Assignment 2 - Build on theory: Unraveling theory

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Research on Corporate Transparency

TRR 266 “Accounting for Transparency”

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Abstract

This is a handout for the lecture on Unravaling Theory.

1 Intuition

"Weather insiders (e.g., managers, sellers) fully disclose their private information has been a research interest in accounting as well as in finance and economics" (Jung and Kwon (1988)). The motivation in this is to understand what are the incentives and expected behaviour of the agents in this (un)certain information environment.

Do firms voluntarily disclose private information (e.g., about earnings, production, future demand, etc.)?

Firms indeed voluntarily disclose private information. They do so to try to avoid adverse selection. Adverse selection can refer to a situation where sellers have more information than buyers (or vice versa) about some aspect of product quality, or any other private information. Typically the more knowledgeable party is the seller. Adverse selection occurs when asymmetric information is exploited. For example, a firm that doesn't disclose results has better information about the company value than other market participants and might try to exploit this fact. However, investors are usually not willing to give money for something they are not fully informed about. By keeping the information private, the firm will end up with less capital invested - investors will discount for unsure information. Hence, firms do have an incentive to disclose and will voluntarily do so.

2 Model with certain information endowment

This model is based on Grossman (1981) and Milgrom (1981). Let's assume a set of i firms with a value x represented by

$$x_i = y_i + \epsilon_i \tag{1}$$

where x_i represents the firm value y_i represents the observable information ϵ_i represents the error term

Information is observed by each firm and has a probability density function of common knowledge and error is a generally unkown noise with $E[\epsilon] = 0$. Investors have rational expectations and based on the information they receive, they will price the firm:

$$P(y) = E[x|y] = y \tag{2}$$

The only equilibrium in this game will be: firms disclose all the information, investors price the firm at $P = y$ upon disclosure and at $P = E[y]$ upon nondisclosure.

Figure 1

Source: Gassen (2021), based on Grossman (1981) and Milgrom (1981)

In Figure 1, we can see how the unraveling occurs. Initially, the 10 firms are uniformly distributed and no one discloses information. Upon nondisclosure (red dots), the market prices the firms based on the expectation of y - uniformly distributed from 1-10. Hence, $P = E[y] = (1 + 2 + \ldots + 10)/10 = 5.5$. The firms that are after the 45' line (that have information that would place them above the price of 5.5) will have a strong incentive to disclose. They will annouce the disclosure (their representation turns blue) and then disclose. The market will adjust their price based on the information, since every information is trustworthy. As the first time, upon nondisclosure, the market will price the firms based on the expectation of y - now, uniformly distributed from 1-5. Hence, $P = E[y] = (1 + 2 + \ldots + 5)/5 = 3$. The price of nondisclosing firms goes down from 5.5 to 3. The firms after the 45'line will again have a strong incentive to disclose,

as they have the information that would place them with a higher price than 3. They update their disclosure decision and disclose information, being priced correctly at the same. The same initial readjustment of prices of nondisclosing firms will occur, they will be priced at the expectation of y - now, uniformly distributed from 1-2, $P = E[y] = (1 + 2)/2 = 1.5$. Price of nondisclosing firms goes down from 3 to 1.5. The firms that are undervalued at such price will disclose. The market will again adjust the price of the nondisclosing firms based on the expectation of y. This mechanism will occur until every firm discloses. The last firm would technically be indeferent on the disclosure, but the model assumes that upon indiference, firms disclose. Hence, we have the unique possible equilibrium - every firm voluntarily discloses information.

3 Model with uncertain information endowment

The first model assumes that managers have a complete and perfect information on the company. However, it is quite strong to assume that every firm actually has the information to disclose. Is it even realistic to think that a manager wouldn't have the information on the company? There are several possibilities where information is not known. First one would be unpredictable cases (e.g., Covid-19). Such unpredictable events lead to an unexpected shock in future demand that affects all firms, with no possibility of forecast. A second possibility would be outside factors - substitute/complementary goods can be released at any time by another firm (affecting future demand, e.g.). Last but not least, different business models (BM) also lead to lack of information. Firms with traditional BM's know their demand, can compare/estimate based on peers, etc. Innovative BM's that work with new products don't really know their future demand – they are trying something new and won't disclose because than it wouldn't be new anymore. There are several other cases when information is not know, these are just some examples. What happens when the manager doesn't have the information? Would unraveling still occur?

Figure 2

Source: Gassen (2021), based on Dye (1985) and Jung and Kwon (1988)

Figure 2 show the unraveling model where some firms don't have information (green dots). The idea is very similar, but the result won't be the same. Starting with 10 uniformly distributed nondisclosing firms, market prices them based on the expectation of y $P = E[y] = (1 + 2 + \ldots + 10)/10 = 5.5$. Again, firms underpriced at $P = 5.5$ will update their disclosure decisions and disclose information. The firms that disclosed will have their prices adjusted upwards and correctly, since every disclosure is trustworthy. The market will again adjust the firms that didn't disclose according to the expectation of y. However, the market only observes red and blue - any nondisclosure act is taken as red, since the market cannot observe the reason. Hence, all of the red and green will be adjusted by the expectation of y, that is, $P = E[y] = (1+2+3+4+10)/5 = 4$. Firms undervalued at the new price of 4 will disclose, market will again correct their prices, etc. This mechanism will continue until all the firms that had incentice/possibility to disclose, did so.

4 Real Life Example

One of the most innovative companies of the current scenario is a perfect example for the uncertain information endowment - Tesla.

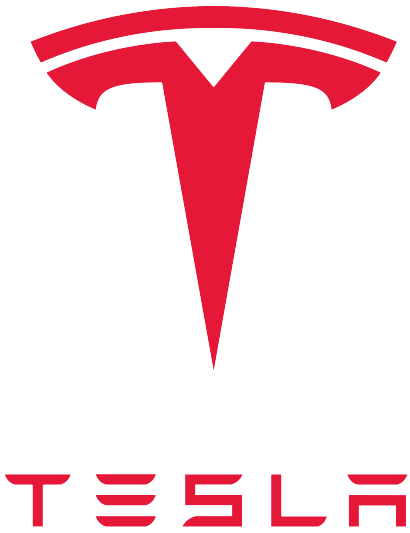
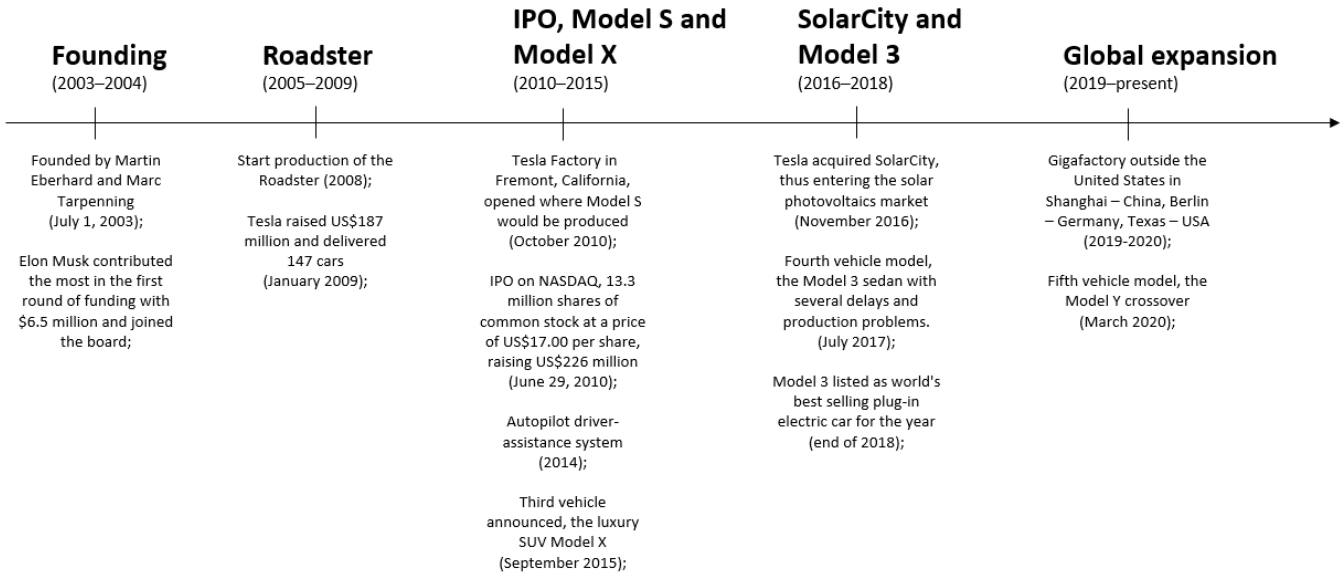


Figure 3 shows a short timeline of Tesla and its main events. This is to put some of the following comments into context.

Figure 3



Tesla timeline. Source: Prepared by the author based on Tesla and Forbes

Model 3 was one of the biggest bets they had. It ended up being the best selling plug-in car of all times. Here are some events concerning the model:

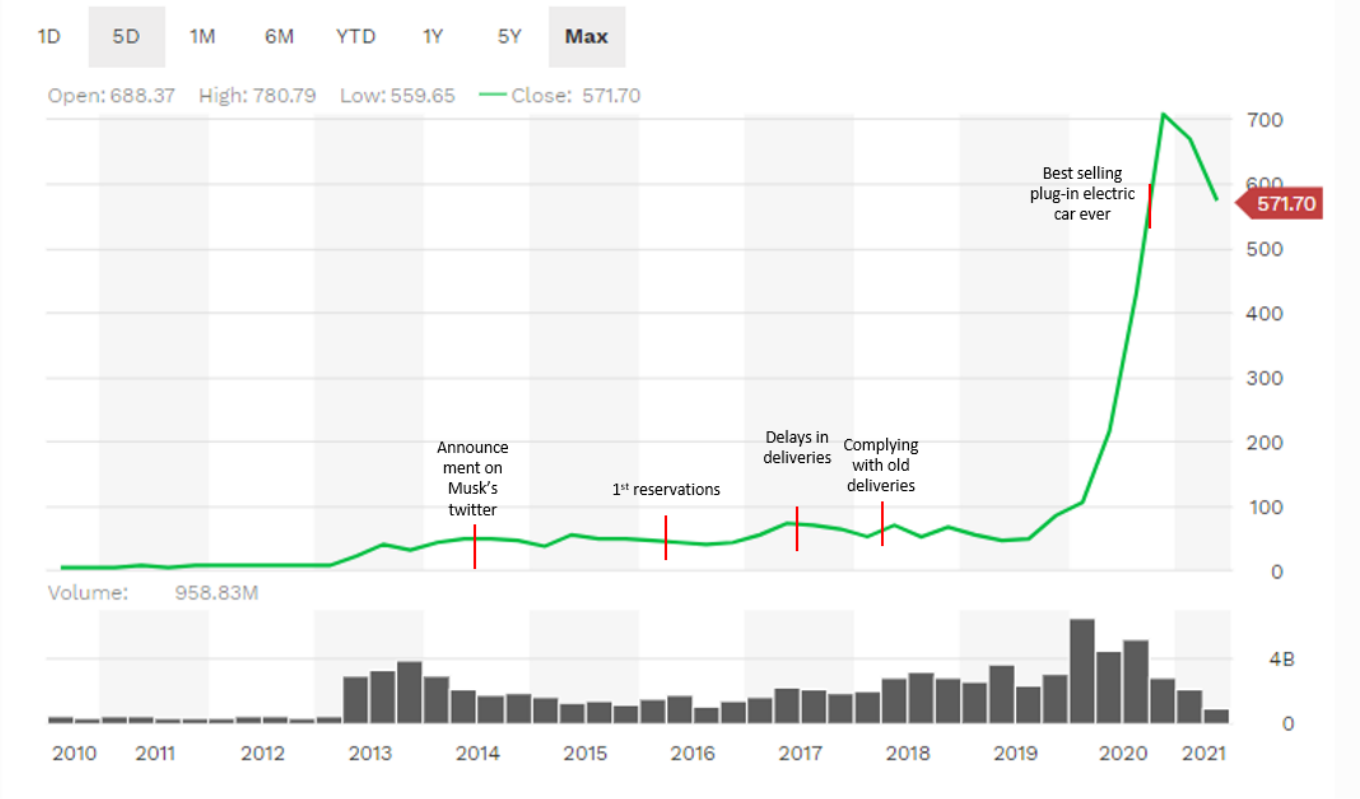
- (2006) First mention of Model 3 as an affordable for all car
- (2007) Model 3 was codenamed Tesla "BlueStar" in the original business plan of 2007
- (Jul2014) Model 3 announced on Musk's Twitter account
- (Mar2016) Costumers able to reserve a Model 3
- (Jul2017) Delays in deliveries – extension until 2018
- (Nov2020) Refreshed with cosmetic and internal changes
- (Dec2020) Global sales since inception totaled about 814,000 units – best selling plug-in electric car ever

Its sucessor, Model Y, also caused a lot of repercursion and has been around for quite some time already.

- (2013) Trademark filed
- (2015) Possible design as a Model 3-based Model Y with falcon-wing doors
- (Jun2017) Model Y's silhouette presented at the annual general meeting
- (Jun2018) New silhouette revealed by CEO Musk
- (Mar2019) Debut of Model Y at Tesla's design studio in Hawthorne, CA
- (Nov2019) Announcement that Model Y would be assembled in Berlin's Gigafactory
- (Jan2020) Announcement that delivery of Model Y should begin in Q1 2020
- (Mar2020) First deliveries
- (Aug2020) Design and manufacturing still improving – world's largest unibody casting machine, switching to casting the rear body in a single piece
- (Jan2021) Improvement of optional 7-seat, third-row seating configuration

Based on the models we just saw, we should expect that those early annoucements would bring the stock price up. However, let's take a closer look.

Figure 4

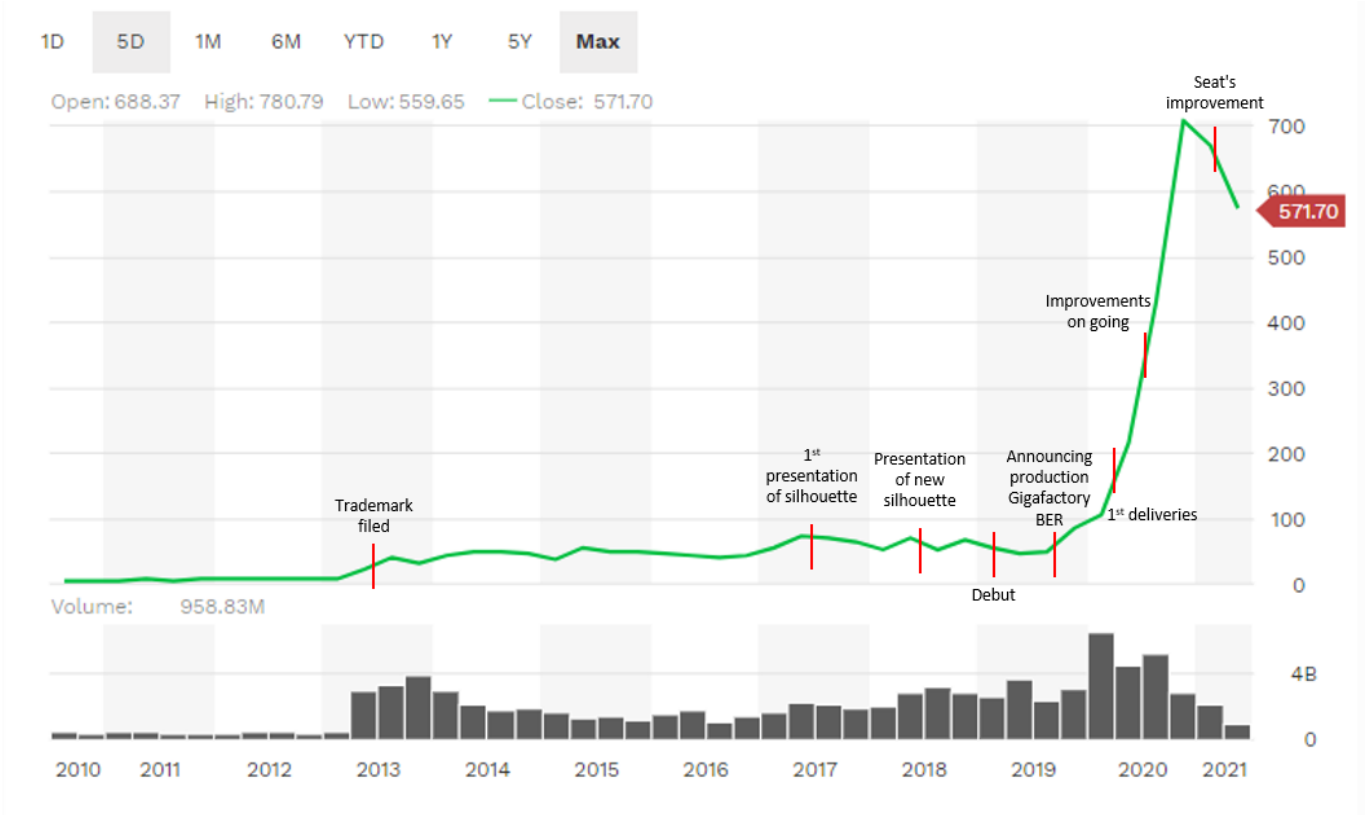


Timeline Model 3 vs. Stock price.

Source: Prepared by the author based on Forbes and Tesla (as of 05/14/2021)

Figure 4 shows us the stock price evolution and the main events concerning Model 3 are pointed in the timeline. Why all of those announcements didn't affect the stock price? Were future demand ever announced? They are selling Model 3 since 2016.

Figure 5



Timeline Model Y vs. Stock price.

Source: Prepared by the author based on Forbes and Tesla (as of 05/14/2021)

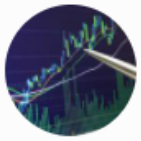
Figure 5 show us the same but for Model Y. The same concerns are raised. If it is such a great thing and great sales potential, why hasn't the stock price gone up? With all those announcements and media attention, why hasn't Tesla's stock price gone up before 2020?

Well, innovation is... new! It is hard to forecast the impact of innovation. Just as it is hard to predict future demand of something that was newly created. Firms themselves can't know the impact and financial forecast when developing new technologies. How do you put a price on something that was never done before? This information is unknown by the manager... and also by everyone else! In this case, the new technology is proving itself profitable after several years when mass production is starting.

Figure 6

Mar 16, 2021, 08:30am EDT | 7,192 views

Why Tesla Stock Looks Set To Rally Further



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Markets

Tesla stock (NASDAQ: TSLA) rallied by almost 17% over the last week, driven by a broader recovery in technology stocks and a bullish outlook from multiple brokerages. Moreover, the company also raised prices on select models including its entry-level Model 3 Standard Range Plus ($500 price increase) and its top-end Model S Plaid Plus ($10k increase), likely signaling that it is more confident about demand going forward. So will Tesla stock continue its upward trajectory over the coming weeks and months, or is a correction looking more likely?

GOTHENBURG, SWEDEN - 2019/09/14: An American automotive and energy company that specialises in ... [+] SOPA IMAGES/LIGHTROCKET VIA GETTY IMAGES

Source: Forbes

We already have some evidence that now that the innovation is around for a while, then it can be priced and its impacts forecasted. In this case, unraveling will occur normally. Signaling increased future demand by raising price will leade to a stock price adjustment - market will price Tesla accordingly upwards.

This is a clear example where a innovative business model/product, will lead to a lack of information. Simply beacuse it's new, and everything that is new, is usually unknown.

Another example to make this explicit, yet extreme, would be SpaceX.Ready for a SpaceX IPO? Company denied any intent to do so, but let's assume it would. Morgan Stanley's Adam Jonas VERY PRECISE valuation on SpaceX is...

"For this report, we built a hypothetical DCF range for SpaceX, valuing the company somewhere between ~$5 bn and $120 bn+, with a Base Case of ~$50 bn."

Figure 7

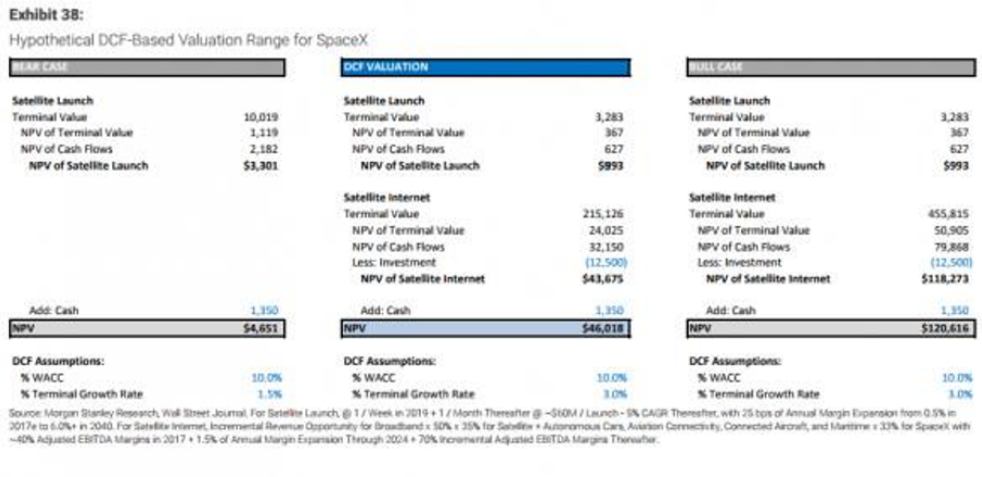

Exhibit 38:

Hypothetical DCF-Based Valuation Range for SpaceX

BEAR CASE		DCF VALUATION		BULL CASE	
Satellite Launch		**Satellite Launch**		**Satellite Launch**	
Terminal Value	10,019	Terminal Value	3,283	Terminal Value	3,283
NPV of Terminal Value	1,119	NPV of Terminal Value	367	NPV of Terminal Value	367
NPV of Cash Flows	2,182	NPV of Cash Flows	627	NPV of Cash Flows	627
NPV of Satellite Launch	**$3,301**	**NPV of Satellite Launch**	**$993**	**NPV of Satellite Launch**	**$993**
		Satellite Internet		**Satellite Internet**	
		Terminal Value	215,126	Terminal Value	455,815
		NPV of Terminal Value	24,025	NPV of Terminal Value	50,905
		NPV of Cash Flows	32,150	NPV of Cash Flows	79,868
		Less: Investment	(12,500)	Less: Investment	(12,500)
		NPV of Satellite Internet	**$43,675**	**NPV of Satellite Internet**	**$118,273**
Add: Cash	1,350	Add: Cash	1,350	Add: Cash	1,350
NPV	**$4,651**	**NPV**	**$46,018**	**NPV**	**$120,616**
DCF Assumptions:		**DCF Assumptions:**		**DCF Assumptions:**	
% WACC	10.0%	% WACC	10.0%	% WACC	10.0%
% Terminal Growth Rate	1.5%	% Terminal Growth Rate	3.0%	% Terminal Growth Rate	3.0%

Source: Morgan Stanley Research, Wall Street Journal. For Satellite Launch, @ 1 / Week in 2019 + 1 / Month Thereafter @ ~$60M / Launch + 5% CAGR Thereafter, with 25 bps of Annual Margin Expansion from 0.5% in 2017e to 6.0%+ in 2040. For Satellite Internet, Incremental Revenue Opportunity for Broadband = 50% x 35% for Satellite + Autonomous Cars, Aviation Connectivity, Connected Aircraft, and Maritime = 33% for SpaceX with ~40% Adjusted EBITDA Margins in 2017 + 1.5% of Annual Margin Expansion Through 2024 + 70% Incremental Adjusted EBITDA Margins Thereafter.

SpaceX valuation.

Source: Financial Times

Part of this valuation depends on whether SpaceX actually does reinvent itself into a satellite-internet company, as Morgan Stanley predicts. (The $5bn figure is their ballparkvaluation if it doesn't.). Mars missions don't appear to factor into their model.

What if it was? What is the value of landing on Mars? Do think anyone has this information?

References

Dye, Ronald A. 1985. "Disclosure of Nonproprietary Information." *Journal of Accounting Research* 23 (1): 123–45. http://www.jstor.org/stable/2490910.

Dyer, Jeff, and Hal Gregersen. 2021. "Tesla's Innovations Are Transforming the Auto Industry." Edited by Forbes. 2021. https://www.forbes.com/sites/innovatorsdna/2016/08/24/teslas-innovations-are-transforming-the-auto-industry/?sh=7fe9722519f7.

Forbes, ed. 2021. "Worl's Most Innovative Companies." 2021. https://www.forbes.com/companies/tesla/?list=innovative-companies&sh=3fb8a70748d4.

Gassen, Joachim. 2021. "Lecture, Research on Corporate Transparency; Element 5: Unraveling." TRR 266 Accounting for Transparency.

Grossman, Sanford J. 1981. "The Informational Role of Warranties and Private Disclosure About Product Quality." *The Journal of Law & Economics* 24 (3): 461–83. http://www.jstor.org/stable/725273.

Jung, Woon-Oh, and Young K. Kwon. 1988. "Disclosure When the Market Is Unsure of Information Endowment of Managers." *Journal of Accounting Research* 26 (1): 146–53. http://www.jstor.org/stable/2491118.

Milgrom, Paul. 1981. "Good News and Bad News: Representation Theorems and Applications." *Bell Journal of Economics* 12 (2): 380–91. https://EconPapers.repec.org/RePEc:rje:bellje:v:12:y:1981:i:autumn:p:380-391.

Scaggs, Alexandra. 2021. "Ready for a Spacex Ipo?" Edited by Financial Times. 2021. https://www.ft.com/content/d6fc608c-5a90-3d3a-a2e1-b455d97c4aa6.

Schreiber, Barbara A., and Erik. Gregersen. 2021. "Tesla, Inc." Edited by Encyclopedia Britannica. 2021. https://www.britannica.com/topic/Tesla-Motors.

Team, Trefis, and Great Speculations Markets. 2021. "Why Tesla Stock Looks Set to Rally Further." Edited by Forbes. 2021. https://www.forbes.com/sites/greatspeculations/2021/03/

16/why-tesla-stock-looks-set-to-rally-further/?sh=c111ad62f395.

Tesla. 2021. “Tesla.” 2021. https://www.tesla.com/.