Tesla Model 3 Production

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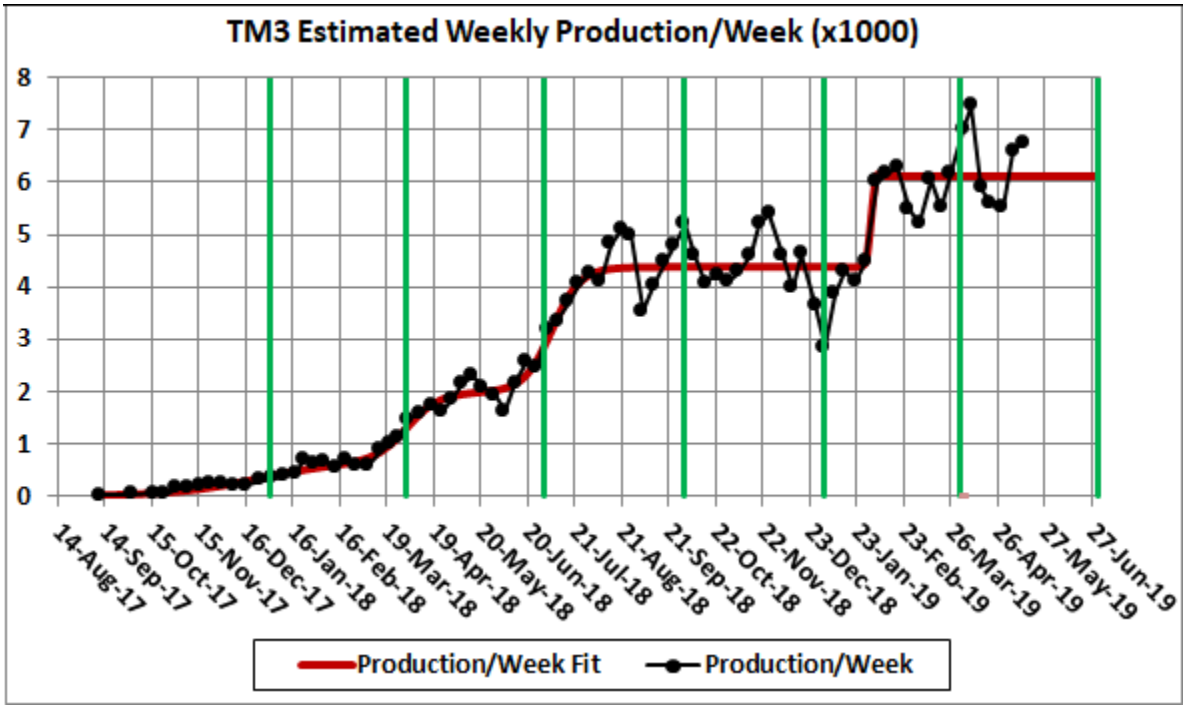
Bloomberg is doing a good service for the BEV community by estimating the weekly production of the Tesla Model 3 (TM3). I have taken their estimated weekly production data and fitted multiple sequential hyperbolic tangents to the data to create a smoothed curve of TM3 weekly production that shows approximate leveling off of the data several times. I think the hyperbolic-tangents fit shows more about weekly production than does the 13-week trailing average (13 weeks before a given week) used by Bloomberg to fit the weekly data.

The equation to estimate weekly production leveling off five times is:

$$\frac{1}{2}\left[a+f+(b-a)\tanh\left(\frac{t-t_1}{w_1}\right)+(c-b)\tanh\left(\frac{t-t_2}{w_2}\right)+(d-c)\tanh\left(\frac{t-t_3}{w_3}\right)+(e-d)\tanh\left(\frac{t-t_4}{w_4}\right)+(f-e)\tanh\left(\frac{t-t_5}{w_5}\right)\right]$$

In this article only the first four hyperbolic tangents are used. The *a* parameter is 0, the beginning plateau. The t parameters are the inflection points for the hyperbolic tangents and the w parameters are twice the exponential rising/asymptotic time constants for the hyperbolic tangents.

Here is the hyperbolic-tangents fit to the estimated weekly production data up to the last data-point date, 3 Apr 2019:



The red curve is a 4-hyperbolic-tangents fit to the Bloomberg data (black data points). The vertical colored lines mark the time boundaries of yearly quarters.

The three production declines near the end of the 3rd-quarter of 2018, at the end of the 4th-quarter line of 2018 and near the end of the 1st-quarter of 2019 were probably due to emphasizing selling TM3s in inventory rather

than producing them. It appears that one production line was slowed for a week or so to go back to the previous production rate after those three declines. At the end of the 2nd-quarter of 2018 the emphasis was to reach a new level of production from ~2200/week to ~4600/week.

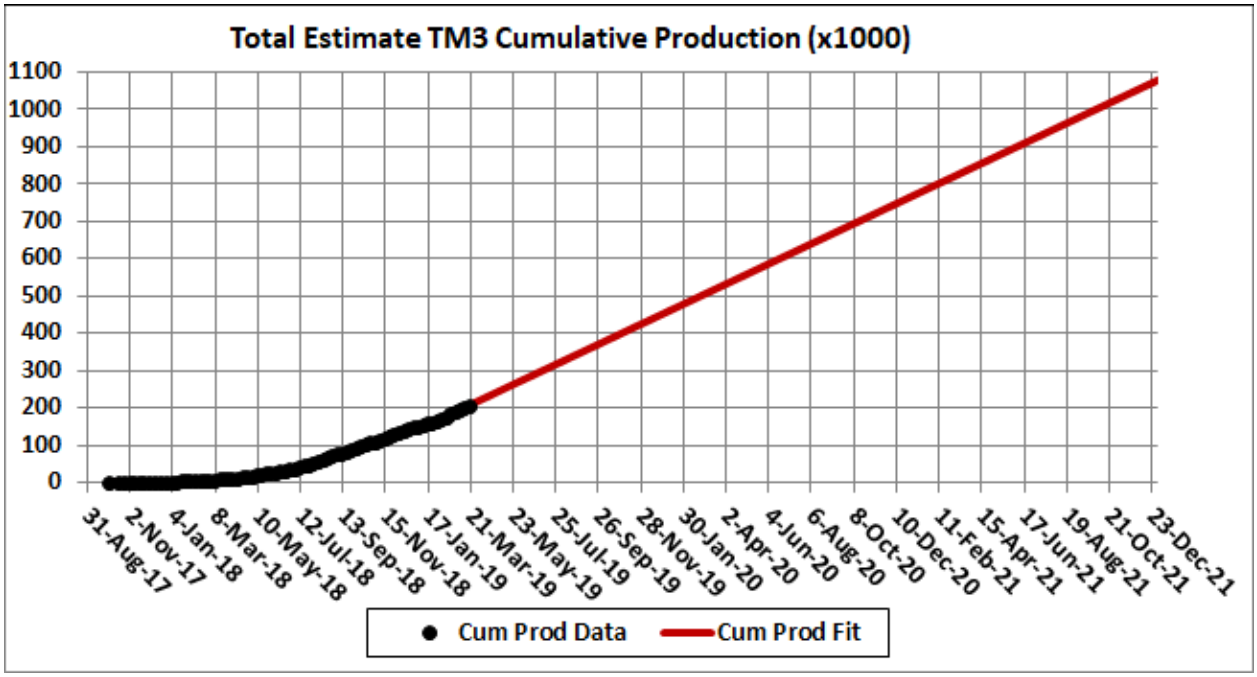
Notice that the change from about 4400/week to about 6000/week was about 18 times faster than the change from about 2000/week to about 4400/week.

The parameters for the 4-hyperbolic-tangents fit are available from the author.

The parameters of the hyperbolic tangents can be changed in the future and more sequential hyperbolic tangents can be added as more weekly data are estimated by Bloomberg. Tesla has stated that plans are to get TM3 production to 10,000/week after the Gigafactory 3 in China starts producing, which would require a 5th hyperbolic tangent in the fit curve.

The rising and asymptotic exponential time constants are the same in the hyperbolic tangent. One could use the Verhulst function instead of the hyperbolic tangent for those two time constants to be different, but the TM3 production data are so uncertain it is not worth the extra effort.

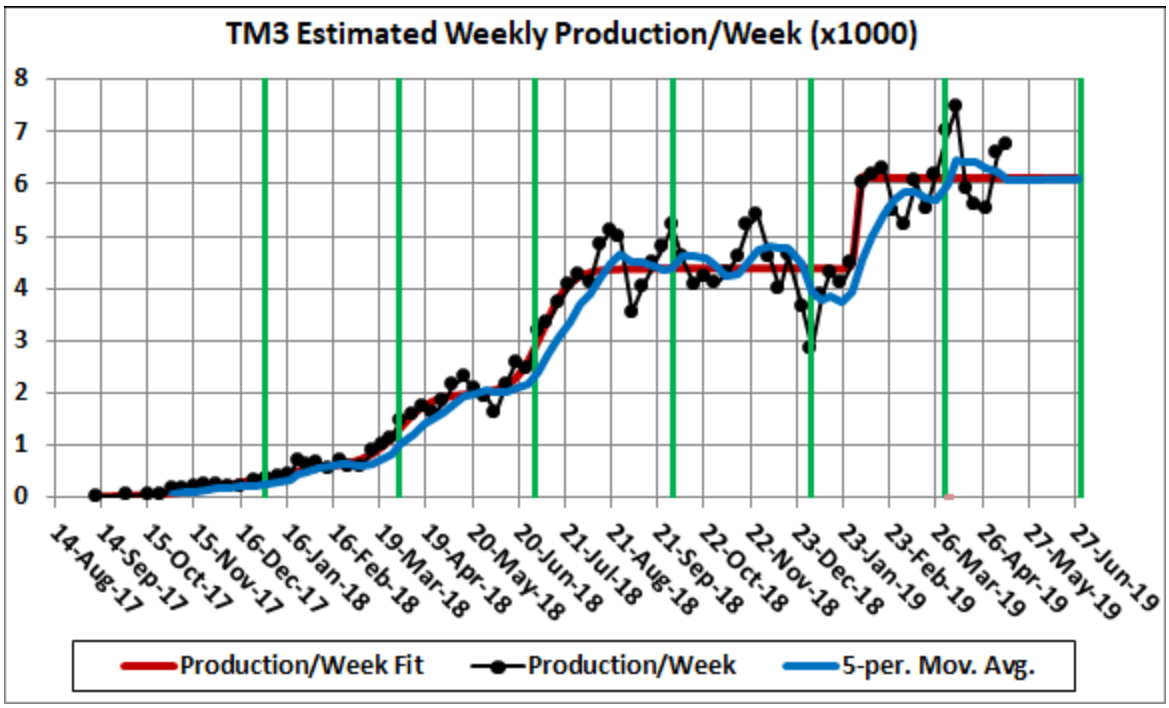
The cumulative TM3s produced versus date according to the weekly estimated production 4-hyperbolic-tangents-fit curve in the last graph projected to the end of 2021 are:



The equation for the red curve is the integral of the weekly-production curve given above.

This estimate is that there will be about1.1 million TM3s on the roads worldwide by the end of 2021, but probably somewhat more as Tesla expects another leveling off at about 10,000/week after the Chinese Gigafactory starts making TM3s in about a year.

The 4-hyperbolic-tangents fit (red curve) is approximately the same as a 5-week moving average (blue curve):


TM3 Estimated Weekly Production/Week (x1000)
8
7
6
5
4
3
2
1
0
14-Aug-17
14-Sep-17
15-Oct-17
15-Nov-17
16-Dec-17
16-Jan-18
16-Feb-18
19-Mar-18
19-Apr-18
20-May-18
20-Jun-18
21-Jul-18
21-Aug-18
21-Sep-18
22-Oct-18
22-Nov-18
23-Dec-18
23-Jan-19
23-Feb-19
26-Mar-19
26-Apr-19
27-May-19
27-Jun-19
Production/Week Fit
Production/Week
5-per. Mov. Avg.