Tesla Valuation Model: Are Investors Stuck in Reverse?

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Last August, we wrote an open letter to Elon Musk and Tesla's Board of Directors with an extract from our Tesla valuation model that communicated why privatizing Tesla at $420 per share would deprive shareholders, many of whom have supported the company for years, of significant returns. We believed then, and even more so now, that TSLA will deliver significant returns during the next five years.

We have updated and now are open-sourcing that extract with the following conclusions. Even if full autonomy turns out to be "science fiction" and Tesla cannot produce an autonomous car, ARK estimates that the electric vehicle opportunity alone would boost its stock 2-6 fold from $195 today to $560-$1,200 by 2023. If Tesla does solve for full autonomy, however, and its electric vehicle (EV) production surpasses our bear case estimates, TSLA could scale significantly higher than our previous $4,000* price target during the next five years, thanks to our newly introduced bull case for electric vehicle volumes.

To foster informed and healthy debate, we have published our Tesla valuation model with explanations on Github at the link here. Feel free to change the relevant variables to battle test both the bearish and the bullish investment cases. We will welcome all questions and constructive criticism and feedback.

At ARK we research, we invest, we educate, and we celebrate innovation. By providing our forecasts – including our assumptions – to market participants, policy makers, and entrepreneurs, we hope to inform decisions about the allocation of scarce capital. We believe that the most inefficiently priced assets today are public equities in the innovation space.

Modifications to Our Original Tesla Valuation Model

1) We developed a bull case based on a more aggressive estimate for the ramp of EV sales. Our original model for EVs is now the bear case.

In our original model we forecasted that Tesla would sell roughly 1.7 million EVs in 2023. The key variable impacting our original bull and bear cases was not the number of EVs sold, but Tesla's ability to launch an autonomous taxi network. During our podcast, Elon Musk noted that Tesla could produce 3 million EVs in 2023.[1] As a result, we have modeled a bull case for EV sales at 3 million units in 2023, which would be consistent with an exponential ramp in production.

Putting the bull and bear cases for EV production into perspective, Tesla's market share of the roughly 1.45 million electric vehicles sold globally in 2018 was 17%.[2] Based on Wright's Law,[3] critical to our analysis of the cost decline of battery pack systems, and on the price elasticity of demand, ARK forecasts that global EV sales should increase nearly 20-fold to 26 million EVs in 2023. If its share of the market were to drop by a third to 11%, Tesla would sell roughly 3 million EVs in 2023, in line with Musk's expectation for vehicle production and with ARK's new bull case. If its share of the market were to drop by two thirds to 6%, however, Tesla would sell roughly 1.7 million EVs in 2023, which now is ARK's bear case.

At an average selling price of $48,250 (today's ASP), Tesla's EV revenue would total $82 billion at 1.7 million units and $145 billion at 3 million, respectively, in 2023. In the bear case, gross margins would average 25%, which is Tesla's guidance, while selling, general, and administrative costs (SG&A) average 10% of sales, comparable to that of other premium auto companies even though its overhead should be much lower. ARK also assumes that Tesla will spend 13% of sales on research and development (R&D), its average for the past five years compared to the 4.3% average[4] of GM, Ford, and Fiat Chrysler in 2018. ARK also expects Tesla to reinvest excess cash back into the business to fuel growth. We expect its multiple of EV to EBITDAR&D[5] to reach 8, slightly higher than the 7.3X average for the auto industry today despite the superior[6] growth profile of EVs relative to gas powered cars. Taken together, based on the electric vehicle opportunity alone, these assumptions suggest that Tesla's enterprise value will scale from $47 billion today to $120 billion in our bear case and $250 billion in our bull case, pushing its stock price up from roughly $195 into the $560-$1,200 price range.

2) We pushed back the timeline for full autonomy by one year and validated some of our assumptions during Tesla's Autonomy Day in April.

During the next few years, Tesla intends to launch a fully autonomous taxi network, charging passengers by the mile and taking a platform fee, a percentage of gross revenues slightly higher than Uber's today.[7] Initially, Tesla could set rates comparable to the $2.50 per mile that Uber and Lyft charge today, declining perhaps to $1 per mile by 2023 as competition drives prices down. Indeed, at Autonomy Day, Musk threw out $1 per mile as a rough estimate and, during Tesla's third quarter call last year, he confirmed our assumption that Tesla will take a roughly 30% cut of gross revenues. At scale, according to our research, autonomous taxi platforms will be able to deliver transportation services profitably for 22 cents a mile, roughly one tenth of the price charged by Uber and Lyft today.[8]

We have pushed the launch of Tesla's fully autonomous taxi network from 2020 in the model we published last year to 2021. During our podcast in February, Musk stated that Autopilot should be feature complete by the end of this year and that full autonomy would be commercially available sometime in 2020. Based on the assumption that 2020 is a stretch goal, like most of Elon Musk's timelines, and on our analysis of the number of miles required to test and validate the Autopilot system, we now expect full autonomy to launch commercially in 2021. We estimate that regulators will require between 1 billion and 10 billion miles of data to prove that the system has a lower error rate than humans, and that Tesla will amass those miles in the 2-3 years after Autopilot is feature complete. If its vehicle owners were to engage Autopilot for roughly 35% of miles driven,[9] then Tesla could accumulate 10 billion miles in three years.[10] ARK expects that a more functional, convenient feature set will encourage customers to increase Autopilot usage beyond 35% of the time, helping Tesla to accrue 10 billion miles in two years, or 2021.[11]

Given the $1 per mile price point and a 30% platform fee, Tesla could achieve software-like margins on its autonomous taxi platform, with 50% of net revenues flowing to operating earnings and roughly 70% of operating earnings translating into cash. Assuming an operating earnings multiple of 14X, 25% below the 19X accorded to the average internet software stock,[12] the enterprise value of Tesla's autonomous taxi business would scale to $800 billion in the bear case for EVs and to $1 trillion in the bull case.

Please note that we assume Tesla will raise an additional $10-$20 billion in equity capital over the next five years to manufacture and operate as many vehicles as possible on the autonomous Tesla network, enabled by an additional Gigafactory. We also expect that the autonomous taxis on Tesla's network either will be owned by a third party, in some cases customers, or will be securitized to minimize their impact on Tesla's balance sheet.

Lastly, we would like to discuss some of the recent concerns[13] that have impacted Tesla's stock:

DEMAND

In the first quarter Tesla reported[14] that since the launch of the standard range Model 3, 69% of trade-ins for the Model 3 came from non-premium vehicles, suggesting that the Model 3 not only is enjoying strong demand in the premium demand segment – outselling the second best-selling vehicle by 60% – but also is pulling demand from the mass market segment. While demand shortfalls often surface in inventories, ARK is reassured that Tesla's days sales of inventory outstanding (DSOs) were less than half of the US industry average in the first quarter, in the absence of advertising!

CASH BURN

Our models incorporate $10-20 billion in equity dilution in addition to the $2.4 billion in net proceeds [15] that Tesla raised in May. Tesla had $2.2 billion in cash at the end of the first quarter which, thanks to the raise, now should total $4.6 billion. ARK estimates that Tesla should be free cash flow positive on balance for the remainder of the year. Debt repayment obligations for the year include a $165 million term loan due in June and $566 million in convertible senior notes due in November.

WARRANTIES

During the first quarter, Tesla's warranty provision was roughly $1,800 per vehicle, down from $2,400 the prior year,[16] primarily because the Model 3, at a lower price point than the Model S and the Model X, accounted for more of its sales mix. For context, BMW's warranty accrual per vehicle was roughly $1,000 in 2017. ARK wouldn't be surprised to see Tesla's warranty provision decline further thanks to the lower cost of maintaining electric vehicles than gas powered cars.

NON-ZEV CREDITS

Unlike in previous quarters, Tesla did not disclose non-ZEV credits in its investor letter during the first quarter. In its 10-Q, however, Tesla disclosed that it received approximately $200 million in non-ZEV credits during the first quarter, an important consideration because analysts use credits in calculating Tesla's underlying automotive gross margin. Unfortunately this apparent lapse in disclosure in the earnings release occurred during Zachary Kirkhorn's first quarter as CFO of Tesla.

You can find a copy of our latest model here. We look forward to healthy and thoughtful debate as we all seek to understand how profoundly the transportation industry will transform during the next five to ten years.

**While our current assessment of the company is positive, please note that it may be necessary for ARK to liquidate or reduce position sizes prior to the company attaining indicated valuation prices due to a variety of conditions including, but not limited to, client specific guidelines, changing market conditions, investor activity, fundamental changes in the company's business model and*

competitive landscape, headline risk, and government/regulatory activity. Additionally, ARK does not have investment banking, consulting, or any type of fee paying relationship with the company.

1. https://ark-invest.com/research/podcast/elon-musk-podcast ↩
2. http://www.ev-volumes.com/country/total-world-plug-in-vehicle-volumes/ ↩
3. https://ark-invest.com/research/wrights-law-2 ↩
4. Based on company reports sourced from Bloomberg ↩
5. http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/vebitda.html ↩
6. https://www.ft.com/content/b69556aa-7660-11e9-be7d-6d846537acab?ftcamp=traffic/partner/feed_headline/us_yahoo/auddev&yptr=yahoo ↩
7. Uber takes roughly a 20% cut, but ARK believes Tesla could command a higher share of gross revenues given that it will be adding more value (full autonomy) to the network than Uber's routing and operating expertise today. ↩
8. Tesla should be able to command premium pricing in the early years as ARK thinks it could be one of, if not the first company to launch autonomous taxi service. ↩
9. We used MIT's Autopilot work in our analysis, which can be found here: https://hcai.mit.edu/tesla-autopilot-human-side.pdf and here https://hcai.mit.edu/tesla-autopilot-miles-and-vehicles/. MIT found autopilot usage was roughly 35% of all miles in its human behavior study, however we can note that there are some drivers who do not use Autopilot at all, which may skew this figure. ↩
10. Note that the miles are acquired after the Autopilot is feature complete and after customers opt in for full self-driving (FSD). ↩
11. If 80% of miles are driven on Autopilot Tesla would accrue 10 billion feature complete Autopilot miles by 2021. ↩
12. http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/vebitda.html ↩
13. https://www.cnbc.com/2019/05/22/citi-sees-chance-tesla-drops-to-36.html; https://www.marketwatch.com/story/tesla-stocks-bear-case-is-10-morgan-stanley-says-2019-05-21 ↩
14. https://ir.tesla.com/static-files/b2218d34-fbee-4f1f-ac95-050eb29dd42f ↩
15. https://electrek.co/2019/05/08/tesla-tsla-closes-capital-raise/ ↩
16. https://ir.tesla.com/sec-filings/sec-filing/10-q/0001564590-19-013462 ↩