A Work Project, presented as part of the requirements for the Award of a Master's degree in Finance, from the Nova School of Business and Economics.

RIVIAN IPO VALUATION AND ANALYSIS

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20-05-2022

Abstract

This work project investigates the IPO valuation of Rivian, an electric vehicle company, based on a discounted cash flow framework. An initial analysis of the market in which Rivian competes was performed, as well as an assessment of Rivian's strategy. The valuation is based on information provided in Rivian's S-1 form and assumptions from especially comparable companies. The findings demonstrate a significant overvaluation, despite substantial expected revenue growth. This can be justified by a high expected return from investors and/or by a general overvaluation of the market.

Keywords : Rivian Automotive Inc, Discounted cash flow, Initial public offering, Market forecast, Electric vehicle

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

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1. Introduction

In 2021, global initial public offerings (IPOs) raised a record $594 billion on the backs of stock market rallies (Reuters 2022). Investors' appetite for risk was bolstered by low-interest rates and the reopening of economies thanks to Covid-19 vaccinations (Wang and Ramnarayan 2021). Among these recent IPO, Rivian Automotive Inc (RIVN.O) raised nearly $12 billion in November 2021, making it the largest U.S. IPO since Alibaba Group Holding Ltd in 2014.

The IPO purpose was to fund growth opportunities in the market. The California-based electric vehicle manufacturer has the aim of creating and category-defining electric cars ("EVs") by designing, developing, and manufacturing them (SEC 2021). Eventually, they started thinking about truck and sport utility vehicle (SUV) since they offered a huge chance to show how a technology-focused vehicle might eliminate long-accepted constraints. Indeed, by offering a unique blend of efficiency, on-road performance, off-road capability, and functional utility, Rivian sought to make a name for itself (SEC 2021). Moreover, their consumers have already placed slightly over 50,000 pre-orders for the two available models, the R1T pickup truck and the R1S sport utility vehicle. In addition, Amazon, a main shareholder of Rivian, has reached an agreement for 100,000 commercial transport trucks to be delivered by 2025 (Lee 2021).

The aim of this paper is to value the company and compare it to the IPO share price announced. For this specific case, scientific articles and reports will first being reviewed and analyzed to gain insight into electric vehicles and the relevant markets in which they operate. Furthermore, Rivian's strategy, challenges, and business development targets will be discussed before the proper valuation. Finally, an analysis will be established to reliably value Rivian and compare it to the IPO share price asked, to assess whether the latter is meaningful and justified.

2. Literature review

2.1. Initial public offering

The initial public offering (IPO) procedure, being the first selling of a company's shares to the public, results in a stock market listing often known as floating or flotation (Amadeo 2015). Additionally, the term "public offering" refers to securities that are sold to the entire public rather than to a select group of investors as in a private placement (Espinasse 2011). Furthermore, most research papers in this field of study tackle one specific question: what are the benefits of a company going public? Traditional responses fall into two categories: (1) raising equity capital for the company to fund growth opportunities and business development costs and (2) allowing company founders and existing shareholders to sell a portion or all their stake in the company as the IPO process creates liquidity for the company's shares (Wang and Ramnarayan 2021). Consequently, the IPO of a company is considered one of the most significant events in its lifecycle (Latham and Braun 2010). Nonetheless, according to (Espinasse 2014), the aftermarket can cause instant instability in any IPO or primary equity issue which can impact the share price. Finally, Roosenboom (2012) tells that while determining the offer price, underwriters purposefully reduce the fair value estimate.

2.2. Discounted cash flow

The discounted cash flow method (DCF) attempts to predict the value of a company's future cash flows regardless of their allocation, which depend on the company's wealth distribution strategy. Following this valuation, the cash flows will be discounted using a particular interest rate depending on the risk level of those cash flows. Therefore, every type of cash flow and organization ultimately have a distinct interest rate (Kruschwitz and Löffler 2005). Furthermore, according to Viñola and Adserá (1997), this approach gives practicality since the information is provided in the balance sheet and the income statement. Moreover, it provides a more accurate picture of the current state and variables that may affect a company's

worth. Therefore, it is seen as one of the best methods to evaluate an IPO. Indeed, according to Berkman, Bradbury, and Ferguson (2000), the method, together with the comparable approach, delivers the most accurate valuation estimate. However, in terms of equilibrium market value, this valuation method delivers a positive bias (Roosenboom 2012).

2.3. Cost of capital

First, one should know that value is created for shareholders only when a company's Return on Investment exceeds its cost of capital. This latter is computed as the weighted sum of the cost of equity and the after-tax cost of debt. To find the cost of equity, the CAPM model, built on Markowitz's modern portfolio research, is the most adopted one. This model, given the non-diversifiable risk, is used to determine the investor necessary rate of return on a risky investment, as systematic risk is minimized in a well-diversified portfolio (Perold 2004). Moreover, the cost of debt results from the interest rate on the debt instrument. Those interests include a risk component that accounts for the likelihood of default (Modigliani and Miller 1958). Subsequently, the fact that debt and equity are based on market values rather than book values is a critical element in assessing the cost of capital (Perold 2004).

Furthermore, the Beta is a measurement of a company's or even an industry's risk in comparison to the entire market (Nasdaq 2018). Industries with fluctuating revenues and market cycles are less predictable and therefore riskier. Resulting from this, companies can lower their cost of capital by adjusting their debt-to-equity ratio (debt is cheaper than equity) and improving operational stability and predictability to minimize the risk premium on invested capital (Modigliani and Miller 1958).

3. Market and company overview

3.1. Electric vehicles general overview

In 2020, CO_2 emissions from the transportation sector accounted for more than 30% of the global emission (Capuder et al. 2020). Several technologies, such as hydrogen fuel cars or

biofuels, have emerged as promising alternatives for achieving the abandonment of petroleum and diesel-fuelled automobiles. Alongside these technologies, electrification of transportation can be seen as the most promising and imminent solution (Capuder et al. 2020). Hence, Electric vehicles (EVs) represent relevant option for a low-carbon energy system by using their battery capacity to help balance the renewable energy sources (RES) dominant power system (Capuder et al. 2020). In Europe, for instance, simply replacing conventional cars with EVs may reduce emissions by 36% (Xu et al. 2020). Consequently, governments act to (1) support research into advanced batteries and innovative technologies, (2) offer consumer incentives to lower the purchase price and operating costs, and (3) invest in large-scale infrastructure deployment to boost consumer confidence (Zhou et al. 2015).

Additionally, within the EVs range, several groups and subgroups can be distinguished. The *Appendix 7* provide those different terms and all other terminology of this paper. First, it is necessary to separate cars with an external source of electricity (PEV) supplying them from the cars without this external electricity supply (HEV). Secondly, one should differentiate between cars having only an electric engine and thus being dependent on their battery (BEV) from cars that still can run with an internal combustion engine (PHEV). Altogether, ten million EVs were on the road throughout the world in 2020 with their sales accounting for 4.6 percent of the global vehicle sales (IEA 2021). Models of electric vehicles have become more widely available and new battery technology projects have been launched. That progress was made in the middle of the Covid-19 pandemic, within the economic downturn and lockdowns that accompanied its (IEA 2021). Nonetheless, this crisis has also weakened the purchasing power of consumers and led to a decline in the overall automotive market (Zhou et al. 2015).

3.2. EV Geographic Markets

This section analyzes the EV market according to four different and main geographic markets, namely (1) The United States, (2) Europe, (3) China, and (4) the rest of the world.

Subsequently, each market is discussed based on its current situation, its local regulations, its growth and demographics, and its leading brands. Finally, to efficiently assess the current situation of the four specific geographic areas, the McKinsey Electric Vehicle Index (EVI) was used (*Appendix 4)*, considering two components on graph axes: (1) market demand and (2) industry supply (Gersdorf et al. 2022).

3.2.1. USA

First, while the car market was declining in the US in 2020 (-23%), 1.7 million EVs were new on the road which represents 295,000 more than the previous year (IEA 2021). Moreover, looking at McKinsey's EVI map, the US is moderately a larger producer of EVs than a consumer (Gersdorf et al. 2022).

Secondly, the gradual US federal government oil prices lowering in 2019 and 2020 were strongly penalizing for the industry (Gersdorf et al. 2022). However, the administration of new President Biden has announced a goal of 50% EV sales by 2030 (Ewing 2021). Accordingly, both the US federal government and the state of California have set pollution rules and laws that grant significant credits to plug-in electric vehicle (PEV) manufacturers (Center for Sustainable Energy 2021).

Thirdly, the rapid decline in battery prices in recent years has allowed EV prices to be reduced, making longer-range batteries more feasible. Moreover, the USA has a high PEV adoption rate per capita, with 2.3 per 1000 people at the end of 2017 (Hao et al. 2020). In fact, considering the entire EVs market, the US will have between 2.9 and 8.1 million EVs on the road by 2030 (International Energy Agency 2021). Besides, it can be considered that US demographics will remain stable for the next few years (World Bank 2021).

Finally, the market launch of the Tesla Model 3 has been driving EV sales in the US since 2018. Meanwhile, sales of the Chevrolet Volt dropped by 14,000 units as it was phased

out. Moreover, the Honda Clarity likewise saw an 8,000-unit drop in sales. Other global vehicle manufacturers, such as Audi (the e-tron), Hyundai (the Kona), and Volkswagen (the e-Golf) successfully launched new cars in the USA in 2019-2020. These three brands sold over 24,500 electric vehicles. Eventually, the most popular vehicle classes are long-range mid-size BEVs in the USA, such as Sports Utility Vehicles (SUVs) (HAO et al. 2020).

3.2.2. Europe

First, despite a 22% drop in new car registrations, EV growth is the most impressive in Europe with 1.4 million new EVs on the road, a 75% growth compared to 2019. Nine of the top ten markets for electric-vehicle penetration rate were European. Moreover, battery EV (BEV) registrations accounted for 54 percent of electric car registrations in Europe in 2020, continuing to outnumber plug-in hybrid electric vehicle (PHEVs) registrations (IEA 2021). Furthermore, looking at McKinsey's EVI map, except for Germany, Europe is moderately a larger EV producer than a consumer (Gersdorf et al. 2022).

Secondly, this impressive growth is mainly due to the initiatives of EU governments. Although their indirect emissions may be significant, European regulation nevertheless considers BEVs to be zero-emission vehicles, which falls within the C02 emissions limit law (Xu et al. 2020). Moreover, as part of stimulus packages to combat the pandemic's effects, numerous European governments extended the EV subsidy program (IEA 2021).

Thirdly, if the entire EV market is considered, Europe will have between 7,1 and 13,3 million EVs on the road by 2030 (IEA 2021). The key drivers behind this potential future growth are mostly positive policy initiatives. Additionally, it can be considered that European demographics will remain stable for the next few years (World bank 2021).

Finally, most represented brands in Europe for 2020-2021 are very similar to the US ones. The Tesla Model 3 is by far the sales leader (100 thousand) with twice as many sales as the Volkswagen with its ID.3 and ID.4 or the Renault Zoe (Statista 2022).

3.2.3. China

First, China remains the largest EV market in 2020 with 4.5 million cars on the road. However, its growth has slowed down considerably in recent years following the overall 9% decline in the light-vehicle market (Gersdorf et al. 2022). Moreover, about 80% of the models sold in the Chinese market were BEVs (HAO et al. 2020). Eventually, looking at McKinsey's EVI map, China is a large EV producer which is not yet associated with a large demand market (Gersdorf et al. 2022).

Secondly, BEV-favoring policies recently allowed BEVs to be largely more popular in China (HAO et al. 2020). A new fuel consumption standard has been set with the goal of obtaining a fleet average fuel consumption rate of 5 L/100 km (Zhinan and Hui 2022). However, several cities loosened car license restrictions in response to the pandemic's economic concerns, letting more internal combustion engine vehicles be registered to help local car companies (IEA 2021).

Thirdly, the EV market in China was rapidly expanding considering the increase in oil price and its deteriorating air quality (Zhang et al. 2017). However, the adoption rate of EVs is lower than in other countries, and still many EVs are purchased by central authorities (Zhou et al. 2015). Thereafter, if the entire EV market is considered, China will have between 9,5 and 12 million EVs on the road by 2030 (IEA 2021). Moreover, the projected birth growth of China is decreasing, despite an increase in GDP and average GNI per capita (World bank 2021).

Finally, BEV small vehicles are the most common vehicle class in China (Hao et al. 2020). The best-selling BEV brand in 2020 was SAIC-GM-Wuling, in which General Motors

is a joint venture partner, with nearly 180 thousand models sold. It is followed by Tesla with 137 thousand models and the Chinese brand BYD with 130 thousand models. Next, 7 brands, all Chinese, compete for the remaining market share (Statista 2021a).

3.2.4. Rest of the world

First, the remaining countries represent in 2020, 0.7 million EVs, or about 7% of the total market. The market growth remained quite stable such as in Canada whose car market plunged by 21% while electric car registrations remained steady. By contrast, a notable exception is Japan, with a 25% drop in EV registrations, while it was the second-largest market for PEVs worldwide in 2014 (Hao et al. 2020). Moreover, South Korea remains an important market with sales in Q1 2020 of 11,500 units (Gersdorf et al. 2022).

Secondly, like in other countries, each EV market remains highly dependent on local regulations. Japan, for instance, issued a "New National Energy Strategy" document in 2009, including targets for the transportation sector to reduce dependence on fossil fuels (Japan Automobile Manufacturers Association 2009).

Thirdly, if the entire EV market is considered, other countries together will have between 2.9 and 6,9 million EVs on the road by 2030 (IEA 2021). Moreover, while it is difficult to find the potential growth country by country, demographics and growth should still soar in some developing countries, such as African countries, Brazil, or India (World bank 2021).

Finally, each country has its own preferred adopted brands. For instance, South Korea’s main brand is Hyundai (Statista 2020). Therefore, markets are still to be conquered by the different international brands. Tesla remains however an undisputed world leader and should play a major role in these countries soon.

3.3. Company overview

3.3.1. Background and current situation

Rivian Company is an American company, created in 2009 in Florida by Robert Scaringe. It has the aim to “design, develop, and manufacture category-defining electric vehicles (“EVs”) and accessories.”(SEC 2021). The consumer EVs provided are 2 BEVs models: the “R1T”, a two-row five-passenger pickup truck, and the “R1S”, and a seven-passenger SUV with three rows. In fact, 50,000 for the R1T and R1S combined are already pre-ordered and sold at $70,000. Moreover, in 2020, Rivian will launch the "Rivian Commercial Vehicle", for delivery businesses. To design and engineer the product, they collaborated with Amazon, their first commercial customer. Amazon has placed an initial order for 100,000 of this vehicle, making it the largest EV order ever.

3.3.2. Business strategy and growth

Rivian's strategy is built on two statements (SEC 2021):

(1) An energy transition to electric power with the use of advanced and efficient technology.

(2) A high-performance, utility vehicle with an American preferred design.

The fastest-growing vehicle sectors of SUVs, EVs, and e-commerce are key components of Rivian's strategy (Henry 2021). Therefore, they plan to enter the electric SUV and heavy electric vehicles niche that Tesla and other brands have not yet managed to enter. Moreover, their business model is designed by a vertically integrated ecosystem based on data, cloud, chargers, and diverse digital services. As they state : “We wanted to establish our brand by delivering a combination of efficiency, on-road performance, off-road capability, functional utility, and product refinement that simply didn’t exist in the market.” (SEC 2021).

Furthermore, in terms of long-term growth, Rivian plans to increase its market share in the US and Canada while continuing its international expansion by targeting the pickup, SUV, and commercial van markets and by locating production and supply chain in the other region concerned. Indeed, as stated in their S-1 file: “Our launch is focused on the U.S. and Canadian markets. We intend to enter Western European markets in the near term, followed by entry into

major Asian-Pacific markets. To serve our global demand, we plan to localize production and supply chains in these regions.” (SEC 2021).

3.3.3. Threat and competition

To begin with, Rivian's first threat is the high automotive market competitiveness and the international brands which could challenge them directly. Moreover, their financial instability is a clear internal threat. Indeed, Rivian expects to incur considerable costs and losses soon. Big-name IPOs, like Coinbase one, have likewise been stuck in a purgatory (Tepper 2021). Additionally, Rivian relies on other stakeholders to manufacture and supply critical semiconductor chip components for our vehicles, thereby raising the cost. As a consequence of the covid-related semiconductor chips shortage, North American automakers were unable to produce over 2.3 million cars and trucks in 2021 (Henry 2021).

Subsequently, Rivian's biggest competitor at this point is Tesla, which also produces BEVs, and has expertise in this field. Tesla also plans to launch an SUV with its Cybertruck, which would compete directly with Rivian's two EV models. A second competitor is Ford, developing its own BEV pickup. However, Ford being a shareholder of Rivian, this competition should be considered in perspective. Another major Rivian contender is General Motors Inc (GM). The latter's ambition is to be the leader in electric and autonomous vehicles by pledging: "to create a world with zero crashes, zero emissions and zero congestion"(Eisenstein 2019). In addition, a company in the same state as Rivian is Lucid. This American-listed company is also in its young stage, having delivered no vehicles yet (Edelstein 2021).

3.3.4. Financial structure and figures

Rivian's long-term growth strategy is highly dependent on its ability to generate sufficient cash flows to invest in product development while servicing its outstanding debt. Therefore, they are always in need of new resources (capital and debt) to fund growth opportunities and

business development costs, corresponding to the first IPO reason described in the literature review section. For this purpose, the $78 per share IPO in November 2021 to raise nearly $12 billion was conducted. The first target offer price was initially between $72 and $74 before the final price of $78. Hence, since Facebook's IPO in May 2012, this was the largest IPO haul for a US company (Lee 2021).

Furthermore, this price increase reflects, together with a positive market reaction, the company's sky-high expectations since it lost about $1 billion in the first half of 2021 and is projected to lose another $1.28 billion in the third quarter. Much of the raised money will be used to expand production capacity at its Normal Illinois plant and to build new facilities in the future (Lee 2021).

Finally, a key component of Rivian's stability and credibility is two of its major shareholders which are Ford and Amazon. Ford owns an 18.1 percent stake post IPO, which is worth $8bn at the listing price, while Amazon purchased in 2021 a 20% investment in the firm and has already placed an order for 100,000 units to be delivered by the end of 2030 (Tepper 2021).

4. Methodology

This chapter provides details on the data processed and the methodology used to investigate the valuation study. The analysis focuses on Rivian valuation based on its future cash flow to assess the relevance of the IPO offered price per share. An Excel spreadsheet including the calculations and valuation steps is included with the paper.

4.1. Data sample

To begin with, the main data and assumptions regarding Rivian will be drawn from the S-1 form of Rivian's IPO. This form is a registration statement issued on the *SEC EDGAR* system by private companies seeking to go public through an IPO. It includes specific information regarding the business financial statements, management, and risk considerations.

The latter allows investors to weigh the pros and cons of the offering and make an informed investment decision.

Furthermore, to compute the unlevered beta and to forecast some of the free cash flow components, Rivian's selected comparable firms' data were taken from *Yahoo Finance*, more precisely from the balance sheet, income statement, cash flow, and market capitalization sections. The median of the comparable figures was used to exclude outliers systematically. Moreover, firms whose data were in foreign currencies were converted to dollars in the *WACC* spreadsheet. In addition, FRED and Damodaran databases were used to derive the risk-free rate and the equity risk premium, both necessary to determine the WACC. Finally, to forecast Rivian's long-term growth rate, the OECD previsions were considered.

4.2. Valuation design

To assess whether Rivian's IPO is over or undervalued, the discounted cash flow method (DCF) was used as a valuation method to compare it to the IPO offer price. This approach is the most relevant one given Rivian's early-stage situation and its non-existent revenues. In fact, no more than 1,000 vehicles were produced in 2021 with most of them being delivered to employees (SEC 2021). Moreover, to estimate future discounted free cash flows, it is first necessary to forecast the inherent development of the firm including its revenues, cost structures, capital costs, and long-term growth rate.

The model can be built using all these components with the following steps:

1) The yearly revenues are determined according to the different target markets of the company.
2) The costs of revenue, operational costs, and depreciation & amortization must be subtracted to find the normalized EBIT. All these costs are expressed and determined as the percentage of revenue except the depreciation & amortization, expressed as a percentage of capital expenditure.

3) A Net Operating Loss (NOL) mechanism is established. When a company's permissible tax-deductible expenses exceed its pre-tax profits, an NOL is formed. The NOLs can be "carried forward" to decrease the tax burden in future successful periods if the company becomes profitable later.
4) The unlevered year-by-year free cash flow is derived from the net operating profit after tax to which is added the previously forecasted depreciation and amortization.
5) Finally, to this previous number, one must subtract first the change in working capital, the latter being the difference between current assets and current liabilities and then the capital expenditures necessary to acquire, upgrade, and maintain physical assets.

Once these unlevered free cash flows have been established, it is then necessary to set a consistent discount cost of capital (WACC). The latter is determined by the risk-free rate (*Rf*) found by long-term treasury bonds, the equity risk premium of the market (*MRP*), and the cost of debt (*Rd*) of the company itself. The last component to find is the beta. To determine it, comparable companies must be mobilized. Thereafter, it is necessary to unlevered the beta of each comparable by gathering their debt-to-equity ratio (*D/E*) and their effective tax rate (*Tc)*, derived from the balance sheet, and by applying the following formula:

$$Unlevered\ Beta = \frac{Levered\ Beta}{[1 + (1 - T_c) * \left(\frac{D}{E}\right)]}$$

In the case of early-stage companies with high growth potential like Rivian, it is relevant to calculate two different betas and thus two different WACC. One for the growth phase and one for the terminal phase. The selected comparable should therefore be spitted into two distinct categories. After having unlevered the beta, one can compute the cost of equity (*Re*) with the CAPM formula:

$$Re = R_f + Unlevered\ Beta * \left(MRP - R_f\right)$$

Once all these components are established and the debt-to-equity ratio ($\frac{D}{E}$ with $V=D+E$) of the studied company is known, the WACC (r later as the discount rate) is determined by the following formula:

$$WACC = \left(\frac{V}{E} * Re\right) + (\frac{V}{D} * Rd * (1 - T_c))$$

All cash flows can now be discounted using the following formula, depending on the concerned year (n):

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n}$$

Following this, the discounted cash flows are summed up with the present value of the NOL balance remaining and the present value of the Terminal Value (*TV*) to find the company's intrinsic value. The last component (*TV*) is calculated by determining a long-term growth rate (g) based on the global growth and the specific market. The Terminal Value must then be discounted by the stable market WACC (r). It should be noted that the discount rate cannot be smaller than the growth rate, to avoid distorting the result. The following formula can be applied.

$$TV = \frac{CF_n * (1+g)}{(r-g)}$$

Lastly, to find the resulting equity value, the cash and the net operating loss must be added and the total debts and the capital leases before the IPO must be removed from the company value. Moreover, the outcome equity value needs to be divided by the diluted shares outstanding to find the estimated share price of the IPO. To find this number of shares, the remaining basic shares must be added to the total number of shares diluted by Options, Warrants, and Restricted stock units (RSU).

Afterward, discussion and analysis must be conducted to assess the differences between the DCF computed and the IPO share price announced and justify any over or under evaluation. Finally, the limitations and risks of this valuation method, the company itself and the markets in which it operates must be discussed.

5. Presentation of results and discussion

5.1. Discounted Cash Flow results

This section addresses the results obtained by the DCF valuation method. To forecast these findings, data and hypotheses of the S-1 form have been used. All the other assumptions supposed are indicated by "*Assumption X*". In addition, the main DCF figures are summarized in *Appendix 2*. Finally, the time frame required to build the model was 10 years given Rivian's early stage of development and thus the need for several years of growth before profitability.

5.1.1. Revenue

To begin with, Rivian's S-1 file identifies two distinct markets: the consumer market (SUVs to retail customers) and the commercial market (delivery trucks to other firms). These market opportunities are set according to two timeframes and geographic areas: the TAM, which is the long-term worldwide target market, and the SAM, the short-term target market focusing on Europe and North America.

Consumer market:

First, the maximum annual production was taken as the basis to forecast Rivian's sales. They expect in their S-1 form to produce 65,000 vehicles in 2022 and are planning a new plant 5x larger which will be built by 2024. Production is expected to increase by 150% (x 2,5) with this new infrastructure, i.e., half production of the new factory's size relative to the existing one (*Assumption 1*). A new plant is expected in 2030, as much time between the first two plants, and will increase capacity by 50% over the previous production (*Assumption 2*). Finally, a production gain declining from 20% in 2023 (production increase from 2022 to 2023) to a

stable 5% from 2031 is assumed (*Assumption 3*). Rivian indeed foresees in his S-1 form a significant increase in production capacity shortly years.

Secondly, Rivian's amount of sold cars for 2022 and 2023 are based on orders to be delivered by 2024, i.e., 50,000 SUVs with 25% of them being sold in 2022 and the remaining 75% in 2023 (*Assumption 4*). For the remaining years, a progressive increase from 48%, the already forecasted delivery, in 2023 to a maximum of 100% of production in 2031 will be delivered and sold each year, after reaching stability (*Assumption 5*). Knowing that Rivian expects in his S-1 to sell its cars for about $70,000, the annual revenues can therefore be deduced (*Appendix 2*).

Furthermore, extra revenues resulting from the life cycle of the vehicle (maintenance, financing, auto-driving options, etc.) and extra revenues related to the potential resale must be added to these figures. For the first case, it is assumed that 75% of the $33,400 per vehicle extra revenue projected by Rivian will be obtained (*Assumption 6*). For the second one, 50% of the $34,500 for the resale and reconditioning service is expected to be earned on vehicles sold 6 years earlier (*Assumption 7*). These earnings will therefore not be received before 2028.

Finally, by breaking down the consumer market forecast, Rivian should sell more than 552,000 vehicles to individuals in 2031, which is about 10% more than Tesla vehicles sold in 2020 with 499,000 vehicles (Statista 2021b) and which reflects an exponential growth, with total revenues of $54.919 billion for this segment, 70% more than Tesla's 2020 revenues of $31.536 billion (Statista 2021c). Moreover, in terms of the potential SAM market, Rivian would sell a significant 7% in terms of vehicle numbers (compare to 7,9 million forecasted in the market) and 6% in terms of final revenue (compare to $954 billion forecasted in the market). This 1% difference, which may be surprising given Rivian's target segment, is justified by the 6 years' gap in resale revenue. Moreover, in terms of the TAM market, Rivian would only sell

1% in terms of final revenue by 2031 (compare to 8,332 billion forecasted), an insignificant market share.

Commercial market:

First, the most important expected revenue in this segment is the order of 100,000 shipping vehicles for Amazon to be delivered by 2024 according to Rivian's plan. It is assumed that Rivian will deliver 10% in 2022, 20% in 2023, and finally 70% in 2024 (*Assumption 8*). After 2024, it is supposed that 10% of these 100,000 vehicles will be re-ordered each year given the life cycle of 10 years per vehicle announced in the S-1 form (*Assumption 9*). For the other electric trucks sold other than Amazon's order, it is assumed that each year 1% of the target market will be captured to reach 10% of the total announced market of 2 million per year by 2031 (*Assumption 10*), as they want to become a major player in this sector in the short term (Rivian S-1 form).

Subsequently, it is required to multiply these numbers by a selling price not revealed in the S-1 form but which, in comparison with the competition and notably the Ford transit sold at $45,000 on its webpage, is considered at $70,000 (*Assumption 12*) like their SUVs, considering the high-end segment targeted and the electric factor. Thereafter, the extra income from the life of the vehicle and its potential resale, calculated in the same way as for "consumer" vehicles must be added. The total revenue for 2031 amounts to $22.600 million. Moreover, this represents 11% of the SAM market and 3% of the TAM market, therefore a significant share of the short-term target market compared to long-term target.

Total revenue

Finally, by adding the revenues of both markets, an impressive growth and revenue of more than $77 billion for 2031 is reached which is more than twice Tesla's revenue of $32 billion but about 30% less than Ford's ($127 billion) and General Motors ($122 billion), all in 2020 (*Appendix 1)*. Moreover, 71% of the total revenue comes from the consumer market with

the remaining 29% from commercial revenue, which is therefore quite significant. Eventually, about 30% of their revenue comes from their extra services and not from the sale itself, which confirms Rivian's revenue strategy based also on auxiliary income.

5.1.2. Cost structure

To derive Rivian's cost of revenue and operating costs (R&D, G&A, etc.), a benchmark based on comparable firms representing Rivian's target automotive market was used. The comparable firms are the following: "Tesla; Nio Inc; General Motors; Volkswagen; Honda; Ford; Bayerische Motoren Werke; Mercedes-Benz". Key features used to choose those firms can be found in *Appendix 1*.

First, a progressive decrease of the cost to revenue ratio from 90% to 82% 5 years later (in 2026) was assumed, with 82% corresponding to the median of the different comparables. For the next 5 years, a gradual decrease to Tesla's ratio of 79% is applied, reflecting Tesla's cost structure, which is optimized for high-end electric vehicles. One should notice that the cost of revenue is equal to what Rivian earns with the selling of its cars, therefore resulting in a null profit margin. This is explained as the cost of revenue includes not only the cost of goods sold but also the cost linked to distribution and marketing. Secondly, regarding the operational costs, the initial cost on revenue ratio is derived from Rivian's S-1 forecast of 2021 and multiplied by 2 (projections of half of the year). Thereafter, Tesla's ratio was used again as an intermediate ratio target in 2026 with the final ratio of 13% in 2031 being the median percentage of comparables. Thirdly, depreciation and amortization are assumed to be 4% of the capital expenditure in 2022, obtained with the forecast given for 2021. This ratio is assumed to remain constant. Moreover, the stock-based compensation is foreseen in the S-1 form for 2022 and assumed to remain a punctual 1% thereafter since it is unpredictable.

Furthermore, the different EBIT for each year can therefore be computed, being all negative for five years until 2026 (FY 5) (*Appendix 2*). Moreover, the NOL balance allows the

positive operating incomes from 2026 (except 2028 and 2031) to be exempted from tax due to the positive balance.

5.1.3. Free Cash Flow

First, the depreciation and amortization added to the profit after tax were taken previously from the cost structure. Secondly, the ratio of revenue on changes in working capital is obtained with 2021 projections, which are multiplied by two (2 quarters only) and then divided by the forecasted revenue of 2022. The resulting 5% ratio is doubled from 2023 onwards to match the trend of the previous two years, forecasted in the S-1 form under "Changes in operating assets and liabilities". This 10% ratio is then assumed to remain stable over time (*Assumption 11*).

Furthermore, regarding the capital expenditure, the expenses in Property, Plant, and Equipment (PP&E) of Tesla's first years have been considered (*Appendix 9*). One can notice an important 3-year growth of these PP&E expenses from 2014 to 2017. Therefore, the same average of this growth (76%) has been applied to the first 2 years instead of 3, given the already significant Rivian's increase in capital expenditures from 2020 to 2021. For the following years, the same approach was used as before, by gradually decreasing the ratio of capital expenditure to revenue derived from 2023 with the PP&E first approach (71% of revenue) to the average of Tesla and Nio (12%), and then to the median of the stable companies (6%). Finally, this results in significant negative unlevered free cash flows until 2030 (FY9) (*Appendix 2*), which confirms Rivian's presumed long loss-making period.

5.1.4. Discount rate

To begin with, as stated in the methodology section, two separate WACCs will be calculated as discount rates. One for high-growth car companies and another terminal WACC computed using stable companies in this same market.

First, the risk-free rate found on Fred's website by the 20 years treasury bond is 1.97% for November 2021, the IPO date. Furthermore, the Damodaran forecasted risk for 2021 is

4.24%. Moreover, the median for high growth beta was 2.18 and 0.55 for stable companies, with means of respectively 2.18 and 0.54. Regarding the weighted average beta, weighted on comparable enterprise value found by adding market capitalization, total debt, and subtracting cash and cash equivalent, it yields 2,10 and 1,26 for respectively high growth firms and stable firms. They can be found in *Appendix 5*, together with key financial figures of the comparable firms. Hence, the two costs of capital, for high growth and terminal value, are 11.33% and 4.33% respectively.

Secondly, regarding the cost of debt, the only two components found in the S-1 form are the 2026 Senior Note representing $1.225 billion and the Long-term lease liabilities of $151 million. Given the expected interest of $6 million by mid-2021, multiplying this number by two (to represent the whole 2021 year) yields a cost of debt of 0.87%. The cost of debt for Rivian is extremely small, much lower than the risk-free rate. This fact is explained since Rivian has to pay 0% interest on its Senior Note until June 2022, after which it pays 5% which is considered directly in this case (*Assumption 13)*. Finally, the WACC formula can be applied which yield an initial discount rate of 11.18% and a terminal discount rate of 4.23%, reflecting a significant difference proving a considerably higher risk for fast-growing firms.

5.1.5. Discounted cash flow and implied share price

To begin with, a 3% growth rate is assumed, supporting the long-term GDP growth rate predicted by the OECD. This rate has not been adjusted to the EV market. Indeed, despite the significant growth expectation for EVs, the overall car market is mainly declining as explained in the market overview section. One can therefore expect a neutralization of these two opposite trends which give a growth rate equal to the long-term expected global GDP growth of 3%. Hence, by adding the present value of the terminal value of $71.3 billion with the negative sum of the $33.5 billion present value of the cash flows, the enterprise value results in $37.9 billion.

It is worth noting that the remaining NOL balance is null. One could also notice that enterprise value depends only on the terminal value given the negative cash flow component.

Furthermore, to reach equity value and the share price, the $19 billion remaining cash and the $25 million net operating losses must be added to this. Moreover, the debts of $1.4 billion must be subtracted to obtain an equity value of $55.6 billion. This number must then be divided by the number of diluted shares. This quote a share price of $56, equivalent to a 28% discount from the IPO offer price ($78).

5.1.6. Sensitivity analysis

Lastly, a sensitivity analysis was conducted to see how the terminal WACC and the terminal growth rate influence the share price. *Appendix 6* shows, as expected, a positive relationship between the growth rate and the share price, and a negative relationship between this same price and the cost of capital. Moreover, a high sensitivity with these two factors can be observed, with a maximum share price of $4,904 for a growth of 4% and a WACC slightly above 4%. This extreme sensitivity is due to the main part of the terminal value in the enterprise value calculated above.

5.2. Discussion

This DCF analysis warns of a high enterprise value overvaluation. Based on this valuation, it is therefore recommended not to take part in the IPO but to wait until the market value of the company decreases to at least the DCF value found or if a new favorable information emerges that would significantly increase Rivian's new value. It is essential to understand both the reasons why this share price may be too high but also why Rivian may believes the price is relevant.

5.2.1. Overvaluation assessment

To begin with, many investors have recently turned to similar high-growth potential companies. An example is the EV brand Nikola, which also went public without any revenue

and whose market value exceeded Ford's (Stevens 2020).This company is now worth less than $6 billion, after being accused of lying about its forecasts. Hence, the current investing trend is to find high return investments, despite high volatility and uncertainty about business projections. For instance, Tesla's valuation, with 2020 being the first profitable year (Statista 2021c), may lead investors to believe that a company like Rivian can afford to remain unprofitable for years to come while long-term growth is expected. However, one should also consider the potential overvaluation of the entire high-growth EV market, including Tesla. In fact, as described in the article of Root (2021), Tesla is considered vastly overvalued.

Furthermore, Amazon's status as a major customer and shareholder, like Ford, may give investors confidence in the company's strength and sustainability, and eventually in the IPO high price. Investors may believe that by investing heavily in Rivian, these two companies have a compelling incentive to continue to develop, fund, and help them grow for fear of losing all their investments in this company.

Finally, the feeling that Rivian is one step ahead of the competition, that its business model is likely to drive them forward and that their growth is under control is strengthened by Rivian strategy. The latter is described by targeting a niche EV market, offering many complimentary services, and by acting on two different segments.

5.2.2. Further Risk

However, even with this significant share price discount, many risks and uncertainty are not considered beyond this valuation based on market, comparable and Rivian’s S-1 form assumptions. First, nothing forces Amazon to honor its order of 100,000 electric vehicles, which is worth $7 billion if we assume the $70,000 per truck price (*Assumption 12*). As stated in the S-1 form: “While the EDV Agreement provides that we will be reimbursed for certain development costs, it does not include any minimum purchase requirements or otherwise

restrict Logistics from developing vehicles or collaborating with, or purchasing similar vehicles from, third parties." (SEC 2021).

Furthermore, as mentioned earlier, since large-scale production and distribution have not started, no cars have been sold yet leading to many doubts and risks regarding production and sales. It is still unknown whether the customer will be satisfied with the product and if they will remain faithful to the brand and eventually generate extra income from the life cycle vehicle revenue. Therefore, the cash flow forecast is quite uncertain and by looking at Tesla's revenue graph from the launch in 2008 to 2021 (*Appendix 8*), one can notice a slight increase and may thus challenge the exponential revenue growth assumed in the DCF model built.

Finally, the high growth market is also attracting many competitors, who already have great expertise in car production, distribution, and sales. These stable firms are turning to the EV market to avoid declining as the global car market is expected to do. For instance, Tesla presented its SUV truck in 2019, and Ford, despite being a major investor, is also expected to launch its EV SUV in the coming years (Halvorson 2020).

5.3. Model limitation

The relevance and the precision of this model may be challenged, and one must be aware of the potential risks associated. To begin with, the 2021 financial figures are only applicable for the first two quarters and are not audited. Some factors are therefore unknown for this specific year, which makes the analysis somewhat imprecise. Moreover, the assumptions made are extremely numerous and the model is thus highly dependent on them.

Furthermore, the DCF method includes many disadvantages which should be considered. The most important one is the high share price volatility from the terminal growth rate and the discount rate, even more significant in our case due to the leading share of the terminal value.

Eventually, as stated in the literature review, the DCF valuation is often positively biased, which suggests an even lower resulting price.

6. Conclusion

The aim of this present research was to conduct a consistent valuation of Rivian IPO, to identify any over or undervaluation and to justify why. To address this question, an analysis of the high-growth electric vehicle market and of Rivian's strategy was first studied. Subsequently, by considering Rivian's S-1 forecasts and by using some comparable companies and market assumptions, a discounted cash flow valuation was conducted.

As a result of this analysis, a significant overvaluation of 28% was found. The enterprise value computed for this IPO was $37.8 billion, with a share price of $56. An investor should therefore not invest at the IPO but wait for a potential market value drop below $56 or for a game-changing news. This suggests on the one hand that Rivian believes the company will outperform its peers, benefit from continued growth, and be supported by its current shareholders General Motors and Ford. On the other hand, it may suggest a significant overvaluation of the global market.

For future research, it would be valuable to study the future reaction of the market to this high-growth company and hence the highly volatile market price. Furthermore, the inherent development of Rivian should be followed to determine whether the company can become soon a major player in the electric vehicle market and bear its assumed market value. Finally, a more in-depth study on the global electric vehicle market could be conducted to determine a potential overvaluation.

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List of Appendices

Appendix 1: Comparable figures and key features

	Tesla	NIO Inc.	General Motors	Volkswagen	Honda	Ford	BMW	Mercedes-Benz
Industry and product	BEV cars	BEV cars	Fuel cell and EV cars	Fuel cell and EV cars	Fuel cell and EV cars	Fuel cell and EV cars	Fuel cell and EV cars	Fuel cell and EV cars
Size (Market Cap of 2021)	$1 T	$33.3 B	$57.2 B	$94.7 B	$44.6 B	$60.4 B	$55.4 B	$74.6 B
Geography	Mainly North America and Europe	Mainly China and slightly in Europe	North America and Europe	Mainly Europe and slightly North America	Mainly Asia (mainly Japan) and North America	Mainly North America and Europe	Mainly Europe and then North America	Mainly Europe and then North America
Growth Rate (2021)	+71%	+109%	+3.7%	+21.8%	+8.9%	+7.2%	+19.3%	+42.5%
Revenue (2020)	$32 B	$2.5 B	$122 B	$251 B	$131 B	$127 B	$112 B	$174 B
Profitability (net income of 2021)	$5.5 B	-$630.3M	$10 B	$18.21 B	$7.26 B	$17.9 B	$13.8 B	$23.4 B
Capital structure (D/E ratio)	0.4X	0.4X	1.1X	1.2X	0.78X	2.84X	2.84X	1.52X
Beta (5Y – Monthly)	2.08	2.42	1.2	1.1	0.96	0.8	1.20	1.41

Source: Yahoo Finance and Bloomberg

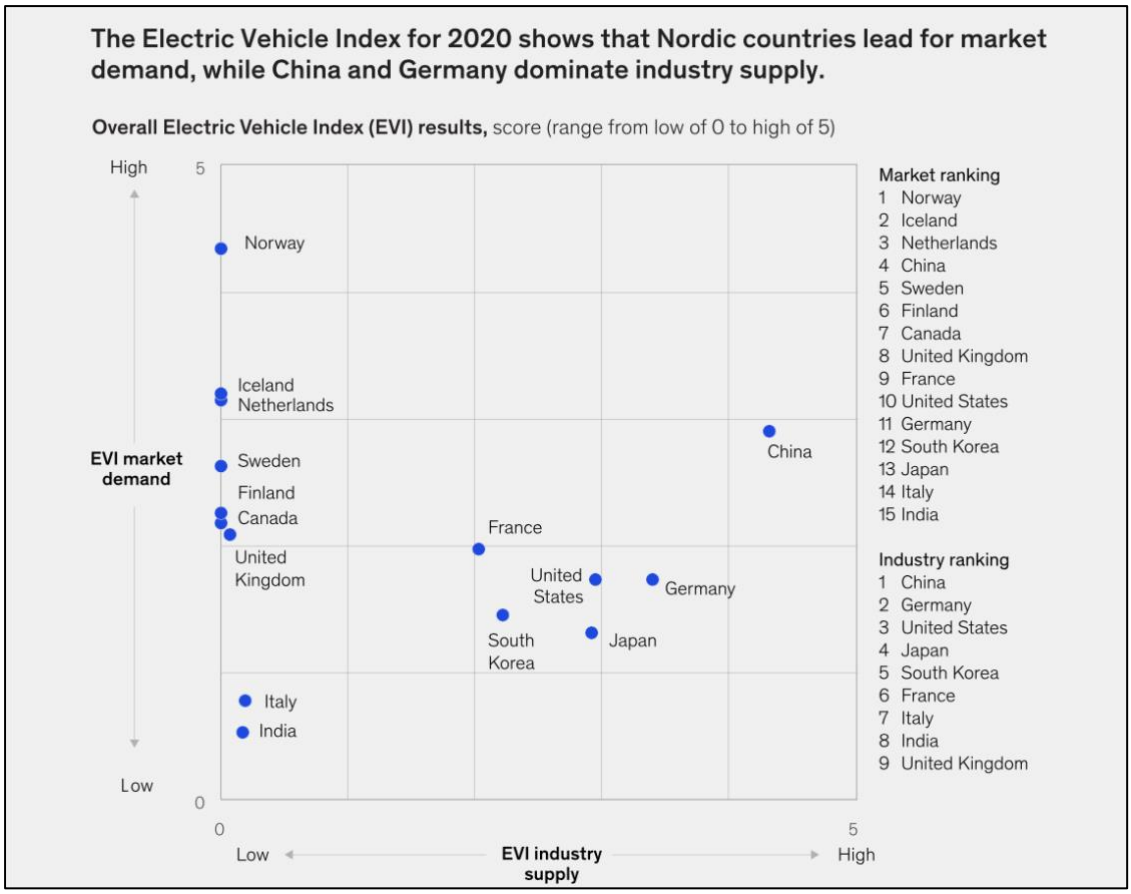
Appendix 2: Table of Rivian DCF figures (in million U.S. dollars)

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Total revenue Consummer market	1,188.1	3,564.4	10,113.9	13,155.9	16,646.5	20,526.8	24,914.0	29,671.1	48,619.1	54,919.9
Total revenue commercial market	3,108.0	6,216.0	13,468.0	9,324.0	11,396.0	13,468.0	15,837.0	18,206.0	20,971.0	22,647.0
Total revenue	4,296.1	9,780.4	23,581.9	22,479.9	28,042.5	33,994.8	40,751.0	47,877.1	69,590.1	77,566.9
Cost of Revenue	*-3,868.5*	*-8,615.7*	*-20,312.8*	*-18,924.3*	*-23,059.1*	*-27,737.2*	*-32,990.5*	*-38,454.9*	*-55,451.9*	*-61,314.5*
Gross Profit	427.6	1,164.7	3,269.1	3,555.6	4,983.4	6,257.5	7,760.5	9,422.2	14,138.2	16,252.4
Unallocated R&D, G&A, & Other Expenses	-1,978.0	-3,737.7	-7,167.0	-5,073.0	-4,134.0	-4,887.5	-5,710.1	-6,533.9	-9,243.2	-10,019.6
Depreciation & Amortization:	-122.8	-216.8	-421.2	-304.7	-259.3	-168.0	-175.5	-175.9	-211.5	-186.5
EBIT	-2,403.2	-2,887.0	-4,551.5	-2,042.1	317.6	870.5	1,475.7	2,241.7	3,996.5	5,277.3
Net Operating Profit After Tax	-2,403.2	-2,887.0	-4,551.5	-2,042.1	317.6	870.5	1,106.8	2,241.7	3,996.5	5,072.4
Change in Working Capital	429.6	548.4	1,380.2	-110.2	556.3	595.2	675.6	712.6	2,171.3	797.7
Capital Expenditures	-3,071.0	-5,420.1	-10,529.8	-7,617.5	-6,483.4	-4,199.6	-4,388.2	-4,396.5	-5,287.1	-4,663.4
Unlevered Free Cash Flow	-4,921.7	-7,541.8	-13,280.0	-9,465.1	-5,350.2	-2,565.9	-2,430.2	-1,266.4	1,092.1	1,393.2
PV of Unlevered FCF	-4,426.6	-6,185.4	-10,070.8	-6,731.0	-3,618.9	-1,674.7	-1,552.9	-803.9	699.1	912.9

Appendix 3: List of assumptions for the DCF valuation

Assumption n°	
1	Production is expected to increase by 2.5x with this new infrastructure, i.e. 50% of the new factory's size
2	The new plant will increase capacity by 50% over the previous production
3	The production gain is declining from 20% in 2023 to a stable 5% in 2031
4	25% of the ordered cars will be sold in 2022 and the remaining 75% in 2023
5	Rivian is assumed to sell "only" 50% of the new production of 2024 and a progressive increase from 48% in to a maximum of 90% in 2031
6	50% of the $33,400 per vehicle extra revenue projected by Rivian will be obtained
7	25% of the $34,500 for the resale and reconditioning service is expected to be earned after 6 years on vehicles sold
8	Rivian will deliver 10% of the trucks ordered by Amazon in 2022, 20% in 2023 and finally 70% in 2024
9	10% of the 100,000 vehicles ordered by Amazon will be re-ordered each year given the life cycle of 10 years
10	Each year 1% of the target commercial market will be captured
11	The 10% changes in working capital to revenue ratio is assumed to remain stable over time
12	SUVs and delivery vehicles will be sold at $70,000
13	Rivian will pay 5% of debt interest for the whole DCF

Appendix 4: McKinsey Electric Vehicle Index



Source: McKinsey Center for Future Mobility (2020)

Appendix 5: Comparable firms unlevered beta calculation (in billion U.S. dollars)

COMPANY	TICKER	LEVERED BETA	DEBT	% DEBT	EQUITY VALUE	% EQUITY	TAX RATE	UNLEVERED BETA
HIGH-GROWTH MARKETPLACE COMPANIES								
TESLA INC.	TSLA	2.08	$ 9	0.9%	$ 1,000	99.1%	11.0%	2.06
NIO INC.	NIO	2.42	$ 3	26.8%	$ 55	94.6%	(1.1%)	1.77
MATURE MARKETPLACE COMPANIES								
GENERAL MOTORS CO.	GM	1.20	$ 110	56.5%	$ 85	43.5%	21.8%	0.60
VOLKSWAGEN	VOW3	1.42	$ 207	58.8%	$ 145	41.2%	23.3%	0.68
HONDA MOTOR CO.	HMC	0.96	$ 68	56.3%	$ 53	43.7%	23.9%	0.48
FORD MOTOR CO.	F	1.10	$ 139	74.2%	$ 49	25.8%	23.6%	0.34
BMW	BMW.DE	1.20	$ 95	65.0%	$ 51	35.0%	25.0%	0.50
MERCEDES - BENZ	MBG.DE	1.41	$ 126	63.3%	$ 73	36.7%	31.6%	0.65

	HIGH-GROWTH	MATURE
MEDIAN BETA:	2.18	0.55
MEAN BETA:	2.18	0.54
VALUE WEIGHTED BETA:	2.1	1.26

Appendix 6: Sensitivity analysis

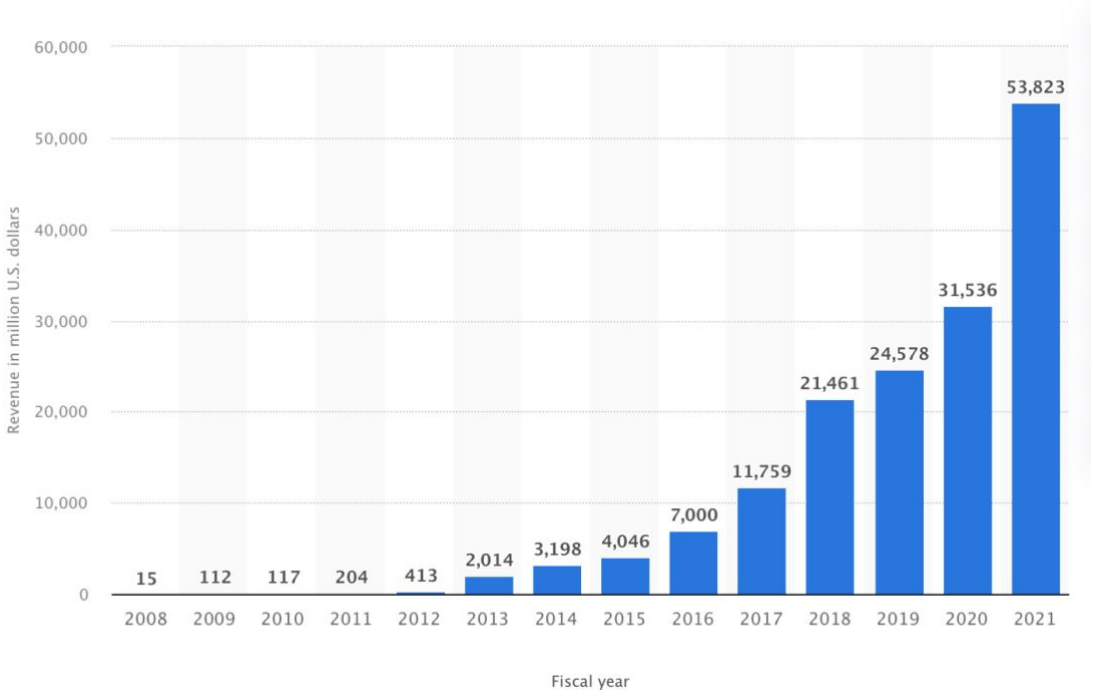
Terminal FCF Growth Rate

Terminal WACC	2.00%	2.20%	2.40%	2.60%	2.80%	3.00%	3.20%	3.40%	3.60%	3.80%	4.00%
4.02%	$31.9	$37.2	$43.9	$52.5	$63.8	$79.7	$103.2	$141.9	$217.5	$430.5	$4,904.2
4.12%	$29.2	$34.0	$39.9	$47.4	$57.1	$70.3	$89.3	$118.7	$170.8	$288.1	$796.3
4.32%	$24.6	$28.5	$33.2	$39.0	$46.4	**$55.9**	$68.9	$87.5	$116.5	$167.7	$283.0
4.42%	$22.6	$26.1	$30.4	$35.5	$42.0	$50.3	$61.2	$76.5	$99.3	$136.7	$209.7
4.52%	$20.7	$24.0	$27.8	$32.4	$38.1	$45.3	$54.7	$67.5	$85.8	$114.3	$164.6

Appendix 7: Terminology

EV	Electric Vehicle
PEV	Plug-In Electric Vehicle
BEV	Battery Electric vehicle
PHEV	Plug-In Hybrid Vehicle
HEV	Hybrid Electric Vehicle
RES	Renewable Energy Sources
SUV	Sports utility vehicle

Appendix 8: Tesla Revenue from FY 2008 to FY 2021



Source: Statista 2021

Appendix 9: Tesla Property, Plant, and Equipment table (in billion U.S. dollars)

IN BILLIARD U.S. DOLLARS	2014	2015	2016	2017	2018	2019	2020	2021
PROPERTY, PLANT AND EQUIPMENT (PP&E)	1.8	3.4	6.0	10.0	11.3	10,4	12.7	17.3
PP&E GROWTH %	147%	86%	76%	68%	13%	-8%	23%	36%

Appendix 10: Net Operating Loss balance (in million U.S. dollars)

BEGINNING NOL BALANCE:	-	2,403	5,289	9,842	11,888	11,577	10,715	10,715	8,481	4,494
(+) NOLS CREATED:	2,403	2,886	4,553	2,046	-	-	-	-	-	-
(-) NOLS USED:	-	-	-	-	(310)	(862)		(2,234)	(3,988)	(4,494)
ENDING NOL BALANCE:	2,403	5,289	9,842	11,888	11,577	10,715	10,715	8,481	4,494	-
NOL-ADJUSTED OPERATING INCOME:	(2,403)	(2,886)	(4,553)	(2,046)	-	-	1,467	-	-	777
(-) CASH TAXES:	-	-	-	-	-	-	(367)	-	-	(194)