 million active users in Japan - which is the same number of downloads that Mercari has.



The incremental downloads per quarter in Japan are already showing signs of having peaked last year and we wouldn't be surprised if they slow down further.



Ads may fall in Japan but points-based spending will likely continue

Mercari's biggest expense for its business is its ad spending, which was at 50 percent of sales over 9M18. The progressive spending on ads as a percentage of sales has been drifting down with each passing year.



Within ad spending, apart from the usual advertising to drive downloads, the company also offers points to its users to drive consumer behaviour within the app. For instance, it would offer points in lieu of people inviting their friends or list their first item for sale or to offer discounts on larger items.

Point System and Coupons

In Japan, points can be earned through promotional campaigns or purchased with sales proceeds at a rate of one point for ¥1. Users can purchase items on *Mercari* by using points, with one point equivalent to ¥1. Points that are purchased by users have an expiration date of 365 days. Points earned in promotional campaigns have varying expiration dates, ranging from 10 to 180 days. In addition, we offer points in a variety of promotional campaigns, such as through invite codes which grant points to both the inviter and invitee or invite codes potential users having the chance to enter a lottery to win points. We also periodically run special promotions that allow users to earn points by completing fun challenges, such as listing their first item on *Mercari* within a certain period after they complete user registration. We also issue coupons that allow users to purchase items that meet certain conditions at a discount in order to encourage users to make purchases. For example, we have periodically offered coupons for discounts on certain item purchases of ¥10,000 or more as a way to encourage larger item purchases.

In the United States, users can use credits and coupons that can be used to pay for all or part of the purchase price for items on *Mercari*. Users can earn credits and coupons by sharing invite codes with potential users and participating in targeted promotional campaigns. *Mercari* credits and coupons have varying expiration dates depending on how the credits were earned.

Considering that the company has a low number of transacting users, it has more buyers than sellers, and it probably can't drive a lot more downloads in Japan going forward, its ad spending will probably shift more towards points and promotions within the app to try and drive more usage.

In other words, while ad spending will likely continue to fall, the point-based spending might continue to increase in proportion to net sales.

Valuations - not as demanding as it seems

For the sake of valuation, we have assumed that FY18 revenue will grow by 70 percent (up 72 percent in 9M18) and a further 40 percent in FY19 to reach JPY 52.5 billion. We are a little more bullish than Mio Kato (10 percent

Company name	Price (local currency)	MCap (US\$m)	P/S (19E,x)	P/E (19E)	Rev Growth (19E, %)	Profit Growth (19E, %)	P/B (18E, x)	ROE (%)
Low End Pricing	2,700	3,333	7.0	-	40.0	-	6.6	-
High End Pricing	3,000	3,703	7.7	-	40.0	-	7.4	-
(MCap weighted avg)			6.0	37.2	18.5	40.0	11.7	31.6
Start Today Co	3875	11,030	9.0	44.5	37.0	34.7	22.7	59.9
MonotaRO Co	4350	4,977	4.2	44.5	19.8	20.3	17.9	38.4
LINE Corp	3905	8,560	4.0	49.2	15.9	130.2	4.7	3.3
Kakaku.com	2329	4,480	9.7	28.0	11.5	12.4	11.0	42.6
eBay Inc	38	38,109	3.2	14.5	8.3	15.1	5.3	28.2
Etsy Inc	32	3,778	5.9	42.4	18.6	27.3	8.5	17.3

higher than his forecast), as we believe the company still has significant room for growth in Japan by driving higher app usage. In addition, as it plans to continue to focus its efforts on driving downloads in the US and it has started charging for sales there, a higher ad spend in the US will hopefully drive higher GMV and improve its contribution to net sales. We have not bothered to forecast EBITDA and net profit since, given the company's ambition for world dominance in its space, profitability doesn't seem to rank very high on its priority list.

Under these assumptions, the shares are being offered at **7.0-7.7x Mcap/FY19 sales as compared to 6.0x for its peer group**. There is no real listed comp for the stock in Japan and hence, a comparison is difficult. You can refer to Mio Kato's Insight on valuations for some more thoughts on P/S and links to revenue growth.

The P/S sales ratio looks more demanding than it actually is. As stated earlier, Mercari spends 50 percent of its revenue on ads. If the company were to cut that, it would easily deliver profits. In the table below, we have illustrated the same with a few scenarios:

- If Mercari were to cut down its total ad expense to 20 percent of net sales while other expenses continue to be in the same proportion as over 9M18, it would result in the company reporting JPY 8 billion of Net income based on our FY19 revenue forecast. That would imply a P/E of 45-50x, in line with where Start Today, MonotaRO, Line, and Etsy are trading.
- If it were to cut ad expense down to 10 percent, that would imply a P/E of 31-35x.
- If it were to cut advertising altogether, that would imply a P/E of 23-27x.
- All these calculations are before factoring in any operating leverage at all in all of the other expenses and include all the expenses incurred for US operations. If the company does decide to exit those businesses, it would cut ad and personnel expenses further and the company would be even more profitable.
- While we don't think any of these scenarios are plausible in the near-term, we would note that the company's ad expenses in Japan are already down to 37 percent of its Japan sales versus 49 percent for the group level. Hence, a gradual reduction in ad expenses over the years is likely, with ad expenses possibly resting in the 10-20 percent range over the longer term.

Income statement	JPY bn	As % of Net Sales
Net sales	52,529	100%
Cost of sales	(9,161)	-17.4%
Gross profit	43,368	82.6%
Expenses		
- Total ad expenses	(10,506)	-20.0%
- Commission	(7,875)	-15.0%
- Personnel expenses	(7,287)	-13.9%
- Other expenses	(6,192)	-11.8%
Total expenses	(31,859);	-60.7%
Operating income	11,509	21.9%
Tax	(3,453)	-6.6%
Net income	8,056	15.3%
Implied Market cap (JPY m)		
- at low end	365,395	
- at high end	405,994	
Implied P/S		
- at low end	6.96	
- at high end	7.73	
Implied P/E @ 20% ad expense		
- at low end	45.4	
- at high end	50.4	
Implied P/E @ 10% ad expense		
- at low end	31.1	
- at high end	34.6	
Implied P/E @ no ad expense		
- at low end	23.7	
- at high end	26.3	

Comparing to other startups in the space

[Carousell](#) was recently valued at US\$500 million. It has only recently started monetising its app, despite being around since 2012. To date, it claims to have helped [sell 50 million items out of 144 million listings](#). *Mercari was doing 10 million transactions per month on average, in other words, it would have done more transactions in the first five months of the year than Carousell has done in the last six years. Based on these statistics Carousell selling rate implies a 34.7 percent sell-through versus 45-50 percent for Mercari.* We couldn't find any data on Carousell MAUs or cumulative downloads.

In the US, [LetGO](#) was recently valued at over US\$1 billion. It claims to have 75 million downloads and tens of millions of active users, and **has only recently started charging for promoting a listing - hence, it doesn't seem to be making much money**. Mercari had 37.5 million downloads in the US and generated US\$14 million of revenue from its US operations over 9M18.

Another US startup, [Offerup](#) was also valued at US\$1 billion in 2016. It claims to have 42 million unique users and recently launched nationwide [shipping in collaboration with USPS](#). It has also started charging users a sales fee of 7.9 percent and seems to have done more than US\$14 billion in transactions in 2016. It's not clear how much revenue and profit it was making as it has only recently started charging a fee on sales and was earlier earning money from ads and promoted listings.

Mercari seems to be way ahead of other flea market apps in terms of its ability to monetise and also in terms of its payments and shipping options.

Main risks

[LightStream Research](#) has covered most of these so we won't be dwelling on details. In our view, the three main risks for the company are:

- Well-funded competitors could put pressure on Mercari's fee-based model, as most of them have opted for slow monetisation, and others could cut down their seller's fee in order to elicit more listings.
- The company could end up spending a lot of money on its US and UK ambitions while remaining an also-ran.
- In Japan, it could overextend into unrelated operations like teacher-student connect and bike sharing, which might drag profits.

Final Say

In its Japan operations, Mercari seems to be far ahead of its global peers in the space in terms of home country dominance and ability to monetise. Its shipping tie-ups in Japan solve a major pain point, along with its payment and feedback mechanism. The company seems to have executed

its Japan operations exceptionally well and can easily turn profitable on a consolidated basis.

At the same time, the founder seems to have a penchant for world dominance, which might lead to the company overextending in terms of geography and product verticals. Both of which could drag profitability and create a negative overhang.

While we would have been much happier with the earlier price range of JPY 2,200-2,700, the company is not overly expensive in the current price range. No, we don't expect the shares to double on listing but a decent upside of 10-20 percent might be doable, more so given that retail investors would also be familiar with the name and hence, there should be good demand from them as well.

Details of scoring on our framework

Company Financials

Positives:

- Revenue has grown at a CAGR of 128.2 percent over the past three years
- Net debt to equity at -97 percent will be lower than comparables at -30 percent
- The company's topline is likely to grow at 51 percent p.a.
- The company is a dominant player

Negatives:

- The company does not guarantee dividend payment in the near future
- The company doesn't have upward/stable margin in the past three years

Relative Valuations

Positives:

- On post money PB basis, the stock offers a reasonable discount at 6.6-7.4x PB vs 11.7x for comparables

Negatives:

- The stock is being offered at 6.8-7.5x EV/sales versus 6.0x for peers

- The lack of profits and positive EBITDA makes a comparison with peers difficult

Corporate Governance

Positives:

- The company is audited by a reputable auditor, namely E&Y

Momentum - Previous Deals

Positives:

- Previous IPOs in Japan, listed over the past year with similar market cap, have returned 17.7 percent on average on first day, and 29.8 percent on average in one week. Although there has been only one deal
- Previous IPOs in Information Technology in Japan, listed over the past two years, have returned an average 26.1 percent on average at open, 22.4 percent in the first week and 15.6 percent to-date
- The company is the only listed stock in the country to provide access to the sector

Momentum - Index and Peers

Positives:

- Peers remain in an uptrend with RSI of 51.5
- Peers have returned 3.5 percent vs index over the past one month, 3.5 percent over the past three months and 10.7 percent over the past six months
- Based on consensus rating and target price, analysts remain bullish on the peer group with an average upside of 15 percent

Negatives:

- The overall market remains in a downtrend with RSI of 40.9
- Index performance has been poor, returning 0.5 percent over the past three months, and -2.6 percent over the past six months



Disclosure & Certification

- I/We have no position(s) in any of the securities referenced in this Insight.
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— Sumeet Singh (5 June 2018)



SC Capital

Has spent 22 years covering Japanese equities on both the sell-side and the buy-side, and is an advisory for a Japan-focused equity long/short fund.

Carlos Ghosn's Troubles Continue as the Nissan-Renault Alliance Remains in Flux

November 2018

The continuing saga of Carlos Ghosn's fall from grace has been 2018's most pivotal event for the global auto industry. Earlier in the year, Smartkarma Insight Providers discussed the importance of Ghosn to the Nissan-Renault alliance and where the two companies go from here, especially given the complicated relationship between the French and Japanese stakeholders. As the embattled leader is ferried in and out of prison, questions about the balance of power are becoming more prevalent. In November, SC Capital explored the possibility of the two companies equalising their stakes in each other, and the impact of such a "right-sizing" between them.



"Renault will likely be the biggest beneficiary if auto demand bottoms out and makes a comeback by 2022, as its exposure to the emerging markets - which could cause short-term pain - would see much higher growth than Nissan, which has most of its exposure in mature markets like North America, Japan, and Europe."

Nissan Motor--What Happens if Nissan & Renault Both Owned 25% Stakes in Each Other?

By SC Capital | 29 November 2018

EXECUTIVE SUMMARY

At the moment, there is little hope of a long-awaited merger between Nissan and Renault, as Nissan's top management had its Chairman, Carlos Ghosn, arrested on 19 November for alleged financial misconduct. The most likely scenario, as detailed by Travis Lundy ([here](#)), is a right-sizing of each company's stake in each other.

This could very likely involve Nissan raising its stake in Renault from 15 percent to 25 percent, while Renault reduces its stake from 43 percent to 25 percent, allowing both car makers to have equal stakes in each other. In this Insight we analyse the impact on Nissan and Renault under the scenario of both holding 25 percent stakes in each other and use FY17 results for calculations. Such an event would be more favourable to Renault shareholders, in our opinion.

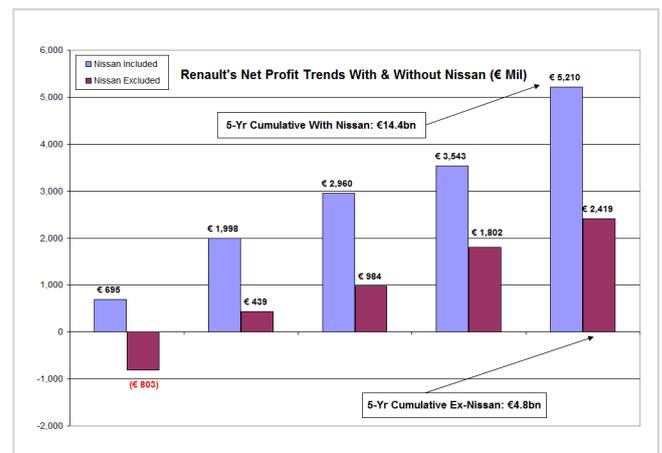
- Many Reasons Why Nissan Now Deserves a Larger Stake in the Alliance:** Nissan has generated 82 percent of the cumulative net profits generated by The Alliance over the past five years (Table-1 below). Because of its 43 percent share of profits from Nissan and the dividends received, Renault's actual five-year cumulative net profits came to €14.4 billion, which is nearly 3x higher than what Renault was able to generate on its own. On top of this, Nissan has bought cars from Renault to sell in uncultivated sales regions and shifted production of high volume models to Renault's French factories. Any Nissan shareholder would agree that enough is enough.

- Equal Stakes of 25 percent Each is Better for Renault Shareholders; Near-Term Negative for Nissan:** Below, we go into the details of how each company would be affected by Nissan buying a larger stake of Renault, while Renault reduces its stake in Nissan. The conclusion is that we would rather be Renault shareholders in such an event rather than Nissan shareholders, as Renault is deleveraging in Nissan at the peak of the demand cycle, while Nissan is increasing exposure to Renault's highly risky emerging market exposure. Simply put: Nissan would shell out roughly US\$2.1 billion to have a greater say in things with little impact on earnings, while Renault would reap in roughly US\$6.8 billion (33 percent of its market cap) in cash at the peak of the cycle without relinquishing any benefits from future synergies.
- Impact on Nissan - Cash Out and Increased Exposure to Emerging Markets at Cycle's Peak:** By raising its stake in Renault from 15 percent to 25 percent, Nissan would first and foremost be able to eliminate Renault's voting rights under Japanese Corporate laws. To carry this out, Nissan would deplete its net cash by 13 percent by shelling out roughly JPY 240 billion (US\$2.1 billion) to buy a further 10 percent stake in Renault. Earnings and valuation impact are negligible (see details on Table-X), but what concerns us is Nissan increasing exposure to Renault at a time when Renault's earnings have likely peaked: Q3 revenues dropped by -6 percent YoY and October global vehicle sales plunged further by -10 percent YoY (see Table-2).

- Impact on Renault from Selling Down its Stake from 43 percent to 25 percent:** This would be a massive US\$6.6 billion share sale and represent roughly 40 days of trading volume. While Nissan could possibly buy back 5 percent of the 18 percent sell-down, it would still present an overhang (29 days of daily trading volume) on Nissan's share price. Renault's net cash would spike by roughly 200 percent, lowering the EV/EBITDA multiple significantly, but net profit would decline by roughly 16 percent in real terms due to lower affiliates and dividend income from Nissan (see Table-2 below). Taking profit and lowering its exposure to Nissan's fragile earnings conditions at the peak of the cycle would be a great move. One would also expect some kind of special dividend or share buyback by Renault, if it were to generate so much cash.
- The Alliance is Vital to Both Despite Nissan's Efforts to Get Rid of Ghosn:** The sheer size of the integration of platforms, engines, and other components among Renault, Nissan, and Mitsubishi Motors ("The Alliance") is immense and already in full swing (see details below). It is slated to generate over US\$11.4 billion in synergies by 2022, which could more than double profits, as well as make The Alliance number 1 or number 2 behind the VW Group in global vehicle sales. This is why we believe that, despite the "palace coup" at Nissan against its Chairman, Carlos Ghosn (who hails from Renault), the show must go on.
- Long Renault/Short Nissan May be the Best Trade:** While the above scenario of Nissan is purely speculative at the moment, it is being factored into both stocks, i.e., the fact that it's better for Renault than Nissan shows: Renault's share price is up +4.9 percent since before Ghosn's arrest on 19 November, while Nissan's share is down -1.8 percent. Both car makers face horrible fundamentals in their respective regions - we would argue that Renault is at greater risk - but if Renault were to generate cash by reducing its Nissan stake at the peak of the cycle, it would have ample padding on its balance sheet to face any storms, which appear imminent as GM just announced the closing of five factories in North America.

Many Reasons Why Nissan Now Deserves a Larger Stake in the Alliance: Nissan has sold 4.22 million vehicles this year through September, which is 42 percent higher than Renault's global vehicle sales of 2.97 million during the same period. According to Renault's financial statements, on a standalone basis (i.e. no equity-method income or dividends from Nissan), Renault had five-year cumulative net profits of €4.8 billion, whereas Nissan had cumulative net profits of €22.8 billion, or 83 percent of the Group's five-year total net profits (refer to Table-1 below). Because of its 43 percent share of profits from Nissan and the dividends received, Renault's actual five-year cumulative net profits came to €14.4 billion, which is nearly 3x higher than what Renault was able to generate on its own (see Chart-1 below).

Chart-1: Renault's Net Profits Without Nissan Would be 2/3 Lower



Source: Renault

There is also the use of Nissan to increase Renault sales and prop up Renault's factory utilisation in France. In markets where Nissan has low penetration - e.g. Brazil, India, Spain, Russia, and Korea - Renault often has Nissan buy Renault models and re-badge them as Nissan models for sale there. This props up Renault's "Sales to Partners" account, which is broken out as separate revenue item in Renault's financial statements.

While the entry-level "Micra" (March) model was to be locally produced at an under-utilised Nissan plant in India,

Renault decided to have it made at its French factory and shipped to India instead. While Renault did literally save Nissan's life back in 1999, after all the benefits Renault has reaped over the past 19 years, any Nissan shareholder would agree that enough is enough.

Table-1: Renault & Nissan Earnings on Standalone Basis and Group Basis (In € Mil.)

Revenues	2012	2013	2014	2015	2016	2017	3yr CAGR	5yr CAGR
Renault	41,270	40,932	41,055	43,108	51,243	58,770	12.7%	7.3%
Nissan	91,448	75,899	79,705	82,870	94,611	93,711	5.5%	0.5%
Total	129,346	113,436	116,882	121,452	139,742	145,942	7.7%	2.4%
Operating Profit	2012	2013	2014	2015	2016	2017	3yr CAGR	5yr CAGR
Renault	122	-34	1,105	2,121	3,283	3,806	51.0%	99.0%
Nissan	4,553	3,794	4,550	5,196	4,879	5,048	3.5%	2.1%
Total	4,675	3,760	5,655	7,317	8,162	8,854	16.1%	13.6%
Net Profit	2012	2013	2014	2015	2016	2017	3yr CAGR	5yr CAGR
Renault	501	-803	439	984	1,802	2,419	76.6%	37.0%
Nissan	3,179	3,623	3,706	4,719	4,209	6,588	21.1%	15.7%
Total	3,680	2,820	4,145	5,703	6,011	9,007	29.5%	19.6%

Source: Renault

Impact on Nissan from Raising Renault Stake from 15 percent to 25 percent: By raising its stake in Renault from 15 percent to 25 percent, the most important effect would be the loss of voting rights for Renault's 43 percent stake in Nissan due to Japanese Corporate laws that cancel a shareholder's right to vote if you own more than 25 percent of that shareholder. To do this, Nissan would need to shell out roughly JPY 240 billion in cash, which would reduce its automotive net cash by 13 percent and push up its EV/EBITDA (FY17 trailing basis) from 2.3x to 2.5x, which isn't much. The increased equity-method earnings and dividends from Renault would boost FY17 EPS by 6 percent, bringing down the PER from 7.3x to 6.9x and boosting the net profit margin from 4.7 percent to 5.2 percent (see Table 2 below). This is also negligible.

Table-2: Nissan & Renault's Valuations & Returns Based on Standalone, Current & Stake Change

	PER	PBR	RoE	Net Margin
Nissan (Ex-Renault)	7.7	0.72	9.3%	4.5%
Renault (Ex-Nissan)	7.6	0.55	7.5%	4.1%
Nissan/Renault Merged	7.7	0.65	8.5%	4.5%
	PER	PBR	RoE	Net Margin
Nissan Currently	7.4	0.71	9.6%	4.7%
Renault Currently	4.2	0.58	13.8%	7.5%
	PER	PBR	RoE	Net Margin
Nissan With 25% Renault Stake	7.0	0.71	10.2%	5.2%
Renault With 25% Nissan Stake	5.0	0.59	11.9%	6.3%

Source: Renault & SC Capital estimates; Note: All numbers based on FY17 results as published by Renault; SC Capital adjusted Nissan profits for €1.8bn in US tax reforms & €620m in profits from the sale of Calsonic Kansei

What concerns us is Nissan's increased exposure to Renault's wobbly auto business, which is highly geared to emerging markets (and their currencies) in Latin America, the Middle East and Africa. Renault's Q3 revenues fell by -6 percent YoY because of this and October monthly vehicle sales at Renault dropped by -10 percent YoY (see Table-3 below). Furthermore, Renault's automotive financing division had receivables of €40 billion (2.2x its current market cap) and much of its exposure is in the emerging markets where US dollar strength is causing interest rate spikes and overall demand is falling. If things do go over the cliff in the emerging markets, Renault may see defaults on its receivables, which would lead to significant write-offs.

Table-3: Renault's Global Vehicle Sales By Region for Q3 and October 2018

	% of 2017 Global Sales	January ~ September 2018 YTD	% YoY	Oct-18	% YoY
France	17.9%	531,536	6.5%	52,681	-1.9%
Russia	11.9%	362,423	14.4%	44,159	6.0%
Germany	6.1%	188,397	12.2%	12,385	-29.9%
Italy	5.7%	161,267	-1.7%	13,338	-23.7%
Spain	4.9%	147,406	13.2%	12,853	-23.4%
Turkey	4.7%	88,677	-24.7%	2,905	-81.5%
Brazil	4.4%	152,235	24.0%	21,691	36.4%
Iran	4.3%	96,000	-13.2%	0	-100.0%
UK	3.1%	80,719	-16.1%	7,364	19.8%
Argentina	3.1%	96,938	5.5%	6,973	-18.8%
Global Sales	100.0%	2,970,518	8.1%	284,952	-10.2%

Source: Renault

Impact on Renault from Selling Down its Stake from 43 percent to 25 percent: Up to now, Renault shareholders have been yearning for a merger between Nissan and Renault, which would be seen to unlock the true value of Renault's automotive operations, which have been valued as low as negative €7.5 billion at its lows and is currently valued at negative €3.3 billion (Renault market cap - its Nissan stake - net cash - finance subsidiary equity). While an event like Renault selling down its stake in Nissan may not be exactly as good as a merger, it does unlock roughly €6.0 billion in value without complex share ratio negotiations. A share buyback would be highly likely and Renault would not relinquish any of its planned synergies from the Alliance, which it sees at €4.2 billion in 2022, which would more than double its operating profit.

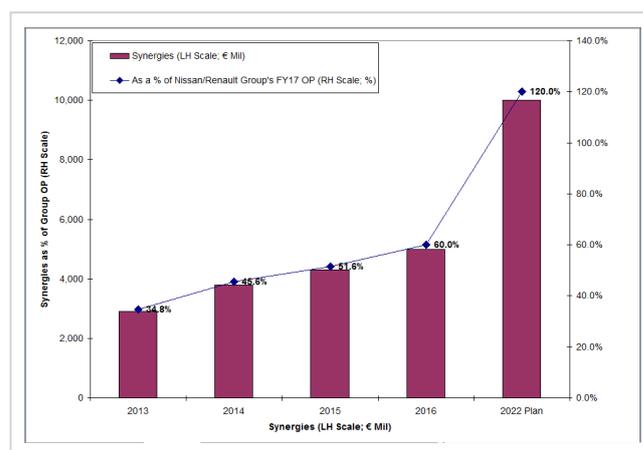
Renault's PER Would Appreciate by 18 percent But its EV/EBITDA Would Drop by 39 percent: While the impact net profit would be reduced by 16 percent due to a lower share of Nissan's profits and dividends, Renault's cash would spike by 200 percent, which would lead to a steep

reduction in the EV/EBITDA multiple from 2.6x to 1.6x, based on FY17 trailing results. PER valuation would rise by 18 percent from a trailing 4.2x to 5.0x, but this is still cheap compared to the valuation of Renault's PER at 7.6x on a standalone, no-ties-to-Nissan basis (see Table-2).

Alliance 2022 Has Started and is too Important to Dismantle for Both Sides: Below are the main points of the Alliance plans for 2022. The planning for this, considering the four-year cycle for new model roll-outs, has long been in place and is currently in motion.

1. Vehicle sales from 10.6 million units in 2017 to 14 million units in 2022 (+32 percent over five years), with an aim to displace the VW Group as Number One in global vehicle sales.
2. Shared engines to comprise 3/4 of all vehicles sold, from only 1/3 at present.
3. Of the 14 million units in global vehicle sales planned in 2022, 9 million vehicles (64 percent) will be manufactured on only four platforms, which should provide a huge chunk of savings.
4. 12 new fully electric vehicles and 40 new models with autonomous driving technology (this is the most aggressive EV plan among the Japanese car makers).
5. Raise synergies from €5 billion to €10 billion by 2022.

Chart-2: Nissan-Renault Synergies as a Percentage of Group Operating Profits



Source: Renault

Synergies break down into parts procurement, the commonisation of parts and platforms, powertrain/engine sharing, and others. While the vehicle sales targets can always be questioned and hinge on the demand environment, the roll-out of new models under fewer platforms, engines, and different components is achievable in our view and should generate at least 2/3 of the overall €10 billion target by 2022. If volumes exceed 14 million units on favorable demand, there could even be upside.

Renault will likely be the biggest beneficiary if auto demand bottoms out and makes a comeback by 2022, as its exposure to the emerging markets - which could cause short-term pain - would see much higher growth than Nissan, which has most of its exposure in mature markets like North America, Japan, and Europe.

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